The costs of tobacco, alcohol and illicit drug abuse to Australian society in 2004/05

by

David J. Collins
Macquarie University

and

Helen M. Lapsley
University of Queensland
and
University of New South Wales

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List of abbreviations

ABOD	Australian Burden of Disease study
ABS	Australian Bureau of Statistics
AF	Attributable fraction (also known as aetiologic fraction)
AIC	Australian Institute of Criminology
AIDS	Acquired immune deficiency syndrome
AIHW	Australian Institute of Health and Welfare
ATO	Australian Taxation Office
BCA	Benefit-cost analysis
BTE	Bureau of Transport Economics
COPD	Chronic obstructive pulmonary disease
DRG	Diagnosis-related groups
DUCO	Drug Use Careers of Offenders
DUMA	Drug Use Monitoring in Australia
EtOH	Ethyl alcohol
GDP	Gross domestic product
GST	Goods and services tax
HIV	Human immunodeficiency virus
ICD	International Classification of Diseases
IGA	Inter-Governmental Agreement on the Reform of Commonwealth-State Financial Arrangements
IHD	Ischaemic heart disease
MSO	Most serious offence
NCA	National Crime Authority
N.a.	Not available
N.e.i.	Not elsewhere included
NHMRC	National Health and Medical Research Council
PBS	Pharmaceutical Benefits Scheme
PYLL	Potential years of life lost
QFRS	Queensland Fire and Rescue Service
RR	Relative risk
RRP	Revenue replacement payment
SIDS	Sudden infant death syndrome
WHO	World Health Organization

Executive Summary

This report is the fourth 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 financial year 2004/05, the most recent year for which all relevant data are available. The production of this report was preceded by an extensive scoping study, including an invitational workshop with other researchers in related areas.

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

Total social costs of drug abuse, 2004/05

	Alcohol ($m)	Tobacco ($m)	Illicit drugs ($m)	Alcohol and illicits together ($m)	All drugs ($m)	All drugs adjusted for health interaction ($m)
Tangible	10,829.5	12,026.2	6,915.4	1,057.8	30,828.9	30,489.8
Intangible	4,488.7	19,459.7	1,274.5		25,222.9	24,683.0
Total	15,318.2	31,485.9	8,189.8	1,057.8	56,051.8	55,172.8
Proportion of unadjusted total	27.3%	56.2%	14.6%	1.9%	100.0%	

Source: Table 35.

Note: health-related cost components in final column have been adjusted to take account of drugs interaction.

Of the total social cost of drug abuse in 2004/05 of $55.2 billion, alcohol accounted for $15.3 billion (27.3 per cent of the unadjusted total), tobacco for $31.5 billion (56.2 per cent), and illicit drugs $8.2 billion (14.6 per cent). Alcohol and illicit drugs acting together accounted for another $1.1 billion (1.9 per cent).

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

Selected tangible drug abuse costs, 2004/05

	Alcohol ($m)	Tobacco ($m)	Illicit drugs ($m)	Alcohol and illicit drugs combined ($m)
Crime	1,611.5		3,840.5	1,261.0
Health (net)	1,976.7	318.4	201.7	
Production in the workplace	3,578.6	5,749.1	1,622.9	
Production in the home	1,571.3	9,843.1	495.5	
Road accidents	2,202.0		527.6	
Fires		136.4		

Source: various tables in Section 6.

The third and fourth tables compare constant price estimates (that is, estimates adjusted to eliminate changes in the general price level) of the social costs of tobacco and illicits respectively between 1998/99 and 2004/05. As a result of revisions to the underlying epidemiological information concerning the health effects of alcohol, it is not possible to make a comparison over time of alcohol costs.

Comparison of constant price estimates of the social costs of tobacco abuse, 1998/99 and 2004/05, at 2004/05 prices

	Tobacco 1998/99 ($m)	Tobacco 2004/05 ($m)	Tobacco (per cent change)
Tangible	9,184.8	12,026.2	30.9
Intangible	16,315.2	19,459.7	19.3
Total	25,500.0	31,485.9	23.5

Source: Table 49.

The *real* social costs of tobacco abuse are estimated to have risen during the period 1998/99 to 2004/05 by 23.5 per cent (consisting of a 30.9 per cent increase in tangible costs and a 19.3 per cent increase in intangible costs). Although smoking prevalence has been falling steadily, the lagged effects on health and on the workforce of smoking in the past have meant that the overall social costs of smoking continue to rise. As these lagged effects work their way through the system, and assuming that smoking prevalence continues to decline, real smoking costs (adjusting for the effects of inflation) can be expected eventually to fall very significantly.

Comparison of constant price estimates of the social costs of illicit drugs, 1998/99 and 2004/05, at 2004/05 prices

	Illicits 1998/99 ($m)	Illicits 2004/05 ($m)	Illicits (per cent change)
Tangible	6,182.8	6,915.4	11.8
Intangible	1,172.9	1,274.5	8.7
Total	7,355.6	8,189.8	11.3

Source: Table 50.

The real social costs of illicit drug use are estimated to have risen between 1998/99 and 2004/05 by 11.3 per cent (consisting of an 11.8 per cent increase in tangible costs and an 8.7 per cent increase in intangible costs). The report also presents a partial disaggregation of the mortality and morbidity costs of illicit drugs by type of drug (see Table 24 to Table 29 inclusive).

Some of the costs of involuntary smoking have again been identified and it remains apparent that a high proportion of these costs are imposed on the young. In 2004/05, under 15 year olds accounted for 25 per cent of all deaths attributable to involuntary smoking, 96 per cent of attributable hospital bed days and 91 per cent of attributable hospital costs (see Table 23).

The report identifies the impact incidence of drug abuse upon the household, business and government sectors.

The alcohol and tobacco tax arrangements which were implemented with the introduction of the GST in 2000 have had a significant effect on the budgetary impact of drug abuse (that is, drug-related taxation revenue less drug-related government expenditures). This is shown in the following table.

The impact of drug abuse on federal and state budgets, 2004/05

	Alcohol		Tobacco		Illicit drugs	
	Federal ($m)	State ($m)	Federal ($m)	State ($m)	Federal ($m)	State ($m)
Net revenue	3,075.4	976.5	2,864.1	937.4	(299.5)	0.0
Expenditure	1,272.6	1,363.8	154.8	104.7	127.5	2,264.8
Revenue less expenditure	1,802.8	(387.3)	2,709.3	832.7	(427.0)	(2,264.8)

Sources: Table 39 to Table 47 inclusive.

Note: figures in brackets are negative.

Consumption of alcohol had a positive effect on the federal budget but negative effects on state budgets, while tobacco consumption had positive effects on both federal and state budgets. Since illicit drugs yield no tax revenue directly (while causing a reduction in general tax revenues) illicit drug abuse had a negative effect upon both federal and state budgets.

Finally, the report makes recommendations for data collection and research to better inform future economic evaluation of policy effectiveness.

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1. Introduction

This study estimates the social costs of the abuse of drugs (alcohol, tobacco and illicit drugs) in Australia in the financial year 2004/05. It is the fourth in a series of such studies prepared for the Department of Health and Ageing by the present authors. Previous studies of these costs were undertaken for the years 1988, 1992 and 1998/99 (Collins and Lapsley, 1991, 1996 and 2002 respectively).

Since the production of the 1998/99 estimates, the present authors have been involved in two significant international developments in this area. They are two of the authors of the World Health Organization publication *International Guidelines for Estimating the Costs of Substance Abuse* (Single et al., 2003). They are also the two lead authors of the Health Canada publication *International guidelines for the estimation of the avoidable costs of substance abuse* (Collins, Lapsley et al., 2006). The latter, produced after a Health Canada-sponsored international workshop on the *avoidable* costs of substance abuse, represents the first systematic attempt to develop a sophisticated methodology to estimate avoidable, as opposed to aggregate, costs. The Australian Government Department of Health and Ageing has commissioned the present authors to undertake a pilot study applying this new methodology to the estimation of the avoidable costs of alcohol abuse in Australia, to be undertaken after the completion of the study published in this report. This avoidable cost study will inform and constitute part of a set of international studies in this area. It is intended that the avoidable cost guidelines will be reviewed in the light of the experience gained in the pilot studies.

Previous studies in this series have analysed the theory and methodology of social cost estimation in considerable detail. This can present a problem to the reader in that the present study runs the risk of largely repeating the methodological explanations of previous studies. On the other hand, if the methodological discussion were too brief or completely eliminated, this paper would not be able to be read as a stand-alone document. This potential conflict is addressed by presenting in Section 2 a methodological discussion which is largely a repeat of discussions in our previous papers. This section need not be read by those readers who are completely familiar with the underlying methodology. We proceed in Section 3 to explain and discuss areas of estimation where new or revised methodologies or new data have become available. Section 4 examines epidemiological issues and Section 5 examines issues in the estimation of drug-attributable crime costs. The aim in the above sections is to present sufficient methodological information so that this paper can be read independently of the previous ones.

Section 6 presents detailed disaggregated cost estimates for crime, health, productivity, road accidents and fires. It also presents a partial disaggregation of the mortality and morbidity costs of illicit drugs by type of drug. Section 7 presents the full results disaggregated by category of drug (alcohol, tobacco and illicit drug). Section 8 considers the comparability of the results with those of previous studies by the present authors. The final section discusses implications of the study for future research.

The approach of the present authors, both of whom are economists, is to concentrate on the economic aspects of the analysis. Where analysis in other areas of scientific specialisation is called for, experts in these areas have provided data and been consulted. Three appendices, specifically attributed to their authors, provide detailed expositions of the non-economic methodologies used in this study—demographic, epidemiological and criminological.

It is recognised that, in spite of the existence of the *International Guidelines* (Single et al., 2003), full consensus does not exist on the methodology of social cost estimation. Thus, the present authors, in common with others in this research field, must decide between various available methodologies. The approach of the present report is to disaggregate the estimates as far as possible, in order that readers are able to identify the impact which the adoption of different methodologies would have upon these estimates. For example, this report incorporates, and separately identifies, the reduction of the costs of health service resources which results from premature deaths caused by drug abuse. Most other cost studies do not identify this impact, preferring to estimate only the gross healthcare costs. Similarly, there has been discussion as to the proportion of total alcohol consumption in the Australian community which can be deemed abusive. This report indicates the impact of different assumed levels of abusive alcohol consumption on the aggregate estimates.

The uses of substance abuse cost estimates are discussed in some detail in Single et al. (2003).

> First, economic cost estimates are frequently used to argue that policies on alcohol, tobacco and other drugs should be given a high priority on the public policy agenda.
>
> Second, cost estimates help to appropriately target specific problems and policies. It is important to know which psychoactive substances involve the greatest economic costs.
>
> Third, economic cost studies help to identify information gaps, research needs and desirable refinements to national statistical reporting systems.
>
> Last but not least, the development of improved estimates of the costs of substance abuse offers the potential to provide baseline measures to determine the efficacy of drug policies and programmes intended to reduce the damaging consequences of alcohol, tobacco and other drug use. Estimates of the social costs can assist policy makers in evaluating outcomes, as expressed in terms of changes in social costs in constant dollar terms. Estimates of social costs can also facilitate cross-national comparisons of the consequences of substance abuse and different approaches to confronting those consequences.

The purpose of the study presented here is to provide reliable estimates which can inform all of these public policy objectives.

2. General methodological issues in the estimation of the social costs of drug abuse

2.1 The definition of costs

The definition of the economic costs of drug abuse used in the three previous Collins and Lapsley studies, and again 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.

This cost concept, which applies to what 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. However, if a study's assumed counterfactual situation is not made explicit, interpretation of its results becomes difficult. For example, a statement that "the social cost of smoking in year X was Y million dollars" is not particularly informative unless we know what was the alternative situation assumed for the purposes of the calculation. The study might be referring to:

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

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

Thus, for the purposes of this study, the counterfactual situation which is compared with the actual 2004/05 drug abuse situation is one in which there has been no abuse of the drug in question for an extended period of time. In this study that period is assumed to be at least 40 years.

To postulate a situation of no past or present drug abuse is not to suggest that such a situation is necessarily achievable. It is, almost certainly, not achievable. 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. Identification of the potential reduction in costs, given the implementation of a set of appropriate public policies, involves the estimation of *avoidable* costs, which is not undertaken in this study. The issues involved in estimating avoidable costs are dealt with extensively in Collins, Lapsley et al. (2006).

2.2 The concept of drug abuse

The definition of tangible abuse cost used in this study refers, as discussed above, 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*. On the other hand, a new National Alcohol Strategy which has recently been published (see www.alcohol.gov.au) offers no preference, separation, or definition for the terms alcohol misuse or abuse.

For convenience, drug abuse is defined for the purposes of this study as consisting of tobacco abuse, illicit drug abuse and alcohol abuse/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 use.

As discussed below, 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.

2.3 Abusive and addictive drug use

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 per cent of alcohol consumption was by addicted drinkers. (It should be emphasised that this does not suggest that 20 per cent of alcohol consumers are addicted, as the average alcohol consumption of addicted drinkers will be much higher than that of other 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. Accordingly, the proportion of abusive alcohol consumption is assumed to be higher, at 30 per cent.

It is recognised that this proportion represents an educated guess and it has been suggested that the true proportion may well be much higher—at least 50 per cent. This figure affects only one component of the alcohol cost estimates—the resources used in abusive consumption. The estimates of all the other components of the social costs of alcohol are made independently of this figure. The figure estimated for the resources used in abusive alcohol consumption, on the basis of the 30 per cent assumption, is $1,689m. If a proportion of 50 per cent were adopted, this figure would rise to $2,815m.

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. In effect, this determines the counterfactual scenario as a situation in which there is no consumption of illicit drugs. The degree to which such unauthorised use is abuse, as discussed elsewhere in this report, is a question outside the scope of this study.

2.4 Demographic and human capital approaches

The approach to cost estimation adopted in previous Collins and Lapsley studies and in the present study has been labelled the “demographic” approach, rather than the “human capital” approach of some 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 World Health Organization (Single et al*.,* 2003). These guidelines acknowledge the legitimacy of both approaches.

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 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 and upon the precise nature of the counterfactual scenario. The two approaches are complementary rather than competitive.

The two approaches are likely to yield different aggregate cost relativities for the three drug categories. This arises from the fact that the age at which an Australian drug-attributable death occurs is lowest for illicit drugs, relatively low for alcohol and highest for tobacco. The average potential years of life lost (PYLL) for all illicit drug-attributable deaths (for the ages 0–74) is 39, for alcohol it is 32, and for tobacco it is only 16. Thus, the human capital approach will place a higher emphasis on costs which involve the discounting back to present day values.

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 the 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.

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.

2.5 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. 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 that would appear impossible to justify. If such 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 and an appropriate counterfactual. 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 alternative uses to which these resources would have been put would be largely determined by government macroeconomic and microeconomic policies and to forecast these uses would therefore be speculative.

2.6 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 negative externalities. (Negative externalities occur when individuals or firms undertake actions which impose costs upon other individuals or firms, while providing no, or insufficient, compensation to those who bear these extra 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 in relatively minor rear-end collisions, with catastrophic implications for its occupants. 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 consistently 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 public policies.

Being fully informed about the private costs of abuse requires the abuser to have access to, and have 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-informed, 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 (which was legal until relatively recently) 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.

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 maximisation over time. Stevenson (1994) says that the theory of rational addiction "assumes that drug users are rational, forward looking utility maximisers 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 the early- or mid-teens when it would seem that the presence of both rationality and full information is unlikely.

The notion of rationality as maximisation 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 maximisation. 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
- 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.

2.7 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.

2.8 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. These potential returns are represented by *avoidable* costs.

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.

Previous papers in this series have presented estimates of the avoidable costs of substance abuse in Australia. However, as indicated above, the present authors will, in a separate paper, estimate the avoidable costs of alcohol misuse in Australia. The present paper, unlike previous papers in this series, does not provide any estimates of the avoidable costs of substance abuse.

2.9 The incidence of abuse costs

This paper follows the recommendations of the *International Guidelines for Estimating the Costs of Substance Abuse* (Single et al., 2003) 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
- government.

There are various mechanisms by which these groups could shift the abuse costs to other groups. Some of these mechanisms are indicated in Table 1.

Table 1, 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)

Given that any costs imposed on business or government must eventually be shifted in some form, all costs must ultimately be borne by individuals.

This table demonstrates 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—households (consisting of ill-informed and/or addicted abusers and other individuals), business and government.

By their nature, intangible costs cannot be shifted. For example, there is no mechanism by which the costs of loss of life can be passed on to others. Thus individuals bear both the impact and the effective incidence of all intangible costs.

An interesting issue arises in relation to the impact incidence of the resources used in the abusive consumption of alcohol, tobacco and illicit drugs. As these resources would have been available for other uses had they not been utilised for this purpose, it needs to be determined which section of the community (households, business or government) would have benefited from the availability of these resources.

The approach of the present study is to assume that the productive resources released from the production and distribution of drugs would have become available for the production and distribution of other goods and services. Thus the impact incidence of the resources used as a result of drug abuse is assumed to be on businesses involved in these alternative activities.

2.10 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). While the term "involuntary smoking" is to be preferred and is adopted in this study, some of the epidemiological information (for example in Appendix C) still refers to "passive smoking".

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) or by Begg et al. (2007) as resulting from passive smoking are assumed to reflect involuntary smoking.

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 2 below lists the conditions assumed by this study to result from involuntary smoking.

Table 2, Involuntary smoking-attributable conditions

0–14 years of age	15 years of age and over
Tobacco abuse	Lung cancer (passive)
Lower respiratory tract infection	Ischaemic heart disease (passive)
Crohn's disease	
Ulcerative colitis	
Antepartum haemorrhage	
Low birthweight	
SIDS	
Fire injuries	
Asthma	
Otitis media	

Source: Appendix C. Note that the Crohn's disease attributable fractions for mortality are positive but for morbidity are negative.

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. However, data deficiencies mean that we have been unable to produce this disaggregation.

2.11 Valuation of life

Drug abuse causes premature deaths. 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 drug abuse victim and others (an intangible cost). How to value the costs to the community of these deaths is the subject of considerable debate in the economic literature.

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 healthcare resources to the aged) demonstrates clearly that it believes the lives of people of beyond work force age are still 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 $2 million, which is at the low end of the range of international estimates. In this study this figure is adjusted to 2004/05 prices by the Australian National Accounts implicit price deflator for domestic final demand 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).

The average intangible value of the loss of one year's living in 2004/05 prices was calculated to be $53,267.

2.12 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 (BTE) (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 may well represent a considerable underestimate.

2.13 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—that is simply a different distribution of the available resources. 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.

Collins and Lapsley (2002, p. 27) concluded that it was not possible to estimate welfare costs, either real or budgetary, causally attributable to the consumption of each of the three drug categories studied (alcohol, tobacco and illicits). The same conclusion was reached in the preparation of the present study.

2.14 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. Using economic terminology, 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 to the general community, by taxation or other means.

The same argument holds for alcohol, the other drug whose use is able to be 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 the GST, customs duties 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, alcohol and illicit drug use, incorporating the revenue-contraction, as well as the revenue-generation, effects. 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, in principle, be excluded, since only taxes which specifically discriminate against these drugs are relevant to the revenue/expenditure comparison.

There is, however, a complication in the Australian context in that the GST which is now applied to alcohol and tobacco was applied to these goods for the purposes of administrative simplicity. An-across-the-board GST at a single rate is much simpler, and accordingly much less costly to implement than one in which there are substantial exemptions (in the tax jargon, *zero rating*). As explained below, when the Australian GST

was implemented, excise duties on alcohol and tobacco were simultaneously reduced, so that the overall tax burdens remained broadly the same. In acknowledging this history, the present study includes GST revenue on alcohol and tobacco for the purposes of the budgetary analysis.

2.15 Research, education and drug program costs

The *International Guidelines for Estimating the Costs of Substance Abuse* (Single et al., 2003) argue that public expenditure on areas such as drug-related education programs or research projects represents the effects of public decisions to reduce abuse rather than the direct effects of abuse and, accordingly, should be excluded from abuse cost estimates. The guidelines 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 follows Collins and Lapsley (2002) in adopting 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.

At the time of the production of Collins and Lapsley (1996), the second in this series of estimates of the social costs of drug abuse, it was possible to obtain information on drug-related research and education costs 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 Australian Government Department of Health and Ageing mean that it no longer separates the funding stream in the previous manner, with consequent difficulties for the attribution of funds to different activities. However, the Commonwealth through the Pharmaceutical Benefits Scheme (PBS) provides the following subsidies for pharmaceuticals prescribed for preventive purposes:

Table 3, PBS subsidies and patient contributions for prescribed preventive pharmaceuticals, 2004/05

	Benefit paid by PBS $	Patient contribution $	Total cost $
Acamprosate calcium	3,556,369	250,746	3,807,115
Naltrexone hydrochloride	2,139,399	150,919	2,290,318
Bupropion hydrochloride (Zyban)	6,914,496	560,721	7,475,217

Source: Australian Government Department of Health and Ageing.

In principle, it would be desirable to estimate 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, 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).

As a result of these problems it has once again not proved possible, for the purposes of the present study, to provide sufficiently comprehensive estimates of public expenditures on drug-related research and education, and on drug programs.

3. Availability of new or revised methodologies and data

This section provides details of areas of estimation where revised or new estimation methodologies have become available or where data availability has improved.

3.1 The impact of the GST on the taxation of alcohol and tobacco

This study, like previous studies by the present authors in this series, estimates the budgetary impact of drug abuse on the Commonwealth and on the states and territories (referred to subsequently for the purpose of brevity as the states). This involves a comparison of drug-attributable expenditures, for example on healthcare and justice, with the relevant tax revenues. Since the previous study (Collins and Lapsley, 2002) there have been significant changes in the ways in which alcohol and tobacco are taxed.

Prior to 1997, tobacco was taxed through federal customs and excise duties and state franchise fees. Alcohol was subject to the federal wholesale sales tax as well as customs and excise duties and franchise fees. In August 1997, in response to a challenge to NSW franchise fees on tobacco, a High Court decision in *Ha and Lim v The State of New South Wales* struck down these fees. This decision clearly also had applicability to tobacco franchise fees imposed by other states and to liquor franchise fees across all states and, as a result, all franchise fees were suspended.

As a consequence, the Commonwealth Government negotiated a safety net agreement with the states under which the Commonwealth would increase its tax rates on alcohol and tobacco to cover the revenue which would have been raised by the now-suspended franchise fees. The safety net revenue was returned to the states as Revenue Replacement Payments (RRPs). This situation was reflected in the 1998/99 tax revenue data in Collins and Lapsley (2002).

In July 2000 the Commonwealth Government introduced the Goods and Services Tax (GST) and abolished the wholesale sales tax, as part of a complicated package of changes resulting from the 1999 Intergovernmental Agreement (IGA) negotiated between the Commonwealth and the states. The IGA changed the methods of taxing alcohol and tobacco, and the distribution of that revenue between the Commonwealth and the states. Under the IGA, all GST revenue was earmarked for the states (though much of this revenue was clawed back by the Commonwealth through the simultaneous abolition of Financial Assistance Grants to the states).

It was intended that the GST should be applied to all forms of alcohol and tobacco at the standard rate of 10 per cent, but that the overall rates of tax on these products should be largely unchanged. Thus some compensatory changes in other taxes were implemented:

- Excise tax rates on alcohol and tobacco were reduced, to adjust for the application of the GST.
- A Wine Equalisation Tax was introduced, to adjust for the abolition of the wholesale sales tax on wine.

At the same time, to improve the effectiveness of the tobacco excise tax, its basis was changed from taxation purely by weight of tobacco to a combination of "per stick" taxation and taxation by tobacco weight. This reform was estimated at the time by Federal Treasury to yield an increase in tobacco tax revenue of $440m in a full year.

Apart from the "per stick" tobacco tax reform, the above changes were designed to leave tax revenue levels broadly unchanged. However, they resulted in a major reallocation of revenue from the states to the Commonwealth. The states lost the Revenue Replacement Payments and, in compensation, received only the 10 per cent GST on alcohol and tobacco. The result of all these changes is shown in the following two tables, which compare the situations in the financial years 1998/99 (the year of the previous drug abuse costs study) and 2004/05.

Table 4, Tobacco tax revenues, 1998/99 and 2004/05

	1998/99			2004/05		
	Federal $m	State (RRPs) $m	Total $m	Federal $m	State (GST) $m	Total $m
Excise tax	1,633.7	3,120.2	4,753.9	5,220.0	0.0	5,220.0
Customs duties	254.0	0.0	254.0	518.0	0.0	518.0
GST	n.a.	n.a.	n.a.	0.0	937.4	937.4
Total revenue	1,887.7	3,120.2	5,007.9	5,738.0	937.4	6,675.4
Percentage	37.7	62.3	100.0	86.0	14.0	100.0

Sources: Australian Bureau of Statistics, Taxation Revenue (5506.0), various years.
Australian Taxation Office, Taxation Statistics (various years).
Australian Bureau of Statistics, unpublished data on customs duties.
Authors' calculations of GST revenue.

Note: n.a. means not applicable.

Table 5, Alcohol tax revenues, 1998/99 and 2004/05

	1998/99			2004/05		
	Federal $m	State (RRPs) $m	Total $m	Federal $m	State (GST) $m	Total $m
Excise tax						
Beer	873.9	0.0	873.9	1,653.0	0.0	1,653.0
Spirits	144.5	0.0	144.5	739.0	0.0	739.0
Total excise tax	1,018.3	0.0	1,018.3	2,392.0	0.0	2,392.0
Sales tax (beer, wine and spirits)	620.6	997.4	1,618.0	n.a.	n.a.	n.a.
Customs duties						
Beer	14.0	0.0	14.0	83.0	0.0	83.0
Wine	4.0	0.0	4.0	5.0	0.0	5.0
Spirits	719.0	0.0	719.0	980.0	0.0	980.0
Total customs duties	737.0	0.0	737.0	1,068.0	0.0	1,068.0
GST	n.a.	n.a.	n.a.	0.0	976.5	976.5
Wine equalisation tax	n.a.	n.a.	n.a.	676.0	0.0	676.0
Total revenue	2,375.9	997.4	3,373.3	4,136.0	976.5	5,112.5
Percentage	70.4	29.6	100.0	80.9	19.1	100.0

Sources: Australian Bureau of Statistics, Taxation Revenue (5506.0), various years.
Australian Taxation Office, Taxation Statistics (various years).
Australian Bureau of Statistics, unpublished data on customs duties.
Authors' calculations of GST revenue.

Note: n.a. means not applicable.

The above two tables show how the taxation of alcohol and tobacco is now almost entirely a Commonwealth prerogative. In 2004/05 the Commonwealth received 86.0 per cent of total tobacco tax revenue (up from 37.7 per cent in 1998/99) and 80.9 per cent of total alcohol tax revenue (up from 70.4 per cent). In practice, the states have no ability to control the GST tax rate, their single remaining source of tax revenue from alcohol and tobacco.

3.2 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.

3.2.1 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 2004/05 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 drug abuse, workforce.

3.2.2 Absenteeism

The absenteeism cost estimates in Collins and Lapsley (2002) relied heavily upon research by Bush and Wooden (1994), who 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.

Since the publication of Collins and Lapsley (2002), Pidd et al. (2006) have argued that the 1998/99 costs of absenteeism attributable to consumption of alcohol were seriously underestimated. Their research is based upon data collected as part of the *2001 National Drug Strategy Household Survey*. They estimate, on the basis of self-reported results in the survey, that 2,683,000 workdays were lost in 2001 as a result of alcohol-attributable absenteeism. Using an alternative technique which calculates for differences in the illness-related or injury-related absenteeism of drinkers and non-drinkers, they estimate that 7,400,000 workdays were lost as a result of alcohol consumption. Following the conservative approach adopted in the present research, the lower of the two estimates is adopted here.

The Bush and Wooden (1994) data and the Pidd et al. (2006) results, together with prevalence data on smoking and drinking from the *2004 National Drug Strategy Household Survey* and Australian Bureau of Statistics data on employee absences from work and their causes, permit the estimation of the excess absenteeism attributable to smoking and drinking compared with the rest of the workforce.

While neither Bush and Wooden nor Pidd et al.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 bed days 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.

3.2.3 On-the-job productivity

Once again, 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. We continue to believe that these costs would be considerable, but quantification is still not possible.

3.3 Production losses in the household sector

Drug-attributable sickness or death cause 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 the most recent 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 household 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 therefore 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 2004/05 levels, are applied to the most recent data on drug-attributable mortality and morbidity developed for the purposes of the present study to yield estimates of production losses in the household sector.

3.4 Health

3.4.1 Hospitals

This study applies well-validated case-mix costs to the episodes of hospital care which have 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 is difficult to compare costs estimated in previous years with the hospital costs estimated in this study. 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.

3.4.2 Medical costs

The total value of medical costs in 2004/05, and the sources of funds for these expenditures, are presented in the Australian Institute of Health and Welfare publication *Health expenditure Australia 2004–05*, Table A1. The relevant proportions of this total cost are allocated to the individual drugs (alcohol, tobacco and illicit drugs) according to the estimated attributable hospital bed days.

3.4.3 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 entoconditis and true psychoses. One example demonstrated by an early 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.

3.4.4 Ambulances

The only data available on illicit drug-attributable ambulance use relate to ambulance attendances for drug overdoses in NSW (see NSW Chief Health Officer, 2006).These data relate to ambulance attendances where the Ambulance Service Protocol 28 (drug overdose and poisoning) was used and where a narcotic antagonist (such as Naloxone/Narcan) was administered. The *Report on Government Services 2006* (Attachment 8A) provides data on total ambulance attendances by state and for Australia as a whole. By applying the proportion of total NSW ambulance attendances which related to drug overdoses to the Australia-wide number of attendances for all causes, an estimate can be produced for drug overdose-related ambulance attendances Australia-wide.

Dietz et al. (2000) studied ambulance attendance at heroin overdoses in Melbourne for three months in 1997/8 and included an estimate of cost per call out. This figure has been updated to 2004/05 values by applying the increase in Australia-wide average ambulance attendance costs for all causes, calculated from data in the *Report on Government Services 2000* (Attachment 10A) and *Report on Government Services 2006* (Attachment 8A). Application of this average overdose attendance cost to the estimated number of overdose-related ambulance attendances produces an estimate of total overdose attendance costs.

It has, for the first time, proved possible to estimate ambulance costs attributable to the consumption of tobacco and alcohol. The Western Australian Department of Health collects data on separations arriving at hospital by ambulance at a level of disaggregation

which permits linking to tobacco- and alcohol-attributable medical conditions. The relevant attributable fractions are applied to these data to yield estimates of attributable ambulance services. These results are then used to estimate Australia-wide attributable ambulance costs by application of ambulance usage and cost data in the *Report on Government Services 2006* (Attachment 8A).

3.4.5 Pharmaceuticals

The pharmaceutical cost estimates presented below relate to selected pharmaceuticals prescribed for the treatment of alcohol- and tobacco-attributable conditions identified in the risk-related fractions, and for which hospital and medical services are provided. The same fraction as in the calculation of hospital and medical services has been applied to each of these drugs. This is necessarily 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 costed only those included in the one hundred highest cost Pharmaceutical Benefits Scheme (PBS) drugs. It was not possible to estimate illicit drug-attributable pharmaceutical costs.

As discussed previously, an increasing component of treatment and care is provided on a non-inpatient basis. It is, therefore, important to identify these costs wherever possible. The cost estimates presented below apply only to prescription pharmaceuticals provided outside the hospital sector. In-patient pharmaceutical costs are incorporated in Diagnosis-Related Groups (DRG) hospital costs.

As this calculation applies only to prescribed pharmaceuticals to maintain or improve health status for tobacco-attributable 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. These cost estimates do not include the government-subsidised costs of prescription drugs which support smoking cessation.

3.5 Road accidents

The estimates of drug-attributable road accident costs presented here are based on Bureau of Transport Economics estimates of aggregate road crash costs in Australia in 1996 (Bureau of Transport Economics, 2000).

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 has also emerged of a causal link between illicit drug use and motor vehicle accidents (see Appendix C for the attributable fractions). There appears to be no convincing evidence that road accidents are causally linked to tobacco consumption. The aetiological fractions presented in Appendix C 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 2004/05 values by use of the Australian National Accounts implicit price deflator for domestic final demand 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 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 recent than those used in the BTE study.

It is assumed in the present 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 above. 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.

3.6 Fires caused by smoking

As with our earlier study, the major source of data on fires caused by smoking comes from research conducted by the Operations and Risk Planning Unit of the Queensland Fire and Rescue Service (see Queensland Fire and Rescue Service, 2006). This research attributes 2.7 per cent of all fires to smokers' materials (excluding matches and lighters). This compares with the figure of 1.9 per cent for 1998/99. 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.

On the assumption that the 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 fire attendances, smoking-attributable fire service costs can also be estimated.

Australia-wide data on numbers of fires and expenditures on fire services are derived from the *Report on Government Services 2006* (Steering Committee, 2006, Attachment 8A). In some of its fire service-related calculations the Productivity Commission appears to have adopted analogous averaging procedures to those adopted here.

The epidemiological data used in the present study separately identify tobacco-attributable fire injuries, deaths and hospital bed days, 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 the fire costs estimated here do not include valuation of public property damage, such as national parks loss of animals and loss of amenity during bush regeneration—they represent conservative estimates of the costs of fires resulting from smoking.

3.7 Resources used in the consumption of illicit drugs

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, can be used to estimate the street value of traded drugs, which can then be 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.

However, the DUCO data are now significantly out of date in two important ways:

- They are derived from prison inmates surveyed in the period December 2000 to July 2001, and relate to the inmates' expenditures in the six months prior to arrest. It is to be expected that illicit drug prices would have changed between 2000 and 2004. There is no reason to believe that any of the price indices produced by the Australian Bureau of Statistics (for example, the Consumer Price Index or national accounts implicit deflators) would be a relevant measure of changes in the street prices of illegal drugs.
- The patterns of drug consumption, and so of expenditures on drugs, are changing. As an illustration of this, see Table 6 below which compares the 1998 and 2004 proportions of the population aged 14 and over who have recently used illicit drugs.

Table 6, Drugs recently used, proportion of the population aged 14 years and over, 1998 and 2004

	1998 per cent	2004 per cent	2004 as per cent of 1998
Marijuana/cannabis	17.9	11.3	63
Steroids	0.2	-	-
Barbiturates	0.3	0.2	67
Inhalants	0.9	0.4	44
Heroin	0.8	0.2	25
Methadone	0.2	0.1	50
Other opiates/opioids	n.a	0.2	n.a
Meth/amphetamine	3.7	3.2	86
Cocaine	1.4	1.0	71
Hallucinogens	3.0	0.7	23
Ecstasy/designer drugs	2.4	3.4	142
Ketamine	n.a	0.3	n.a
GHB	n.a	0.1	n.a
Injected illegal drugs	0.8	0.4	50
Any illicit drug	22.0	15.3	70

Source: Australian Institute of Health and Welfare, Statistics on Drug Use in Australia 2004, Table 4.2.

Note: - indicates nil or rounded to zero.
n.a indicates not available.

The estimates presented here of the resources used in the consumption of illegal drugs apply 2004 prevalence data to the DUCO expenditures. From these data are estimated total street values of illegal drugs consumed in 2004. In order to estimate the value which these resources would have in other legitimate uses, these total street values are discounted to eliminate their risk component. However, DUCO expenditure data are not available for barbiturates, inhalants, other opiates/opioids, ecstasy, ketamine and GBH. Accordingly, the costs presented here are likely to have been significantly underestimated.

3.8 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, in the case of broken glass, can be dangerous. 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.

4. 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 ; Ridolfo and Stevenson, 2001). The latest in the series is a research project on the Australian Burden of Disease (ABOD) undertaken by the School of Population Health at the University of Queensland (see Begg et al., 2007)

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 7 below.

Table 7, Selected aetiological fractions for tobacco

Condition	Male Aged 35–39	Female Aged 35–39
Stroke	0.408	0.333
Ischaemic heart disease	0.401	0.326

Source: Appendix C.

This table indicates that 40.8 per cent of all stroke deaths of Australian males in the age group 35 to 39 are estimated to be causally associated with tobacco. Among Australian females in the same age group, the percentage (33.3 per cent) is slightly lower. Slightly lower proportions of ischaemic heart disease deaths are attributable to smoking (40.1 per cent for males aged 35–39 and 32.6 per cent for females in the same age group). 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 ischaemic heart disease. 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). Our current epidemiological work is fundamentally based upon the earlier work by Ridolfo and Stevenson (2001) and Holman et al. (1991) as

well as on the recent University of Queensland ABOD study (Begg et al., 2007). Appendix C explains the derivation of the epidemiological estimates used in the current study.

Table 8 lists all the conditions which Appendix C concludes are causally linked to the abuse of alcohol, tobacco or illicit drugs.

Table 8, Conditions attributable to drug abuse, classified by drug

Alcohol	Tobacco	Illicits
Oropharyngeal cancer	Oropharyngeal cancer	Opiate dependence
Oesophageal cancer	Oesophageal cancer	Opiate abuse
Liver cancer	Stomach cancer	Opiate poisoning
Laryngeal cancer	Pancreatic cancer	Accidental opiate poisoning
Female breast cancer	Laryngeal cancer	Cannabis dependence
Alcoholic psychosis	Lung cancer	Cannabis abuse
Alcohol dependence/abuse	Cervical cancer	Amphetamine dependence
Alcoholic liver cirrhosis	Endometrial cancer	Amphetamine abuse
Road injuries	Bladder cancer	Cocaine dependence
Alcoholic poly-neuropathy	Kidney cancer	Cocaine abuse
Hypertension	Ischaemic heart disease	Psychostimulant poisoning
Ischaemic heart disease	Chronic obstructive pulmonary disease	Accidental poison by psychostimulants
Alcoholic cardiomyopathy	Tobacco abuse	Hallucinogen dependence
Supraventricular cardiac dysrhythmias	Parkinson's disease	Hallucinogen abuse
Heart failure	Pulmonary circulation disease	Hallucinogen poisoning
Stroke—haemorrhagic/ischaemic	Cardiac dysrhythmias	Other psychotropic drug poisoning
Oesophageal varices	Heart failure	Accidental poisoning by hallucinogens
Gastro-oesophageal haemorrhage	Stroke	Anabolic steroid poisoning
Alcoholic gastritis	Peripheral vascular disease	Hepatitis B
Unspecified liver cirrhosis	Lower respiratory tract infection	Hepatitis C
Cholelithiasis	Crohn's disease	HIV/AIDS
Pancreatitis—acute/chronic	Ulcerative colitis	Infective endocarditis
Alcoholic beverage & other EtOH poisoning	Antepartum haemorrhage	Drug psychoses
Fall injuries	Low birthweight	Maternal drug dependence
Fire injuries	SIDS	Newborn drug toxicity
Drowning	Fire injuries	Antepartum haemorrhage
Aspiration	Asthma (under 15 years)	Low birthweight
Occupational and machine injuries	Macular degeneration	Road injuries
Suicide and self-inflicted injury	Otitis media	Suicide
Child abuse & assault	Lung cancer (passive)	Schizophrenia
	Ischaemic heart disease (passive)	Licit/unspecified/combined

Source: Appendix C.

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.

4.1 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. 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 2004/05 would be overestimated by 2.18 per cent (366 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 of mortality-related and morbidity-related costs 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 of these types of costs by 2.18 per cent, the extent of the estimated double counting.

4.2 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 9 below presents a summary of the alcohol-attributable conditions for which 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 9, Alcohol-attributable conditions for which the abstinence-based aetiological fractions are negative

Males	Females
Ischaemic heart disease	Ischaemic heart disease
Cholelithiasis	Cholelithiasis
Heart failure	Stroke—ischaemic
	Stroke—haemorrhagic
	Hypertension

Source: Appendix C.

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. (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 above, 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 extent only in the consumption of alcohol. It is for this reason that the present study, in common with our two previous studies of the social costs of drug abuse, calculates aetiological fractions on an abstinence basis.

To express this in another way, the assumed alcohol counterfactual situation of no previous alcohol abuse over an extended period implies both:

- no costs of alcohol, and
- no protective health benefits of alcohol consumption.

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 10 below analyses the impact of estimated alcohol-attributable deaths by "deaths caused" and by "deaths prevented". It also presents the same analysis for hospital bed days. This table illustrates the potential pitfalls of interpreting the aggregate death or bed day figures, without considering the components of those aggregate data.

Table 10, Alcohol-attributable deaths and hospital bed days, 2004/05

	Deaths	Hospital bed days
Male		
Caused	2,582	575,773
Prevented	1,376	61,036
Total male	1,206	514,737
Female		
Caused	913	455,886
Prevented	1,061	53,690
Total female	(149)	402,197
Male and female		
Caused	3,494	1,031,660
Prevented	2,437	114,726
Total male and female	1,057	916,934

Note: figures in brackets are negative

Consider the total male alcohol-attributable deaths of 1,206. This figure is derived by subtracting the number of deaths prevented, as a result of the protective effects of alcohol (1,376), from the number of deaths caused (2,582). It is estimated that in total in 2004/05 alcohol caused 3,494 deaths but prevented 2,437. When examining the potential benefits of policies designed to prevent alcohol misuse, the relevant number of deaths is 3,494, not the net figure of 1,057.

Similarly the number of potentially preventable hospital bed days is 1,031,660, not the net figure of 916,934. Of particular relevance to alcohol misuse policies is the fact that these deaths and hospital bed-days can be more readily linked to actual individuals, while the deaths and hospital bed-days prevented are theoretical. As always, interpretation of these data has to be undertaken with care.

A paper by Chikritzhs, Stockwell et al. (2002) 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 in Collins and Lapsley (2002), largely as a result of the different time periods of the two analyses, but indicate a similar direction.

Table 11, Estimated numbers of lives lost and saved due to low risk and risky/high-risk drinking when compared to abstinence in Australia, 1998

	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)

Source: Chikritzhs, Stockwell et al. (2002), Table 1.

Note: figures in brackets represent numbers of lives saved.

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, 88 per cent occur at the age of 60 or above. 73 per cent of hospital bed days saved accrues to this age group.

4.3 Changes in alcohol-attributable fractions

To a large extent the changes since the previous report in the attributable fractions for tobacco and illicit drugs result from changes in prevalence rates, rather than changes in relative risk. However, significant changes in the evidence of relative risk for alcohol have caused substantial changes in the number of deaths and hospital bed days, and therefore in hospital costs, estimated to be attributable to the consumption of alcohol. The changes in relative risk arise from several causes.

The current method sees the exclusion (compared with the previous work) of epilepsy and psoriasis. A number of other conditions (oropharyngeal cancer, falls, fire, occupational) are defined by a wider range of codes, resulting in increased numbers of attributable cases. Hypertension has a narrower range of defining codes due to the exclusion of renal-related hypertension.

The net number of alcohol-caused deaths/hospitalisations was greater in the current study than would have been previously estimated due to a combination of the above factors but, more importantly, due to revisions of the attributable fractions (AFs) applied to a number of key diseases. These revisions have arisen from work recently undertaken by the University of Queensland Australian Burden of Disease (ABOD) research project. The ABOD report (Begg et al., 2007, p. 84) makes the following comment:

> This study reports a substantially lower health benefit due to alcohol compared to the previous Australian burden study (AIHW: Mathers et al 1999, AIHW: Ridolfo and Stevenson 2001) with only an estimated 2,346 deaths being prevented in 2003 compared to 7,157 deaths in 1996. This is due to the previous study underestimating the number of people who abstain from alcohol or drink less than 0.25 drinks per day.

For some diseases, the ABOD report utilised a lower AF for alcohol-caused cancers, hypertension, IHD, stroke, aspiration, drowning and suicide. While this reduced the numbers of deaths/hospitalisation due to conditions such as aspiration, drowning and suicide, the impact of smaller AFs was much greater in reducing the number of deaths/hospitalisations for IHD and stroke prevented by the consumption of alcohol. In general, the lower AFs are due to the lower prevalence of hazardous and harmful drinking reported in the ABOD report than that used by Ridolfo and Stevenson. While this contributes to the AFs for stroke and 'fire, scolds and burns', other analysis by the ABOD group using different information also contributes to the reduction in the attribution of these conditions to alcohol.

The problems with the earlier alcohol attributable fractions identified by the ABOD report have implications for the demographic estimates used in the present study. These implications arise for two reasons:

1. It has not proved possible to recalculate the earlier alcohol-attributable fractions.
2. As explained in Appendix A, in the demographic calculations the English et al. (1995) attributable fractions are assumed to apply prior to 1988 (but without illicit drug deaths prior to 1962) and those of Ridolfo and Stevenson in 1998, with intermediate fractions for the period 1989–1997. Those of Codde (see Appendix C) are assumed to apply in 2006, with intermediate fractions from 1999 and 2005.

Because the Ricardo and Stevenson attributable fractions imply an overestimate of the number of alcohol-attributable deaths prevented, and thus an underestimate of net deaths, the demographic estimates used here will tend to understate the alcohol-attributable reduction in the 2004/05 population. It follows that the alcohol-attributable social costs presented below will also be underestimated.

It is unfortunate, from the perspective of this economic study, that the change in the epidemiological method of estimating the protective effects of alcohol has eliminated any

comparability between the alcohol cost estimates presented in this study and those for 1998/99 presented in Collins and Lapsley (2002). The epidemiological data affect not only the health cost estimates but also, through their demographic implications, the estimated labour costs in both the workforce and the household. Thus, in order to make inter-temporal comparisons of alcohol costs, the 1998/99 estimates would have needed to be recalculated using the revised epidemiological data. For further discussion of this issue see section "9.2 Recalculation of the 1998/99 alcohol cost estimates" on page 80.

4.4 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 benefits, although, unlike alcohol, these benefits are proportionately extremely small. Nevertheless, for consistency it is appropriate to provide details of these benefits.

Table 12 gives details of the tobacco-attributable conditions with negative aetiological fractions; that is, against which tobacco provides some protective effect.

Table 12, Tobacco-attributable conditions for which the aetiological fractions are negative

Males	Females
Parkinson's disease	Parkinson's disease
	Endometrial cancer

Source: Appendix C.

The breakdown of tobacco-attributable deaths and hospital bed days into the caused and saved categories is presented in Table 13.

Table 13, Tobacco-attributable deaths and hospital bed days, 2004/05

	Deaths	Hospital bed days
Male		
Caused	9,814	470,030
Prevented	91	5,301
Total male	9,723	464,729
Female		
Caused	5,236	292,822
Prevented	58	3,933
Total female	5,178	288,889
Male and female		
Caused	15,050	762,851
Prevented	148	9,233
Total male and female	14,901	753,618

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, 97 per cent occur at the age of 60 or above. 73 per cent of hospital bed days saved accrues to this age group.

5. Estimation of drug-attributable crime costs

In studying the drug-attributable costs of crime, only those crime costs should be estimated where a causal connection can be demonstrated between the consumption of a drug and the commission of a crime. A mere association between the two is insufficient. To confuse association with causation would result in a vast overestimate of the costs of drug-attributable crime.

5.1 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, 2002).

- *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.
- *The economic means model.* This model concerns crimes which are committed to fund the acquisition of illicit drugs or alcohol.
- *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.
- *The substance-defined model.* This model relates to actions which are defined as being criminal through legislation which regulates 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.

In practice, all four models are used in their appropriate contexts in the present study.

5.2 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.

A drug-attributable fraction for a particular category of crime (for example, violence or theft) indicates the proportion of this crime which is assessed to be causally attributable to consumption of the drug in question. The categories of drugs studied here are alcohol and illicit drugs. The nature of these attributable fractions is illustrated by Table 14 below, which

presents attributable fractions for violence classified by type of drug, in this case sourced from police detainee interviews.

Table 14, Illustration of drug-attributable fractions for violent crime, 2004/05

Category of drug	Percentage
Illicit drugs	24
Alcohol	15
Both	7
Any	46
No substance	54

Source: Appendix B.

This table indicates that, of all violent offences for which prisoners are incarcerated, 24 per cent are estimated to be causally attributable to the consumption of illicit drugs and 15 per cent causally attributable to alcohol. A complication illustrated by this table is that some component of crime is causally attributable jointly to alcohol and illicit drugs (in the case of violent crime seven per cent). It is not possible meaningfully to disaggregate these joint fractions back to the individual drugs. Accordingly, drugs in total explain 46 per cent of violent crime with the remaining 54 per cent being explained by non-drug factors.

Collins and Lapsley (2002) produced the first comprehensive estimates of the costs of drug-attributable crime in Australia. These estimates were based on attributable fractions produced specifically for the study by the Australian Institute of Criminology (AIC). The derivation of these fractions is described in considerable detail in appendices to Collins and Lapsley (2002) by Paul Williams, and by Toni Makkai and Kiah McGregor.

For the purposes of the present study, attributable fractions have again been developed by the AIC. Appendix B presents the attributable fractions and fully explains their derivation.

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 and female inmates in six 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 seven specific sites.

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

5.3 Types of costs

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

5.3.1 Policing

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 *2002 National Police Custody Survey (*Taylor and Bareja, 2005), 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 attributable fractions for police call-outs not resulting in the recording of a crime are the same as for other call-outs.

5.3.2 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 serious offence, data derived from the National Police Custody Survey (Taylor and Bareja, 2005). They are then allocated to drug-attributable crime according to the DUMA (detainee) attributable fractions.

5.3.3 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.

5.3.4 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.

5.3.5 National Crime Authority

As in our previous study, we are still unable to identify any basis upon which it would be possible to identify the drug-attributable component of NCA costs.

5.3.6 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.

5.3.7 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.

5.3.8 Property theft and damage

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 since, as long as the property is not subsequently damaged or destroyed, it merely 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 Australian Institute of Criminology paper (Mayhew and Adkins, 2005) estimates the overall costs of crime in Australia in 2001, including the costs of various types of property crime. The categories of property crime whose costs are estimated are armed and unarmed robbery, burglary, shoplifting, vehicle theft, theft from vehicles, other theft and handling, and criminal damage. These costs can be updated to 2004/05 values by application of the ABS GDP chain price index.

In the judgment of the present authors, neither vehicle theft nor criminal damage can be causally attributed with any level of certainty to the consumption of drugs in the way that other property crime can. Accordingly, these two categories of property crime are assumed, for the purposes of this study, not to be affected by the consumption of drugs. DUCO (prisoner) attributable fractions are used to attribute the costs of property crime to drug consumption or to non-drug causes.

Information in Stevenson and Forsythe (1998) suggests 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 and about 57 per cent of second-

hand values. The AIC report itself does not make clear whether its estimated property losses are new values or replacement (second-hand) values. However, private correspondence with one of the report's authors indicates that the estimates represent replacement (that is, depreciated) values.

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

5.3.9 Administration of insurance against property theft and damage

The present report also estimates drug-attributable insurance costs. The costs of insurance against property loss have two components:

- the compensation paid to insured persons or organisations for property losses—this represents a pecuniary transfer from insurance non-claimers to insurance claimers, and does not constitute a resource cost
- costs of insurance administration—these costs are a real resource cost.

Mayhew and Adkins (2005) report an industry estimate of the costs of administering insurance for theft and damage in 2001/2 of $500m. Adjusting this figure on a pro-rata basis to exclude the insurance administration costs relating to vehicle theft and criminal property damage (see above), the relevant insurance costs in 2001/2 are estimated to have been $376m. These costs, inflated to 2004/05 values by the GDP implicit price deflator, are then allocated to drugs and other causes by application of the DUCO (prisoner) attributable fractions.

5.3.10 Violence

The epidemiological data used in this research include information on deaths, hospital episodes and bed days resulting from alcohol-attributable violence and these have been applied to DRG cost data to yield hospital costs. From these data the full costs of such violence can be determined.

No such information on illicit drug-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.

5.3.11 Money laundering

A report prepared for the Australian Institute of Criminology (see Walker, forthcoming) estimates that around $2.8 billion of the proceeds of crime in Australia was laundered in 2004. Of this amount, Walker estimates, around $300 million was attributable to the market in illicit drugs.

However, money laundering has extremely complex economic effects (for example, on the allocation of productive resources, on the distribution of income in the community at large, and on tax revenues and public expenditures) which are beyond the scope of this paper to analyse.

5.3.12 The illegal tobacco market

The Australian Taxation Office (ATO) has produced evidence of the diversion into the illegal market of substantial quantities of tobacco grown in Australian plantations. The tobacco sold in this illegal market is known as “chop-chop”. Table 15 presents estimates by the ATO of tobacco diverted into the illegal market.

Table 15, Estimates of the quantities of tobacco grown, diverted to the illegal market, and seized by the ATO

	2001–02 (kg)	2002–03 (kg)	2003–04 (kg)	2004–05 (kg)
Legally grown tobacco	4,068,180	3,808,148	3,496,505	3,598,880
Estimated diverted tobacco	243,000	295,000	313,000	347,000
Total seized illegal tobacco (cut and leaf)	33,637	59,525	68,205	22,444

Source: Australian National Audit Office (2006, Table 1, p. 15)

However, the ATO acknowledges that there is a range of uncertainties inherent in the estimates and so has not produced recent estimates of the implied revenue loss. Earlier estimates, referred to in Collins and Lapsley (2002), from a variety of sources showed a considerable variation.

The Australian National Audit Office reports that:

> ATO research suggests that the profit takers, or organisers, in the illegal tobacco market are criminals actively involved in other forms of criminality such as drugs, money laundering, identity fraud and car rebirthing as well as tobacco smuggling. ATO research shows that this type of highly organised involvement in the illegal tobacco market has intensified over the past three years. (Australian National Audit Office, 2006, p. 14.)

In addition, a paper prepared for the Australian Government Department of Health and Ageing on the medical consequences of smoking chop-chop tobacco (see Bittoun, 2004) has demonstrated that smoking chop-chop presents serious health risks additional to those related to the smoking of legal tobacco.

Thus the chop-chop market is likely to have both real effects on the allocation of productive resources in the Australian economy and budgetary effects through the loss of revenues from tobacco tax and other taxes and through additional health expenditures. However, given the uncertainty surrounding the size of the illegal tobacco market, it has not proved possible to quantify these social costs.

5.3.13 Legal expenses

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

5.3.14 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.

6. Some disaggregated costs

This section provides detailed estimates of the costs of drug-attributable crime, healthcare, production losses and road accidents, and the costs of fires specifically attributable to smoking. It also presents information on the breakdown of the costs of illicit drugs according to the type of drug. 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 estimating 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.

6.1 Crime

Table 16 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 individually or illicit drugs individually.

Alcohol-attributable crime cost $1.7 billion in 2004/05 while crime attributable to consumption of illicit drugs cost $4.0 billion. Crime attributable jointly to both types of drugs cost a further $1.4 billion.

Table 16, Summary of selected drug-attributable crime costs, 2004/05

	Alcohol ($m)	Illicit drugs ($m)	Both ($m)
Tangible costs			
Police	747.1	1,716.9	320.2
Criminal courts	85.8	146.8	28.0
Prisons	141.8	348.6	146.6
Property	67.1	445.4	144.6
Insurance administration	14.3	94.6	30.7
Violence	187.5	196.1	203.2
Productivity of prisoners	368.0	892.1	387.7
Total tangible	1,611.5	3,840.5	1,261.0
Intangible costs			
Loss of life (violence)	124.4	130.1	134.8
Total intangible costs	124.4	130.1	134.8
Total costs	1,735.9	3,970.6	1,395.8
Total n.e.i.			
Tangible	1,424.0	3,644.5	1,057.8
Intangible	0.0	0.0	0.0
Relevant costs as a proportion of GDP	0.20%	0.48%	0.16%

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

The attributable policing and court costs are based on “lower bound” estimates of the relevant attributable fractions.

Table 17 indicates how these cost estimates would change if the upper bound attributable fractions were used. The significance of upper and lower bound DUMA attributable fractions is explained in Appendix B.

Table 17, Summary of the impact upon drug- and alcohol-attributable police and court costs of use of lower and upper bound DUMA estimates, 2004/05

	Alcohol ($m)	Illicit drugs ($m)	Both ($m)
Police			
Lower bound	747.1	1,716.9	320.2
Upper bound	1,182.9	1,563.8	479.8
Difference (upper bound minus lower bound)	435.9	(153.1)	159.6
Criminal courts			
Lower bound	85.8	146.8	28.0
Upper bound	123.9	133.4	42.0
Difference (upper bound minus lower bound)	38.2	(13.4)	14.0

Source: Appendix B.

Note: numbers in brackets are negative.

6.2 Health

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

Table 18 presents estimates of drug-attributable healthcare 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 18, Healthcare costs and savings resulting from drug abuse, 2004/05

	Medical ($m)	Hospitals ($m)	Nursing homes ($m)	Pharma-ceuticals ($m)	Ambu-lances ($m)	Total ($m)
Alcohol						
Gross costs	562.3	693.9	389.2	324.8	80.4	2,050.5
Savings from premature deaths	21.5	31.6	(12.0)	27.2	5.5	73.9
Net costs	540.7	662.2	401.2	297.6	74.8	1,976.7
Tobacco						
Gross costs	462.1	669.6	436.6	205.2	62.5	1,836.0
Savings from premature deaths	303.7	446.2	613.9	127.9	25.9	1,517.6
Net costs	158.4	223.4	(177.3)	77.3	36.6	318.4
Illicit drugs						
Gross costs	122.5	112.6	11.9	n.a.	6.0	252.9
Savings from premature deaths	17.8	26.1	5.7	n.a.	1.6	51.2
Net costs	104.7	86.5	6.2	n.a.	4.4	201.7
All drugs						
Gross costs	1,146.8	1,476.1	837.7	530.0	148.9	4,139.5
Savings from premature deaths	343.0	504.0	607.6	155.0	33.0	1,642.7
Net costs	803.8	972.1	230.1	375.0	115.8	2,496.8

Notes: n.a. indicates not available.
Numbers in brackets are negative.

Total drug-attributable *gross* healthcare costs in 2004/05 were $4.1 billion while *net* costs were $2.5 billion. The percentages of total costs accounted for by the individual drugs are shown in Table 19 below.

Table 19, Percentages of gross and net health costs, 2004/05

	Gross health costs (%)	Net health costs (%)
Alcohol	49.5	79.2
Tobacco	44.4	12.8
Illicit drugs	6.1	8.1
Total	100.0	100.0

Alcohol accounted for 50 per cent of gross costs but 79 per cent of net costs. Tobacco, on the other hand, accounted for 44 per cent of gross costs but only 13 per cent of net costs. The difference in the relativities between gross and net costs for the two drugs is accounted for by the fact that tobacco-attributable mortality is much higher than that attributable to alcohol.

Great care should be taken in the correct interpretation of this type of information. The healthcare savings resulting from premature deaths must be balanced against the other physical and psychological costs of such deaths. In no way could it be claimed that, even if the healthcare savings resulting from the premature deaths were to exceed the gross healthcare costs, these deaths would be in the community's interest. 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 costs of drug abuse. In the case of alcohol, the extension in life expectancies attributable to moderate alcohol consumption implies that extra healthcare burdens are imposed. It is difficult to believe that anyone would seriously argue that such 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. Table 20 clearly illustrates this point.

Table 20, Alcohol-attributable deaths, hospital bed days and hospital costs, 2004/05, caused or prevented

	Deaths (number)	Hospital bed days (number)	Hospital costs ($m)
Caused	3,494	1,031,660	833.1
Prevented	2,437	114,726	139.2
Caused less prevented	1,057	916,934	693.9

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 21.

Table 21, Tobacco-attributable deaths, hospital bed days and hospital costs, 2004/05, caused or prevented

	Deaths (number)	Hospital bed days (number)	Hospital costs ($m)
Caused	15,050	762,851	675.7
Prevented	148	9,233	6.0
Caused less prevented	14,901	753,618	669.6

Estimates of the impact of involuntary smoking on deaths, hospital bed days and hospital costs, classified by age, are presented in Table 22. These results are presented in proportionate terms in Table 23.

Table 22, Tobacco-attributable deaths, hospital bed days and hospital costs, 2004/05, by age and smoking status

	Voluntary	Involuntary	Total
Deaths (number)			
0–14	0.0	36	36
15+	14,753	112	14,865
Total	14,753	149	14,901
Hospital bed days (number)			
0–14	0.0	61,178	61,178
15+	689,951	2,489	692,440
Total	689,951	63,667	753,618
Hospital costs ($m)			
0–14	0.0	30.6	30.6
15+	636.0	3.1	639.1
Total	636.0	33.7	669.6

Table 23, Percentages of tobacco-attributable deaths, hospital bed days and hospital costs, 2004/05, by age and smoking status

	Voluntary (%)	Involuntary (%)	Total (%)
Deaths			
0–14	0.0	24.5	0.2
15+	100.0	75.5	99.8
Total	100.0	100.0	100.0
Hospital bed days			
0–14	0.0	96.1	8.1
15+	100.0	3.9	91.9
Total	100.0	100.0	100.0
Hospital costs			
0–14	0.0	90.8	4.6
15+	100.0	9.2	95.4
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 2004/05 for 25 per cent of attributable deaths, 96 per cent of attributable hospital bed days and 91 per cent of attributable hospital costs.

6.3 Illicit drugs disaggregated

The illicit drug-attributable mortality and morbidity costs presented above relate to illicit drugs as a whole. In reality, the category "illicit drugs" represents a range of diverse drugs (see Table 6) and we consider that these costs should, wherever possible, be disaggregated down to the level of individual drugs. The ability to disaggregate is, however, severely limited by the scope of the available epidemiological data. It is possible to identify some of the effects of individual drugs on mortality, potential years of life lost (PYLL), hospital usage and *gross* hospital costs (not taking into account any savings which have resulted from drug-attributable premature deaths). At this stage it is not possible to assign to specific illicit drugs the costs of ambulances, nursing homes, pharmaceuticals, crime, road accidents and productivity losses. The next three tables present a summary of the epidemiological information for males, females and persons.

Table 24, Individual drug categories, summary of health outcomes, 2004/05, males

	Deaths (number)	PYLL ages 0–74 (number)	Hospital bed days (number)	Gross hospital costs ($'000)
Opiates	182	7,557	13,982	7,717
Cannabis	0	0	4,597	2,036
Amphetamines	0	0	2,861	1,634
Cocaine	0	0	445	239
Psychostimulants	12	537	320	411
Hallucinogens	1	50	237	283
Other psychotropics	1	45	62	88
Anabolic steroids	0	0	0	0
Other	91	3,198	87,764	47,802
Licit/unspecified/combined	296	11,071	21,265	10,463
Total	583	22,457	131,533	70,674
Sum of identified drugs	196	8,188	22,504	12,409

Table 25, Individual drug categories, summary of health outcomes, 2004/05, females

	Deaths (number)	PYLL ages 0–74 (number)	Hospital bed days (number)	Gross hospital costs ($'000)
Opiates	46	1,860	8,481	5,377
Cannabis	1	41	2,690	1,018
Amphetamines	0	0	1,849	984
Cocaine	0	0	182	173
Psychostimulants	5	269	258	329
Hallucinogens	0	0	181	211
Other psychotropics	2	87	67	104
Anabolic steroids	0	0	0	0
Other	48	1,363	34,918	21,195
Licit/unspecified/combined	187	5,428	19,546	12,498
Total	289	9,047	68,172	41,889
Sum of identified drugs	54	2,256	13,708	8,195

Table 26, Individual drug categories, summary of health outcomes, 2004/05, persons

	Deaths (number)	PYLL ages 0–74 (number)	Hospital bed days (number)	Gross hospital costs ($'000)
Opiates	228	9,417	22,463	13,094
Cannabis	1	41	7,287	3,054
Amphetamines	0	0	4,710	2,618
Cocaine	0	0	627	412
Psychostimulants	17	806	578	740
Hallucinogens	1	50	418	494
Other psychotropics	3	132	129	192
Anabolic steroids	0	0	0	0
Other	139	4,561	122,683	68,998
Licit/unspecified/combined	483	16,498	40,811	22,961
Total	872	31,504	199,706	112,563
Sum of identified drugs	250	10,445	36,212	20,604

As can be seen in the above tables, a very significant proportion of the total impact on mortality and morbidity results from conditions which the epidemiological data do not assign to specific illicit drugs. The following three tables provide a breakdown of the results for the medical conditions which the epidemiological data identify as related to specific drugs.

Table 27, Individual drug categories, summary of health outcomes, 2004/05, males, percentages of total identified

	Deaths (%)	PYLL ages 0–74 (%)	Hospital bed days (%)	Gross hospital costs (%)
Opiates	92.9	92.3	62.1	62.2
Cannabis	0.0	0.0	20.4	16.4
Amphetamines	0.0	0.0	12.7	13.2
Cocaine	0.0	0.0	2.0	1.9
Psychostimulants	6.1	6.6	1.4	3.3
Hallucinogens	0.5	0.6	1.1	2.3
Other psychotropics	0.5	0.5	0.3	0.7
Anabolic steroids	0.0	0.0	0.0	0.0
Total identified	100.0	100.0	100.0	100.0
Identified as proportion of total	33.6	36.5	17.1	17.6

Table 28, Individual drug categories, summary of health outcomes, 2004/05, females, percentages of total identified

	Deaths (%)	PYLL ages 0–74 (%)	Hospital bed days (%)	Gross hospital costs (%)
Opiates	85.2	82.4	61.9	65.6
Cannabis	1.9	1.8	19.6	12.4
Amphetamines	0.0	0.0	13.5	12.0
Cocaine	0.0	0.0	1.3	2.1
Psychostimulants	9.3	11.9	1.9	4.0
Hallucinogens	0.0	0.0	1.3	2.6
Other psychotropics	3.7	3.8	0.5	1.3
Anabolic steroids	0.0	0.0	0.0	0.0
Total identified	100.0	100.0	100.0	100.0
Identified as proportion of total	18.7	24.9	20.1	19.6

Table 29, Individual drug categories, summary of health outcomes, 2004/05, persons, percentages of total identified

	Deaths (%)	PYLL ages 0–74 (%)	Hospital bed days (%)	Gross hospital costs (%)
Opiates	91.2	90.2	62.0	63.6
Cannabis	0.4	0.4	20.1	14.8
Amphetamines	0.0	0.0	13.0	12.7
Cocaine	0.0	0.0	1.7	2.0
Psychostimulants	6.8	7.7	1.6	3.6
Hallucinogens	0.4	0.5	1.2	2.4
Other psychotropics	1.2	1.3	0.4	0.9
Anabolic steroids	0.0	0.0	0.0	0.0
Total identified	100.0	100.0	100.0	100.0
Identified as proportion of total	28.7	33.2	18.1	18.3

As Table 29 shows, only 28.7 per cent of total illicit drug-attributable deaths can be assigned to specific drugs, 33.2 per cent of PYLL, 18.1 per cent of hospital bed days and 18.3 per cent of gross hospital costs.

6.4 Productivity

Drug abuse causes a loss of national productive capacity in the paid workforce 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 30 presents estimates of the reductions in productive capacity which resulted from drug abuse in 2004/05.

Of the total net production costs of $13.2 billion, tobacco accounted for by far the largest share (60.7 per cent or $8.0 billion). Alcohol represented 26.8 per cent ($3.5 billion) and illicit drugs 12.5 per cent ($1.6 billion). Of the gross production costs of $22.9 billion, workforce losses represented 47.9 per cent ($11.0 billion) and household losses 52.1 per cent ($11.9 billion).

Table 30, Paid and unpaid production costs of drug abuse, 2004/05

		Alcohol ($m)	Tobacco ($m)	Illicit drugs ($m)	Total ($m)	Proportion of gross costs (%)
Labour in the workforce						
	Reduction in workforce					
	Male	2,741.4	4,030.1	762.3		
	Female	469.3	939.3	127.1		
	Total reduction in workforce	3,210.7	4,969.5	889.4	9,069.5	39.7
	Absenteeism					
	Male	228.5	646.9	698.9		
	Female	139.4	132.7	34.6		
	Total absenteeism	367.9	779.6	733.5	1,880.9	8.2
Total paid production costs		3,578.6	5,749.1	1,622.9	10,950.5	47.9
Labour in the household						
	Premature death					
	Male	1,294.4	5,806.9	314.6		
	Female	129.5	3,349.5	143.9		
	Total premature death	1,423.9	9,156.4	458.5	11,038.8	48.3
	Sickness					
	Male	60.7	452.8	30.1		
	Female	86.3	233.9	6.9		
	Total sickness	146.9	686.7	37.0	870.6	3.8
Total unpaid production costs		1,570.8	9,843.1	495.5	11,909.4	52.1
Total paid and unpaid production costs		5,149.4	15,592.2	2,118.3	22,859.9	100.0
Consumption resources saved						
	Male	1,464.1	5,534.8	367.8		
	Female	147.2	2,048.3	101.6		
Total consumption resources saved		1,611.3	7,583.1	469.5	9,663.9	
Total net production costs		3,538.0	8,009.1	1,648.9	13,196.0	
Percentage of total net production costs		26.8%	60.7%	12.5%	100.0%	

6.5 Road accidents

Table 31 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 31, Drug-attributable road accident costs, 2004/05, by type of drug

		Attributable to	
		Alcohol ($m)	Illicit drugs ($m)
Human costs			
	Medical	25.9	5.1
	Ambulance	7.9	1.6
	Hospital	41.2	11.5
	Long-term care	10.6	2.1
	Labour in the workplace	523.7	95.2
	Labour in the household	44.9	106.9
	Value of life p.a.	563.3	104.6
	Quality of life (injuries)	353.6	69.7
	Legal	162.5	32.1
	Correctional services	3.4	0.7
	Workplace disruption	62.6	12.3
	Premature funerals	0.6	0.1
	Coroner	0.2	0.0
Total human costs		1,800.5	442.0
Vehicle costs			
	Repairs	776.6	153.2
	Unavailability of vehicles	36.4	7.2
	Towing	8.6	1.7
Total vehicle costs		821.6	162.0
General costs			
	Travel delays	288.9	57.0
	Insurance administration	185.1	36.5
	Police	14.8	2.9
	Property	6.0	1.2
	Fire	2.0	0.4
Total general costs		496.8	98.0
Total costs		3,118.9	702.0
Of which			
	Tangible	2,202.0	527.6
	Intangible	916.9	174.3
Total n.e.i.			
	Tangible	1,329.6	262.2
	Intangible	353.6	69.7
Relevant costs as a proportion of GDP		0.27%	0.05%

Sources: BTE (2001) and authors' calculations.

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

It should be noted 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 $3.1 billion in 2004/05, of which 71 per cent were tangible costs. Illicit drug-attributable road accidents cost $702 million of which 75 per cent were tangible costs.

As indicated earlier, any comparison of costs and GDP can include only those categories of cost which are included in the GDP calculation. The bottom line of Table 31 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 0.27 per cent of GDP and illicit drug-attributable accidents 0.05 per cent.

6.6 Fires

Table 32 below presents estimates of the costs of fires resulting from smoking.

Table 32, Costs of smoking-attributable fires, 2004/05

		$m
Tangible costs		
	Health	
	Medical	6.9
	Hospital	9.7
	Total health	16.6
	Labour	
	In the workforce	43.7
	In the household	13.1
	Total labour	56.8
	Fire services	46.9
	Property damage	16.1
Total tangible costs		136.4
Intangible costs		
	Value of loss of life	35.7
Total intangible costs		35.7
Total costs		172.1
Total tangible n.e.i.		63.0
Total intangible n.e.i.		0.0
As proportion of GDP		0.02%

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

It is estimated that smoking-attributable fires cost $172 million in 2004/05, of which tangible costs represented 79 per cent and intangible costs 21 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

7.1 Total costs

This section of the paper presents a summary of the overall social costs of drug abuse, classified by type of drug.

Table 33 presents a summary of tangible costs, Table 34 presents intangible costs and Table 35 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 to be made to the all drugs total for the interactive effects involved in the estimation of aetiological fractions for conditions attributable to more than one drug.

Table 33, Tangible social costs of drug abuse, 2004/05

		Alcohol ($m)	Tobacco ($m)	Illicit drugs ($m)	Alcohol and illicits together ($m)	Total ($m)	Total adjusted for interaction ($m)
Labour in the workforce							
	Reduction in workforce	3,210.7	4,969.5	889.4		9,069.5	8,872.1
	Absenteeism	367.9	779.6	733.5		1,880.9	1,840.0
Total		3,578.6	5,749.1	1,622.9		10,950.5	10,712.1
Labour in the household							
	Premature death	1,423.9	9,156.4	458.5		11,038.8	10,798.5
	Sickness	146.9	686.7	37.0		870.6	851.7
Total		1,570.8	9,843.1	495.5		11,909.4	11,650.2
Total paid and unpaid labour costs		5,149.4	15,592.2	2,118.3		22,859.9	22,362.2
Less consumption resources saved		1,611.3	7,583.1	469.5		9,663.9	9,453.5
Total net labour costs		3,538.0	8,009.1	1,648.9		13,196.0	12,908.7
Healthcare (net)							
	Medical	540.7	158.4	104.7		803.8	786.3
	Hospital	662.2	223.4	86.5		972.1	950.9
	Nursing homes	401.2	(177.3)	6.2		230.1	225.1
	Pharmaceuticals	297.6	77.3			375.0	366.8
	Ambulances	74.8	36.6	4.4		115.8	115.8
Total healthcare		1,976.7	318.4	201.7		2,496.8	2,445.0
Road accidents n.e.i.		2,202.0		527.6		2,729.6	2,729.6
Fires n.e.i.			63.0			63.0	63.0
Crime n.e.i.							
	Police	747.1		1,716.9	320.2	2,784.2	2,784.2
	Criminal courts	85.8		146.8	28.0	260.7	260.7
	Prisons	141.8		348.6	146.6	636.9	636.9
	Property	67.1		445.4	144.6	657.1	657.1
	Insurance administration	14.3		94.6	30.7	139.6	139.6
	Productivity of prisoners	368.0		892.1	387.7	1,647.9	1,647.9
Total crime		1,424.0		3,644.5	1,057.8	6,126.3	6,126.3
Resources used in abusive consumption		1,688.8	3,635.6	892.7		6,217.1	6,217.1
Total		10,829.5	12,026.2	6,915.4	1,057.8	30,828.9	30,489.8
Proportion of total unadjusted tangible costs		35.1%	39.0%	22.4%	3.4%	100.0%	

Notes: n.e.i. denotes not elsewhere included.
Numbers in brackets are negative.

Tangible costs attributable to alcohol in 2004/05 were $10.8 billion, to tobacco were $12.0 billion, and to illicit drugs were $6.9 billion. Alcohol and illicit drugs acting together in the causation of crime contributed a further $1.1 billion. Labour and health costs constituted the major cost component for alcohol. Workforce costs were a large component of tobacco tangible costs. Crime costs comprised a very high proportion of illicit drug costs.

Table 34, Intangible social costs of drug abuse, 2004/05

	Alcohol ($m)	Tobacco ($m)	Illicit drugs ($m)	All drugs ($m)	All drugs adjusted for health interaction ($m)
Loss of life	4,135.0	19,459.7	1,204.7	24,799.5	24,259.6
Pain and suffering (road accidents)	353.6		69.7	423.4	423.4
Total intangible costs	4,488.7	19,459.7	1,274.5	25,222.9	24,683.0
Proportion of unadjusted total intangible costs	17.8%	77.2%	5.1%	100.0%	

In relation to intangible costs, with the exception of pain and suffering of road accident victims, only the value of loss of life (to be precise, the loss of a year's living) could be estimated. Intangible alcohol costs were $4.5 billion, tobacco costs $19.5 billion, and illicit costs $1.3 billion. The predominance of tobacco-attributable intangible costs is a direct result of the high level of premature mortality caused by smoking.

Table 35, Total social costs of drug abuse, 2004/05

	Alcohol ($m)	Tobacco ($m)	Illicit drugs ($m)	Alcohol and illicits together ($m)	All drugs ($m)	All drugs adjusted for health interaction ($m)
Tangible	10,829.5	12,026.2	6,915.4	1,057.8	30,828.9	30,489.8
Intangible	4,488.7	19,459.7	1,274.5		25,222.9	24,683.0
Total	15,318.2	31,485.9	8,189.8	1,057.8	56,051.8	55,172.8
Proportion of unadjusted total	27.3%	56.2%	14.6%	1.9%	100.0%	

Note: health-related cost components in final column have been adjusted by 2.18% to take account of drugs interaction.

Of the total social costs of drug abuse in 2004/05 of $55.1 billion, alcohol accounted for $15.3 billion (27.3 per cent of the unadjusted total), tobacco $31.5 billion (56.2 per cent) and illicit drugs $8.2 billion (14.6 per cent). Alcohol and illicit drugs acting together accounted for another $1.1 billion (1.9 per cent).

7.2 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 (households, business and government). As indicated in Section 2 above, the concept of incidence used in these estimates is impact incidence, a term explained in that section.

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, although it is to be expected that households would have borne a substantial proportion of these costs. Neither Table 36 nor Table 38 take account of the crime-attributable costs which are attributable jointly to alcohol and illicit drugs.

Table 36, Incidence of the tangible social costs of alcohol misuse, 2004/05

	Households ($m)	Business ($m)	Government ($m)	Total ($m)
Workforce labour	0.0	2,811.9	766.6	3,578.6
Household labour	1,570.8	0.0	0.0	1,570.8
Hospitals	21.6	111.4	529.2	662.2
Medical	60.0	54.9	425.8	540.7
Nursing homes	84.3	1.0	316.0	401.2
Pharmaceuticals	56.2	0.0	241.4	297.6
Ambulances	23.3	8.6	43.0	74.8
Road accidents n.e.i.	742.0	481.2	106.4	1,329.6
Crime n.e.i.	n.a.	418.4	494.8	913.2
Resources used in abusive consumption	0.0	1,688.8	0.0	1,688.8
Total quantified tangible costs	2,558.2	5,576.3	2,923.2	11,057.7
Percentage of total quantified costs	23.1%	50.4%	26.4%	100.0%

Note: n.a. signifies not available.

Table 37, Incidence of the tangible social costs of tobacco abuse, 2004/05

	Households ($m)	Business ($m)	Government ($m)	Total ($m)
Workforce labour	0.0	4,517.4	1,231.6	5,749.1
Household labour	9,843.1	0.0	0.0	9,843.1
Hospitals	7.3	37.6	178.5	223.4
Medical	17.6	16.1	124.8	158.4
Nursing homes	(37.2)	(0.4)	(139.6)	(177.3)
Pharmaceuticals	12.7	0.0	64.6	77.3
Ambulances	11.4	4.2	21.0	36.6
Fires n.e.i.	16.4	36.5	10.2	63.0
Resources used in abusive consumption	0.0	3,635.6	0.0	3,635.6
Total quantified tangible costs	9,871.2	8,247.0	1,491.1	19,609.3
Percentage of total quantified costs	50.3%	42.1%	7.6%	100.0%

Note: numbers in brackets are negative.

Table 38, Incidence of the tangible social costs of abuse of illicit drugs, 2004/05

	Households ($m)	Business ($m)	Government ($m)	Total ($m)
Workforce labour	0.0	1,275.2	347.7	1,622.9
Household labour	495.5	0.0	0.0	495.5
Hospitals	2.8	14.5	69.1	86.5
Medical	11.6	10.6	82.4	104.7
Nursing homes	1.3	0.0	4.9	6.2
Pharmaceuticals	0.0	0.0	0.0	0.0
Ambulances	1.4	0.5	2.5	4.4
Road accidents n.e.i.	146.3	94.9	21.0	262.2
Crime n.e.i.	n.a.	986.8	2,212.3	3,199.1
Resources used in abusive consumption	0.0	892.7	0.0	892.7
Total quantified tangible costs	658.9	3,275.2	2,739.9	6,674.1
Percentage of total quantified costs	9.9%	49.1%	41.1%	100.0%

Note: n.a. signifies not available.

The government sector bore a relatively small proportion of the tangible costs of drug abuse (26 per cent of alcohol-attributable costs, 8 per cent for tobacco and 41 per cent for illicit drugs). In all cases business bore a greater proportion of the burden (50 per cent for alcohol, 42 per cent for tobacco and 49 per cent for illicit drugs). By their nature, all intangible costs are borne by individuals.

7.3 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 separately for each type of drug.

7.3.1 Alcohol

Table 39, Impact of alcohol misuse on the federal government budget, 2004/05

Outlays		$m
Health		
	Hospitals	277.5
	Medical	425.8
	Nursing homes	300.5
	Pharmaceuticals	241.4
	Ambulances	8.7
Total health		1,253.9
Road accidents n.e.i.		18.6
Total outlays		1,272.6
Net revenue minus outlays		1,802.9

Receipts		$m
Excise tax		
	Beer	1,653.0
	Spirits	739.0
Total excise tax		2,392.0
Customs duties		
	Beer	83.0
	Wine	5.0
	Spirits	980.0
Total customs duties		1,068.0
Wine equalisation tax		676.0
Total alcohol revenue		4,136.0
Less		
Revenue forgone		
	Income tax	667.7
	Indirect taxes	392.9
Total revenue forgone		1,060.6
Total net revenue		3,075.4

Table 40, Impact of alcohol misuse on state government budgets, 2004/05

Outlays		$m
Health		
	Hospitals	251.7
	Medical	0.0
	Nursing homes	15.4
	Ambulances	34.3
Total health		301.4
Road accidents n.e.i.		87.8
Crime n.e.i.		
	Police	747.1
	Criminal courts	85.8
	Prisons	141.8
Total crime n.e.i.		974.6
Total outlays		1,363.8
Net revenue minus outlays		(387.3)

Receipts	$m
GST	976.5
Total net revenue	976.5

Note: numbers in brackets are negative

Table 41, Total budgetary impact of alcohol misuse, 2004/05

Outlays		$m
Health		
	Hospitals	529.2
	Medical	425.8
	Nursing homes	316.0
	Pharmaceuticals	241.4
	Ambulances	43.0
Total Health		1,555.3
Road accidents n.e.i.		106.4
Crime n.e.i.		
	Police	747.1
	Criminal courts	85.8
	Prisons	141.8
Total crime n.e.i.		974.6
Total outlays		2,636.4
Net revenue minus outlays		1,415.6

Receipts		$m
Excise tax		
	Beer	1,653.0
	Spirits	739.0
Total excise tax		2,392.0
Customs duties		
	Beer	83.0
	Wine	5.0
	Spirits	980.0
Total customs duties		1,068.0
GST		976.5
Wine equalisation tax		676.0
Total alcohol revenue		5,112.5
Less		
Revenue forgone		
	Income tax	667.7
	Indirect taxes	392.9
Total revenue forgone		1,060.6
Total net revenue		4,052.0

Alcohol tax revenue in 2004/05 exceeded alcohol-attributable costs borne by the public sector by $1.4 billion. The Commonwealth Government accrued an alcohol-attributable surplus of $1.8 billion, while the states were in deficit to the amount of $387 million.

7.3.2 Tobacco

Table 42, Impact of tobacco abuse upon the federal government budget, 2004/05

Outlays		$m
Health		
	Hospitals	93.6
	Medical	124.8
	Nursing homes	(132.8)
	Pharmaceuticals	64.6
	Ambulances	4.3
Total health		154.4
Fires n.e.i.		0.4
Total outlays		154.8
Net revenue minus outlays		2,709.3

Receipts		$m
Excise tax		5,220.0
Customs duties		518.0
Total tobacco revenue		5,738.0
Less		
Revenue forgone		
	Income tax	1,025.0
	Indirect taxes	1,848.9
Total revenue forgone		2,873.9
Total net revenue		2,864.1

Note: numbers in brackets are negative.

Table 43, Impact of tobacco abuse on state government budgets, 2004/05

Outlays		$m
Health		
	Hospitals	84.9
	Medical	0.0
	Nursing homes	(6.8)
	Ambulances	16.7
Total health		94.8
Fires n.e.i.		9.8
Total outlays		104.7
Net revenue minus outlays		832.7

Receipts	$m
GST	937.4
Total net revenue	937.4

Note: numbers in brackets are negative.

Table 44, Total budgetary impact of tobacco abuse, 2004/05

Outlays		$m
Health		
	Hospitals	178.5
	Medical	124.8
	Nursing homes	(139.6)
	Pharmaceuticals	64.6
	Ambulances	21.0
Total health		249.3
Fires n.e.i.		10.2
Total outlays		259.5
Net revenue minus outlays		3,542.0

Receipts		$m
Excise tax		5,220.0
Customs duties		518.0
GST		937.4
Total tobacco revenue		6,675.4
Less		
Revenue forgone		
	Income tax	1,025.0
	Indirect taxes	1,848.9
Total revenue forgone		2,873.9
Total net revenue		3,801.5

Note: numbers in brackets are negative.

Tobacco tax revenue in 2004/05 exceeded tobacco-attributable costs borne by the public sector by over $3.5 billion. Of this surplus $2.7 billion accrued to the Commonwealth and around $800 million to state governments.

7.3.3 Illicit drugs

Table 45, Impact of abuse of illicit drugs on the federal government budget, 2004/05

Outlays		$m
Health		
	Hospitals	36.2
	Medical	82.4
	Nursing homes	4.6
	Ambulances	0.5
Total health		123.8
Road accidents n.e.i.		3.7
Total outlays		127.5
Net revenue minus outlays		(427.0)

Receipts		$m
Total revenue		0.0
Less		
Revenue forgone		
	Income tax	185.1
	Indirect taxes	114.5
Total revenue forgone		299.5
Total net revenue		(299.5)

Note: numbers in brackets are negative.

Table 46, Impact of abuse of illicit drugs on state government budgets, 2004/05

Outlays		$m
Health		
	Hospitals	32.9
	Medical	0.0
	Nursing homes	0.2
	Ambulances	2.0
Total health		35.1
Road accidents n.e.i.		17.3
Crime n.e.i.		
	Police	1,716.9
	Criminal courts	146.8
	Prisons	348.6
Total crime n.e.i.		2,212.3
Total outlays		2,264.8
Net revenue minus outlays		(2,264.8)

Receipts	$m
Revenue	0.0
Total net revenue	0.0

Note: numbers in brackets are negative

Table 47, Total budgetary impact of illicit drugs abuse, 2004/05

Outlays		$m
Health		
	Hospitals	69.1
	Medical	82.4
	Nursing homes	4.9
	Ambulances	2.5
Total health		158.9
Road accidents n.e.i.		21.0
Crime n.e.i.		
	Police	1,716.9
	Criminal courts	146.8
	Prisons	348.6
Total crime n.e.i.		2,212.3
Total outlays		2,392.2
Net revenue minus outlays		(2,691.8)

Receipts	$m
Revenue forgone	0.0
Income tax	185.1
Indirect taxes	114.5
Total revenue forgone	299.5
Total net revenue	(299.5)

Note: numbers in brackets are negative

By their nature, illicit drugs yield no tax revenue. Their production or importation by a clandestine industry renders taxation impossible. Indeed, overall tax revenue is reduced (by an estimated $299.5 million in 2004/05) because drug-attributable mortality and morbidity reduce revenue from general taxes on income and consumption. At the same time, the consumption of illicit drugs imposes substantial costs, particularly crime costs, on the public sector. In 2004/05 attributable public sector outlays together with revenue losses amounted to a total of almost $2.7 billion, of which 84 per cent was borne by state governments.

7.3.4 Summary of budgetary impacts

The 1999 Intergovernmental Agreement, which *inter alia* created the GST and removed the states' abilities to tax tobacco and alcohol except through the GST (see Section 3), caused a very significant adjustment of taxing powers between the states and the Commonwealth. It is now the Commonwealth Government which is the major beneficiary of the tax revenue from tobacco and alcohol.

7.4 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.

One 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 address this problem, Table 48 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 48, Comparison of some tangible cost categories with gross domestic product, 2004/05

	Alcohol ($m)	Tobacco ($m)	Illicit drugs ($m)	Alcohol and illicits ($m)	Alcohol (% of GDP)	Tobacco (% of GDP)	Illicit drugs (% of GDP)	Alcohol and illicits (% of GDP)
Labour in the workforce	3,578.6	5,749.1	1,622.9		0.45	0.73	0.20	
Net healthcare	1,976.7	318.4	201.7		0.25	0.04	0.03	
Road accidents n.e.i.	2,157.0		420.7		0.27		0.05	
Fires n.e.i.		123.4				0.02		
Crime	1,611.5		3,840.5	1,261.0	0.20		0.48	0.16
Resources used in abusive consumption	1,688.8	3,635.6	892.7		0.21	0.46	0.11	
Total	11,012.6	9,826.5	6,978.5	1,261.0	1.39	1.24	0.88	0.16

Note: The "Alcohol and illicits" columns refer to the impact of alcohol and illicit drugs, jointly consumed, in the causation of crime.

7.5 Sensitivity estimates of results

Given the nature of the epidemiological and other data which underpin the calculations for this report, it is not possible to produce a complete sensitivity analysis. However, this report does indicate the impact which the adoption of a range of alternative assumptions or methodologies would have upon the results:

- The differential effects of the adoption of DUMA upper and lower bound estimates on the alcohol-attributable and illicit drug-attributable costs of police and criminal courts are presented in Table 17.
- The impact of the possible exclusion of healthcare savings is indicated in Table 18.
- The effect of the possible exclusion of the costs of resources used in the production and distribution of abusive consumption of drugs can be seen in Table 33.
- The impact of the adoption of a higher assumed proportion of abusive alcohol use is indicated in the above section, "2.3 Abusive and addictive drug use" on page 5.
- The impact of an alternative method for estimating alcohol-attributable absenteeism is given in the above section, "3.2.2 Absenteeism" on page 24.
- The effect which a decision to exclude GST revenue on alcohol and tobacco from the estimated budgetary impacts on state governments would have can be calculated from Table 40 (for alcohol) and Table 43 (for tobacco).

8. Comparability with previous social cost estimates

The present authors have previously estimated the social costs of drug abuse in Australia for the calendar years 1998 and 1992, and for the financial year 1998/99. It is tempting to try to calculate the rate of change of these costs over time by comparison between the four sets of estimates. However, this is an exercise which should be approached with caution.

Estimates of the social costs of drug abuse can change for a variety of reasons. The main reasons are:

1. **Changes in the underlying available epidemiological information, as indicated by the attributable fractions (AFs).** The AF 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 consideration. 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. Changes in either or both components will affect the size of the AF, which will feed through to changes in the estimated costs. 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. This may result from development of improved research knowledge rather than from a change in the actual cause of the condition under study. On the other hand, changes in prevalence rates will represent real changes in population exposure to the risk in question.

   To illustrate this point, changes in the tobacco AFs for the present study are more a result of reductions in smoking prevalence than a change in information on smoking relative risk. On the other hand, a significant change in the relative risk information for alcohol is the major reason for the substantial increase in the estimated social costs of alcohol misuse.

2. **Changes in the scope of estimates.** As an illustration, a major reason for the increased social costs estimated for 1998/99, compared with earlier years, was the comprehensive estimation for the first time of the costs of crime attributable to the consumption of alcohol or illicit drugs. With some relatively minor exceptions, the scope of the present study is similar to that of the 1998/99 research.

3. **Changes in the information available for the estimation of some categories of cost.** One of these changes in the present study relates to availability of improved estimates of workplace absenteeism attributable to alcohol consumption. The result is that the estimated costs of alcohol-attributable workplace absenteeism are much higher than in the 1998/99 study.

4. **Changes in the costs and effectiveness of prevention and treatment programs.** There are many instances of these types of changes. For example, there is now a much wider availability of both government-subsidised prescribed pharmaceuticals and over-the-counter nicotine therapies. Also, there has been increasing state expenditure on treatment programs, most of which have not been subject to economic evaluation. Rapid changes in the patterns of consumption of illicit drugs (see Table 6) have, as a public policy reaction, led to changes in prevention strategies.
5. **Changes in the general level of prices and costs.** During the period from 1998/99 to 2004/05 the Australian National Accounts implicit price deflator for gross domestic product rose by 21 per cent (an indication of the change in the general level of prices and costs over this period). Comparison should be made between *real* changes (adjusting for the effects of inflation) rather than changes in aggregates expressed in current price terms.

If movements in estimated costs resulted from changes in one or more of

- the prevalence of drug consumption
- the costs or effectiveness of prevention and treatment
- the general level of prices and costs,

the cost estimates over time would be comparable (after adjustment for general price inflation).

On the other hand, if the changed social cost estimates resulted from changes in one or more of

- information on relative risk
- the scope of the estimates
- information availability,

the results over time will not be directly comparable.

In relation to the comparability of the 2004/05 estimates with those for 1998/99, there has been a significant change in the relative risk information for alcohol. Generally, the scope of the estimates of the social costs of the three drug categories has not changed greatly but the availability of information has improved in some areas, particularly for alcohol-attributable absenteeism and ambulance usage.

In summary, the 1998/99 and 2004/05 estimates for tobacco and illicit drugs are, after taking account of the increase in the general price level, broadly comparable. Those for alcohol are not directly comparable (this issue is discussed further in Section 9 below).

Accordingly, the basis for comparison of the 1998/99 and 2004/05 estimates of the social costs of tobacco is provided in Table 49 below. The same comparison for illicit drugs is provided in Table 50. No meaningful comparison of alcohol costs is possible. To eliminate the effects of the general increase in prices over the period, the 1998/99 cost estimates in these two tables are adjusted to 2004/05 prices by application of the change over that period in the Australian National Accounts gross domestic product implicit price deflator.

Table 49, Comparison of constant price estimates of the social costs of tobacco, 1998/99 and 2004/05, at 2004/05 prices

	Tobacco 1998/99 ($m)	Tobacco 2004/05 ($m)	Tobacco per cent change
Tangible	9,184.8	12,026.2	30.9
Intangible	16,315.2	19,459.7	19.3
Total	25,500.0	31,485.9	23.5

The *real* social costs of tobacco abuse are estimated to have risen during the period 1998/99 to 2004/05 by 23.5 per cent (consisting of a 30.9 per cent increase in tangible costs and a 19.3 per cent increase in intangible costs). Although smoking prevalence has been falling steadily (the percentage of the population aged 14 years and over who are daily smokers falling from 21.8 per cent in 1998 to 17.4 per cent in 2004) and smoking-attributable mortality has also fallen very significantly (from 19,429 deaths in 1998/99 to 14,901 deaths in 2004/05), the lagged effects of past smoking both on healthcare and on the workforce have meant that the overall social costs of smoking continue to rise. However, the period between the decline in smoking prevalence in Australia and the subsequent decline in mortality appears to be much shorter than that indicated by models of the "tobacco epidemic" (see Lopez et al., 1994). This suggests that the social benefits of policies designed to reduce smoking prevalence are likely to be realised far sooner than indicated by the tobacco epidemic models. Earlier realisation of these benefits will result in a higher social rate of return from expenditures on anti-smoking programs.

As the lagged effects work their way through the system, and assuming that smoking prevalence continues to decline, real smoking costs (adjusting for the effects of inflation) should eventually fall very significantly.

The lag between the decline in smoking prevalence and the consequent reduction in social costs is an illustration of the fact that the extent to which costs are avoidable depends very much on the time period under consideration. The longer the time period, the greater will be the proportion of costs which are avoidable (until an irreducible minimum is reached).

Table 50, Comparison of constant price estimates of the social costs of illicit drugs, 1998/99 and 2004/05, at 2004/05 prices

	Illicits 1998/99 ($m)	Illicits 2004/05 ($m)	Illicits per cent change
Tangible	6,182.8	6,915.4	11.8
Intangible	1,172.9	1,274.5	8.7
Total	7,355.6	8,189.8	11.3

During the same period the *real* social costs of illicit drug use are estimated to have risen by 11.3 per cent (consisting of an 11.8 per cent increase in tangible costs and an 8.7 per cent increase in intangible costs). Between 1998/99 and 2004/05 the *structure* of the illicit drugs market changed very substantially, with a decline in the prevalence of use of some drugs and the emergence of other drugs (see Table 6). It is, therefore, difficult to make a judgment as to whether the increase in the real social costs of the abuse of illicit drugs resulted from an increased level of usage of illicit drugs or from other causes.

9. Future research

Over the years in which we have been involved in this work, data availability and reliability have improved significantly. However, we still wish to draw attention to areas where there are either no data or inadequate data and where the production of sound information would enhance the usefulness of social cost studies for measurement and evaluation of policy effectiveness. Several of these recommendations are carried forward from our previous report published in 2002, in areas where data availability has not improved significantly in the ensuing period.

9.1 Re-estimation of the results using the human capital approach

It has been argued above that the demographic approach adopted for this study is preferable to the more widely-adopted human capital approach. These two approaches are compared in Section 2 above. The present authors have suggested that the demographic approach produces results whose interpretation is more straightforward and more easily understood. Further, it permits incorporation into the results of any benefits (that is, negative costs) of drug abuse, which should from a public policy viewpoint also be taken into account. The argument in favour of adopting the human capital approach is that, since this is the approach adopted in most international studies, its adoption in the Australian study would facilitate comparison with such studies in other countries.

As pointed out in Section 2 above, the data sets used in the two approaches are largely overlapping and it would be feasible to extend the present study to produce human capital-based estimates. It should be emphasised that, in this case, the results of the new study should be very carefully explained and interpreted.

9.2 Recalculation of the 1998/99 alcohol cost estimates

As indicated above, the 2004/05 estimates of the social costs of alcohol are not comparable with the earlier estimates for 1998/99, for two important reasons:

1. The methodology for the estimation of the alcohol-attributable fractions has changed.
2. Much improved estimates of the impact of alcohol consumption on workplace absenteeism have become available.

For these two reasons the 1998/99 alcohol abuse costs presented in Collins and Lapsley (2002) can now be seen to be significant underestimates. In order to produce a reliable indicator of the real change in these costs between 1998/99 and 2004/05 it would be necessary to recalculate the earlier results incorporating the improved data now available. This would involve recalculation for 1998/99 of:

- the revised alcohol-attributable fractions
- the estimated reduction in the Australian population attributable to alcohol abuse
- the costs of alcohol-attributable workplace absenteeism.

It can be expected that this recalculation would indicate substantially higher costs than those presented in Collins and Lapsley (2002).

It would be totally inappropriate to recalculate these 2004/05 results in line with the data used in the earlier study. There would be no justification for recalculating the latest estimates using data now acknowledged to be incorrect.

9.3 Crime

There are several areas in which the availability of crime statistics could be improved if research resources were provided to the appropriate bodies.

The DUCO surveys provided very important information, but they were 'one-offs' and are now becoming dated. There is a case for their replication on a three-year cycle as these data cannot be obtained from administrative records, and criminal and drug use behaviours change. For example, recently there has been a decline in the use of heroin but a rise in methamphetamine. Similarly, there has been a decline in property crime but no decline in assaults. For cost estimates to reflect current costs, it is necessary to invest in the collection of longitudinal data in the criminal justice sector, comparable to the investment in research and data in the health sector.

The collection of DUMA should be expanded. It is currently not collected across all jurisdictions and existing DUMA data show substantial variation across states. As a result current estimates of attributable crime could be biased by the current selection of states. It is recommended that funding for DUMA as an ongoing monitoring program should be ensured.

There are no panel data on the general population that focus on onset, persistence and desistance from crime and drug use. The National Drug Strategy Household Survey does not appear to be the appropriate vehicle as it is already too long and the inclusion of criminal questions of the detail and specificity required would probably affect the survey response rate which is already down to 45 per cent.

Tobacco-attributable crime (including smuggling), and therefore its costs, remain unquantified.

9.4 Workplace absenteeism and reduced workplace productivity attributable to tobacco and illicit drugs

Recent research at the National Centre for Education and Training on Addiction at Flinders University, based on data collected for the 2001 National Drug Strategy Household Survey, has provided the basis for improved estimates of workplace absenteeism attributable to the consumption of alcohol. Similar research in relation to absenteeism attributable to tobacco and to illicit drugs is recommended.

Once again, 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. These costs, currently unquantifiable, are likely to be considerable.

9.5 The value of household work

The Australian Bureau of Statistics data on the value of unpaid work in the household have proved very useful but are now becoming dated. An updating of this research is recommended.

9.6 Smoking-attributable fires

Research conducted by the Queensland Fire and Rescue Service remains the only source of data for the quantification of the costs of smoking-attributable fires. Similar research by fire services in other states would permit assessment of whether the Queensland fire experience is typical of Australia as a whole.

9.7 Epidemiology

The current research has demonstrated that estimates of the costs of alcohol and of illicit drugs could be significantly refined if further epidemiological research were conducted on:

- estimation of alcohol aetiological fractions by type of alcohol (beer, wine and spirits)
- estimation of illicit drug aetiological fractions by type of drug.

9.8 Pharmaceuticals

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 also would enable more comprehensive estimates of health costs.

9.9 Prescribed pharmaceuticals

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

9.10 Litter

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

9.11 Ambulances

Data collected by the Western Australian Department of Health and, in the case of drug overdoses, by the New South Wales Chief Health Officer provide the basis for the current estimates of drug-attributable ambulance costs. The collection by other states of ambulance data similar to the Western Australian data and the NSW drug overdose data would facilitate inter-state comparisons.

9.12 Research and education expenditures

With the exception of research undertaken by Moore (2005) in relation to illicit drugs, there remains a lack of information on expenditures by the law enforcement, customs and education sectors on drug-related research and education.

9.13 Road accidents

The Bureau of Transport and Regional Economics has produced three reports on road crash costs, the most recent being for the year 1996. This information is now becoming outdated and an updating would facilitate future studies of the costs of drug-attributable road accident costs.

9.14 Review of data needs

It was suggested by one of the reviewers of this report that, given the extensive data needs of research of this type and the data gaps which are acknowledged still to exist, an expert advisory meeting should be held to review future data needs. This would involve input from the various disciplines involved in this type of research. It would also involve advice from representatives of bodies using such research results and from those authorities who currently collect, collate and interpret existing data.

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- Crime
- Epidemiology
- Fires
- Health
- Litter
- Paid and unpaid workforce
- Public expenditures
- Road accidents
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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 2005 had there been no use of illicit drugs, alcohol or tobacco.

This appendix was written by J.H. Pollard, Emeritus 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 2005 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).

We note from column (7) that, in the absence of the use of illicit drugs, alcohol and tobacco, the 2005 male population would be 3.5 per cent higher than it is estimated to have been, and that the 2005 female population would be 1 per cent higher.

The data

The aetiological fractions used in this report are those presented in English, Holman et al. (1995), Ridolfo and Stevenson (2001), and by Codde in Appendix C of this report. For the purposes of this projection, the first set of aetiological fractions are assumed to apply prior to 1988 (but without illicit drug deaths prior to 1962) and those of Ridolfo and Stevenson in 1998, with intermediate fractions for the period 1989–1997. Those of Codde are assumed to apply in 2006, with intermediate fractions from 1999 and 2005.

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
- ABS Life Tables Australia 2003–2005
- the numbers of births in Australia for each calendar year 1947–2005
- the numbers of net migrants by age (in broad age groups) and sex for representative years in each decade (1950s, 1960s, 1970s, 1980s,1990s) and 2000-2003
- estimate of the Australian population in 2005 by age and sex.

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 2005. The resultant estimates for 2005 were close to those provided by 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.

All calculations were performed using single years of age. The reported results are in five-year age groups.

As in previous reports, no attempt was made to quantify the births that 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 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 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.

It is important to note that the current Australian Burden of Disease (ABOD) study (see Begg et al., 2007) reports a substantially lower health benefit due to alcohol compared with the previous study, with only an estimated 2,346 deaths being saved by alcohol in 2003, compared with 7,157 deaths saved in 1996. According to the authors of the current ABOD report, the previous study incorrectly estimated the number of people who abstain from alcohol or drink less than 0.25 drinks per day. In the absence of corrected aetiological fractions for the mid 1990s, the original fractions were incorporated in the projection as described above, and as a result the net numbers of alcohol-related deaths are believed to be underestimated. Further discussion of the issue and consequences is given in the main body of this report in the section “Changes in alcohol attributable fractions”.

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

Table 51, The impact of drug abuse upon the Australian male population

Age group	Mid-year population	Mid-year population – no illicit drug abuse	Additional population – no illicit drug abuse	Mid-year population – no alcohol drug abuse	Additional population – no alcohol abuse	Mid-year population – no tobacco abuse	Additional population – no tobacco abuse
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	654,879	654,889	10	654,921	32	655,066	145
5	676,395	676,418	23	676,478	61	676,814	335
10	714,009	714,038	29	714,129	92	714,607	478
15	720,491	720,545	54	720,803	258	721,702	898
20	746,088	746,301	213	747,226	924	748,880	1,655
25	706,314	706,972	658	709,122	2,149	712,169	3,047
30	738,918	740,332	1,414	744,510	4,178	749,826	5,316
35	754,177	756,142	1,965	762,142	6,000	769,750	7,608
40	759,679	762,164	2,485	770,188	8,023	780,483	10,296
45	741,193	743,730	2,537	752,718	8,989	765,024	12,305
50	671,491	673,843	2,352	683,228	9,385	697,653	14,425
55	642,234	644,315	2,081	653,954	9,639	671,763	17,808
60	498,115	499,601	1,486	507,437	7,836	526,378	18,940
65	393,033	394,095	1,062	400,853	6,758	425,004	24,152
70	304,612	305,290	678	310,699	5,409	341,372	30,673
75	255,297	255,717	420	259,471	3,753	299,906	40,435
80	169,493	169,672	179	170,371	698	208,991	38,620
85	111,000	111,074	74	107,426	-3,648	146,933	39,508
Total	10,257,418	10,275,139	17,721	10,345,676	70,537	10,612,320	266,644

Table 52, The impact of drug abuse on the Australian female population

Age group	Mid-year population	Mid-year population – no illicit drug abuse	Additional population – no illicit drug abuse	Mid-year population – no alcohol drug abuse	Additional population – no alcohol abuse	Mid-year population – no tobacco abuse	Additional population – no tobacco abuse
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	620,286	620,291	5	620,303	12	620,386	83
5	642,855	642,876	21	642,900	25	643,119	219
10	676,901	676,924	23	676,963	39	677,285	322
15	684,928	684,959	31	685,050	91	685,601	551
20	707,341	707,446	105	707,725	279	708,522	797
25	685,650	685,881	231	686,448	567	687,678	1,230
30	741,858	742,228	370	743,196	967	745,023	1,828
35	760,402	760,843	441	762,210	1,367	764,720	2,510
40	764,490	765,056	566	767,027	1,970	770,491	3,464
45	748,927	749,531	604	751,858	2,326	756,139	4,281
50	680,722	681,301	579	683,814	2,512	688,880	5,067
55	643,087	643,635	548	646,366	2,731	652,650	6,284
60	489,951	490,385	434	492,768	2,383	499,262	6,494
65	398,737	399,097	360	401,166	2,069	409,538	8,372
70	329,759	330,011	252	331,467	1,456	342,159	10,692
75	302,950	303,125	175	303,566	441	318,345	14,780
80	242,233	242,338	105	240,880	-1,458	256,841	15,961
85	226,993	227,040	47	216,353	-10,687	232,100	15,747
Total	10,348,070	10,352,967	4,897	10,360,058	7,091	10,458,739	98,681

Table 53, The impact of drug abuse upon the Australian male and female population

Age group	Mid-year population	Mid-year population – no illicit drug abuse	Additional population – no illicit drug abuse	Mid-year population – no alcohol drug abuse	Additional population – no alcohol abuse	Mid-year population – no tobacco abuse	Additional population – no tobacco abuse
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	1,275,165	1,275,180	15	1,275,223	44	1,275,452	229
5	1,319,250	1,319,293	43	1,319,379	85	1,319,933	554
10	1,390,910	1,390,961	51	1,391,092	131	1,391,892	800
15	1,405,419	1,405,504	85	1,405,853	349	1,407,302	1,449
20	1,453,429	1,453,747	318	1,454,950	1,203	1,457,402	2,452
25	1,391,964	1,392,853	889	1,395,570	2,716	1,399,846	4,277
30	1,480,776	1,482,561	1,785	1,487,706	5,145	1,494,849	7,143
35	1,514,579	1,516,985	2,406	1,524,352	7,368	1,534,470	10,117
40	1,524,169	1,527,221	3,052	1,537,214	9,993	1,550,974	13,760
45	1,490,120	1,493,261	3,141	1,504,576	11,315	1,521,162	16,587
50	1,352,213	1,355,144	2,931	1,367,042	11,898	1,386,533	19,491
55	1,285,321	1,287,950	2,629	1,300,320	12,370	1,324,413	24,093
60	988,066	989,986	1,920	1,000,206	10,219	1,025,639	25,434
65	791,770	793,191	1,421	802,019	8,827	834,542	32,524
70	634,371	635,302	931	642,167	6,865	683,531	41,364
75	558,247	558,842	595	563,036	4,194	618,251	55,215
80	411,726	412,010	284	411,250	-760	465,832	54,582
85	337,993	338,114	121	323,778	-14,335	379,033	55,255
Total	20,605,488	20,628,360	22,872	20,709,491	81,130	21,078,651	369,161

Appendix B, Drugs and crime: calculating attributable fractions from the DUMA and DUCO projects

This appendix was written by Dr Toni Makkai, Director, Australian Institute of Criminology and Dr Jeromey Temple, Research Fellow, Research School of Social Sciences, Australian National University.

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Introduction

In 2002 the Australian Institute of Criminology produced a series of fractions for crime that could be attributed to drug use (see Makkai and McGregor, 2002 and Williams, 2002). This paper updates that information and as a result draws on the earlier work produced by Institute staff at that time. There are significant limitations in the current national crime and justice collections which do not allow us to produce attributable fractions that could be deemed as being 'true'. In particular Australia does not produce annual national data on:

- the total number of police detainees and all offences committed in Australia
- the total number of prison detainees and all offences committed in Australia
- the extent to which individual offending was causally due to the person being intoxicated with alcohol
- the extent to which each individual offence was causally due to the person's dependency on an illegal substance.

Administrative data sources such as police and prison crime statistics have significant limitations and are often not regularly published at a national level (see Makkai, 1999; Carcach, 1997; Carcach and Makkai, 2002; Pernanen, et al., 2002). This is compounded by measurement issues of intoxication and dependency (see Makkai, 2002; Pernanen et al., 2002). There is currently no reliable drug test that can determine levels of intoxication (see Poysner, Makkai, Norman and Mills, 2002) or dependency for illegal drugs such as heroin and cocaine.

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). These studies have found that concordance between self-report and chemical testing for illegal drug use varies by socio-demographic characteristics and the particular drug involved (see McGregor and Makkai, 2003). There is also debate over whether self-reported attributions for drugs and offending are reliable (see Davies, 1992 and Dalrymple, 2006).

There are essentially three models or ideal types that are used to explain the *causal* links between drugs and crime (see Pernanen et al., 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 that the intoxication caused the behaviour.
2. **Economic compulsive**—this postulates the person has a drug dependency problem that 'compelled' the person to commit crimes to support the 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 et al., 2002, p. 82 for more detailed discussion). For the latter, drug-defined crimes can theoretically be attributed a fraction of 100 percent on the basis that the crime would not have occurred if the activity had been defined as legal. However, even where drugs are legally available to adults, such as alcohol and tobacco, there continues to be illegal activity. Further, different forms of the substance that are illegal are still trafficked, such as 'chop-chop' tobacco. In this context some offenders will continue to traffic and use illegal drugs so that the legal status of specific drugs will not make any difference to their illegal activity.

There are complications with these ideal types. 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 on every individual. Until data collection and measurement are advanced in the criminal justice sector it remains necessary to rely on samples and to a large extent self-report data by offenders of their behaviour.

Data sources and key limitations: DUMA and DUCO

The data used in this paper come from the Drug Use Monitoring in Australia (DUMA) (see Mouzos, Smith and Hind, 2006) and the Drug Use Careers of Offenders (DUCO) projects (see Makkai and Payne, 2003; Johnson, 2004). DUMA is a regular quarterly monitoring system that has been operating since 1999. It surveys adult male and female persons brought to selected police stations for arrest purposes. DUCO was a one-off large scale survey of adult male and female offenders. Both collections have limitations. They are voluntary and largely rely on self-report information. However, DUMA has the added benefit of urinalysis testing. Neither data set is national, however both have the largest samples of their respective populations that are available for secondary analysis. DUMA data are available for 2005/06 financial year while DUCO relies on the male survey undertaken in 2002 and the female sample undertaken in 2003.

This paper uses a sample from DUMA of 3,623 adults for the financial year ended July 2006. DUCO relies on 2,135 sentenced adult male inmates in four jurisdictions and 467 sentenced adult female inmates in six jurisdictions.

Measuring offending

There are three measures of offending—the number of offenders, the number of offending episodes and within that episode the number of offences. In any one year an offender may commit more than one offending episode. In addition, the number of charges can vary for the same offending episode depending on the arresting officer (see Makkai et al., 2004). Further, not all charges will go to court, and not all charges that do go to court will result in a guilty verdict. This filtering in the criminal justice system means that administrative and survey data are highly specific to the point in the system where the data are collected.

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. For DUMA the decision was made to take into account all arrests reported over the past 12 months, not just the most current offence. Potentially this overcomes the problem of relying on one arrest occasion as a measure of the 'typical' offending profile. However, 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, unless adjustments for multiple offences are made.

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. In the DUCO surveys only selected criminal histories were collected, so it is not possible to adjust for offending in the 12 months prior to the current offending episode that resulted in a term of imprisonment.

Measuring intoxication with DUMA data

If a person has used a drug it does not automatically mean they are 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.

DUCO did ask offenders if they were intoxicated at the time of committing the most serious offence for which they were incarcerated and this measure is used in the DUCO calculations.

Measuring causation

There is no measure or even approximation for causal behaviour for alcohol in DUMA. 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 detainees indicated some or more of their offending was drug-related they were assumed to be drug-related. DUCO relies upon individual offenders' accounts of why they committed their crimes.

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). In the previous calculations the DUMA attributions relied on a single item that asked detainees whether they felt they needed or were dependent on [drugs] in the past 12 months.

In 2004, a six item scale to measure alcohol and illegal drug dependency was included. This scale had been developed for use with police detainees in the United States and the questions reflect each of the diagnostic criteria for abuse and dependence defined by the DMS-IV (see Hoffman et al., 2003). If individuals answer yes to three of the six items they are considered to be dependent (Mouzos et al., 2006). This same scale was also replicated in the female DUCO sample and is used to measure dependency. The DUCO male sample relies on offenders' self-reported motivations for their most serious offence. Such motivations may not reflect the general pattern for all offences.

Table 54 provides two pieces of information – the upper and lower estimates for attributions of offending activity to drug dependency and two sets of attributions using a single item versus a scale to measure dependency. Regardless of whether the single item or the scale

is used to measure dependency, the distribution of reported attributions remain similar for the upper estimates. However, with the lower bound estimates the dependency scale results in more detainees being assigned to the alcohol category and fewer detainees not attributing any of the offending to drug dependency.

As the dependency scale has been developed and validated for use amongst police detainees, it is probably more appropriate to use this measure. Taking the more conservative measure the lower bound estimates indicate that 25 per cent of detainees were classified as either dependent or intoxicated and attributed some or more of their offending to illicit drug use, 12 per cent were only dependent on alcohol and using alcohol at the time of the arrest and 5 percent were using both alcohol and illicit drugs. Overall 59 per cent of detainees did not fall into of the above categories. For the upper bound estimates the proportion using alcohol almost doubles to 22 per cent and the other estimates are adjusted downwards.

Overall the percentage of detainees that attribute their offending to drugs is 41 per cent for the more conservative lower estimates and 51 per cent for the more liberal upper estimate.

Table 54, Comparing the single item and new dependency measure on self-reported attributions for police detainees, percentages

	Lower single item (per cent)	Upper single item (per cent)	Lower dependency scale (per cent)	Upper dependency scale (per cent)
Illicit drugs	24	20	25	22
Alcohol	6	22	12	22
Both	2	7	5	7
None of the above	67	51	59	49

Source: AIC, DUMA collection, n= 3,623 [computer file]

The cut-off point on the dependency scale does have an effect on the attributable fractions. If the cut off is increased to 4 then considerably fewer persons are classed as 'dependent'. As a result it is likely that our results, even the lower bound estimates, are liberal estimates.

Developing multiple offence-adjusted attributable fractions

Essentially the same rationale as outlined in the earlier publication was used to calculate the attributable fractions. For the details readers are referred to that work. As part of this project, the earlier method with the new data was replicated and found to be highly comparable. However, using the DUMA data, a methodological change has been made through the development of parity-adjusted attributable fractions for the estimates provided in this report. The previous method attributed illicit and licit substances to the reported most serious offence (MSO). In reality, a substantial proportion of persons are charged with multiple offences. Apportioning the attribution to the MSO only in this instance biases the true level of attribution. The new method used here entails calculating a set of unique or mutually exclusive parity measures for each of the MSO offences over the last 12 months.

These are then combined to take into account parities across the offence categories producing multiple offence-adjusted attributions. Effectively, attributions for violent crime (the most serious offence category) remain unchanged but all the other attributions are adjusted by parities for lower order offending episodes.

Table 55 provides multiple offence-adjusted attributions by crime type. It is important to note that these attributable fractions are not for individual offenders. The 95 per cent binomial confidence intervals are included so that upper and lower bound estimates can be calculated. The range of the estimates can vary by as much as 11 percentage points for traffic offenders to a low of five percentage points for a number of the crime types.

In the 2002 calculations a theoretical decision was taken to attribute 100 per cent of drug and drink driving behaviour to substance use. In these calculations we have estimated attributions for crime type based on what offenders reported, which is consistent with the DUCO calculations.

Overall attribution tends to be highest for illicit drugs only, followed by alcohol only and then both. When the fractions are adjusted for levels of dependency, there are noticeable differences for the more liberal estimates, with alcohol being the highest category for violent, drink driving and disorder crime types.

Table 55, Self-reported causal attributions by crime type, multiple offence-adjusted attributions, DUMA, percentages

	Violent	Property	Drug	Drink driving	Traffic	Disorder	Breaches	Other	Total
(n)	**(1128)**	**(1050)**	**(255)**	**(202)**	**(352)**	**(177)**	**(325)**	**(99)**	**(3623)**
Upper bound estimates									
Illicit drugs	21	36	43	9	25	23	23	26	27
Alcohol	25	11	9	51	17	31	23	23	20
Both	11	10	13	9	6	10	8	10	10
(Any)	**56**	**57**	**65**	**69**	**48**	**64**	**54**	**59**	**57**
Bin 95% C.I.	54, 59	54, 59	61, 68	64, 74	45, 51	60, 68	51, 57	56, 62	n.a.
No substance	44	44	35	31	52	36	46	41	43
Lower bound estimates									
Illicit drugs	24	40	49	12	27	25	26	30	30
Alcohol	15	6	5	24	8	20	13	13	11
Both	7	6	7	6	4	8	6	6	6
(Any)	**47**	**52**	**60**	**43**	**39**	**53**	**44**	**49**	**47**
Bin 95% C.I.	44, 50	49, 54	57, 64	37, 48	36, 43	49, 57	42, 47	46, 53	n.a.
No substance	53	48	40	57	61	47	56	51	53

Source: AIC, DUMA collection, n= 3,623 [computer file].

Weighting DUCO

Neither DUCO nor DUMA were nationally representative samples although they may indeed be representative. In the case of DUCO the sample excludes South Australian and Victorian males and New South Wales males and females. Given that DUMA shows that there is considerable variation in drug markets between NSW and the other jurisdictions we have provided both unweighted and weighted DUCO data to reflect the age, gender and state profile to the ABS 2005 prison census data. Due to different variable definitions and low cell sizes, it was not possible to implement a more comprehensive procedure. For DUCO males the fractions were adjusted by using census data to weight the attributable fractions within offence cells by each age group and state. For DUCO females, an overall distribution within each age category and state was used because of the small cell sizes for many 'less serious' offences.

Table 56 provides the weighted estimates and Table 57 the unweighted estimates. For males, the unweighted calculations are those developed by Williams (2005). For females the calculations use the dependency scale to determine whether the person was addicted to drugs at the time of committing the MSO and then adjusts the proportion by whether or not the offence was committed because of drug dependency. These figures are slightly

different from those produced by Johnson (2004) as the measures adjust for both the first and second charges reported by the offender[1]. There is effectively little difference in the unweighted and the weighted attributions. Because of the weighting, the confidence intervals are not calculated.

It is important to note that sample sizes for minor offending categories become very small. This reflects the nature of the criminal justice population—incarcerated offenders are usually sentenced to prison for serious offences, although their offending history will frequently contain a plethora of sentences for minor offences. As is consistent with the criminological literature, females report higher rates of drug dependency and attribution.

Table 56, DUCO males and females, weighted estimates, percentages

	Violent	Property	Drug	Traffic (a)	Breaches (a)	Disorder (a)	DUI (a)	Other (a)	Total
Females									
High only	27	44	38	12	24	0	100	0	32
Drunk only	15	2	0	3	15	44	0	40	9
High and drunk	2	1	0	4	0	0	0	9	2
(Any)	**44**	**46**	**38**	**19**	**39**	**44**	**100**	**49**	**43**
No substance	56	54	62	81	61	56	0	51	57
Males									
High only	11	23	26	8	15	7	0	12	14
Drunk only	11	4	1	13	13	13	10	11	9
High and drunk	12	9	4	6	10	6	14	15	11
(Any)	**34**	**37**	**31**	**27**	**38**	**26**	**23**	**38**	**34**
No substance	66	63	69	73	62	74	77	62	66

Notes: (a) For females based on less than 50 observations. Treat with caution.

Source: AIC, DUCO Male 2002 (n=2,135) and Female 2003 (n=467), unweighted data [computer file].

Table 57, DUCO males and females, unweighted estimates, percentages

	Violent	Property	Drug	Traffic (a)	Breaches (a)	Disorder (a)	DUI (a)	Other (a)	Total
Females									
High only	25	41	36	13	21	0	100	0	31
Drunk only	15	2	0	4	14	33	0	40	9
High and drunk	2	1	0	4	0	0	0	10	2
(Any)	**42**	**43**	**36**	**21**	**36**	**33**	**100**	**50**	**41**
CI 950	*35, 49*	*36, 51*	*24, 49*	*4, 38*	*10, 62*	*n.a*	*n.a*	*17, 83*	*36, 45*
No substance	58	57	64	79	64	67	0	50	59
(n)	(196)	(161)	(58)	(24)	(14)	(3)	(1)	(10)	(467)
Males (b)									
High only	11	23	26	8	15	6	0	16	14
Drunk only	11	4	1	13	13	13	10	11	9
High and drunk	13	9	4	7	11	6	14	17	11
(Any)	**35**	**37**	**31**	**28**	**39**	**25**	**24**	**45**	**35**
CI 95	*32,37*	*32,42*	*24,39*	*20,36*	*28,49*	*4,46*	*11,36*	*34,55*	*33,37*
No substance	66	63	69	72	61	75	77	55	66

Source: AIC, DUCO Male 2002 (n=2,135) and Female 2003 (n=467), unweighted data [computer file].

Notes: (a) For females based on less than 50 observations. Treat with caution. (b) specific (n) not available from publication.

Conclusion

This chapter has updated earlier work that attempted to calculate the proportion of adult detainees' and prisoners' offending that could be 'causally' linked to illicit drugs and alcohol. The limitations of the data have been identified throughout this Appendix and should be kept in mind when using or applying these estimates to the whole of the offender population. Four key innovations have been used in an attempt to improve estimations. These are:

1. A scale rather than a single item has been used to measure dependency in the DUMA and DUCO female samples.
2. The DUMA data have used a technique to adjust the attributable fractions so that they take into account multiple offences. Previously, the attribution had been applied to the most serious offence (MSO) only.
3. 95 per cent confidence intervals have been produced for the DUMA data.
4. Weighted estimates for DUCO males and females have been provided. These take into account the age, sex and state profile of prisoners based on the ABS 2005 Prisoner Census.

Overall, the estimates range from 41 per cent to 51 per cent for police detainees with variation occurring for different offence types, when classified by most serious offence. This is consistent with the DUMA estimates derived in 2002. When adjustments are made for multiple offences, the estimates increase slightly from a range of 47 to 57 per cent. For DUCO females 43 per cent are estimated to have committed their most serious offence because of substance abuse and for males the estimate is 34 per cent. There is far less variability across offending types than occurs for the DUMA sample.

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Appendix C, Estimation of drug-attributable cases

This appendix was written by Associate Professor Jim Codde, School of Population Health, University of Western Australia.

Population data

Australian estimated resident population data for June 2004 used to calculate the drug-caused mortality rates shown in this report were obtained from the Australian Bureau of Statistics (ABS) publication *Population by Age and Sex, Australian States and Territories, June 2005* (3201.0).

Mortality data

Unit record level national mortality data for 2004 were obtained from ABS, *Deaths, Australia, 2004* (3302.0). The total number of deaths registered in that year was 132,508. The causes of death for this data were coded using ICD-10. Alcohol-caused and tobacco-caused deaths were determined on the basis of the major cause of death codes but for many illicit drug-caused deaths, the additional causes of death data were used to determine the specific drug involved if possible.

Morbidity data

De-identified unit record level data for all public and private hospital discharges that occurred in Australia between 1 July 2004 and 30 June 2005 were obtained from the Australian Institute of Health and Welfare (AIHW) after receiving permission from all states and territories. All of the 7 million records were coded to ICD-10-AM (Third Edition) and grouped to ANDRG Version 4.2. Approximate cost of hospitalisation due to drug abuse was determined from the ANDRGs and the National Hospital Costing Data (Round 8, ANDRG 4.2) produced by the Commonwealth Department of Health and Ageing[2].

Estimation of drug-attributable cases

Conditions and diseases attributed to drug use are shown in Table 58 to Table 60 inclusive. Drug attributed cases were determined by multiplying these cases with an age-, sex- and condition-specific aetiologic fraction. The aetiologic fractions used in this report are largely based on the original work of English et al. (1995)[3] and subsequently updated by Ridolfo and Stevenson (2001)[4]. While, on the whole, the relative risks of diseases associated with drug usage remained the same, for some diseases the aetiologic fractions in these two reports differed due to the use of more current drug usage prevalence data (1989 and 1995 respectively). For the purpose of this report, it was decided to update the aetiologic fractions once more where possible using even more current prevalence information. Furthermore, there was a desire to link more closely with the Australian Burden of Disease (ABOD) work being undertaken by the University of Queensland and the Australian Government Department of Health and Ageing.

As such, a revised list of drug-related diseases and many of the aetiologic fractions cited in this report were based on a recent publication on the burden of disease and injury in Australia[5]. Due to a different focus, some drug-caused conditions were grouped into a broader category in the ABOD report. For the purposes of the current study, these diseases were more clearly identified as indicated in the following tables, which allows closer comparison with the work of English et al. (1995) and Ridolfo and Stevenson (2001).

On the whole, the alcohol aetiologic fractions derived for the ABOD report (Begg et al., 2007) were based on prevalence information from the 2001 National Health Survey[6] categorized into the four levels used by English et al., Ridolfo and Stevenson and the NHMRC's recommendations on alcohol consumption. The relative risks and population attributable fractions were largely drawn from Ridolfo and Stevenson's report. Due to the long lag time between exposure to tobacco smoke and the occurrence of cancer and chronic respiratory diseases, the proportion of disease attributable to smoking cannot be determined from current smoking prevalence. Consequently Begg et al. used a variety of techniques as outlined in their report. Similarly, determination of the aetiologic fractions associated with illicit drug use was based on a number of data sources that included the 2004 National Drug Strategy Household Survey[7] and National Centre in HIV Epidemiology and Clinical Research[8].

Table 61 to Table 67 inclusive show the sex- and age-specific aetiologic fractions for each drug-caused disease or condition. Unless stated to the contrary, these figures were obtained or derived from the ABOD report or personal communications with the authors. Using these aetiologic fractions, the number of cases attributable to drug usage was determined. Based on the derived fraction of cases, the number of potential years of life lost was estimated from death data using the method of Hakulinen and Teppo (1976)[9]. Similarly, the drug-caused fraction of hospital separations, bed days and hospital costs were determined from the application of aetiologic fractions to the age and gender specific data.

Table 58, Alcohol-caused conditions and defining ICD-10 codes

Diseases and conditions	ICD-10 codes
Oropharyngeal cancer	C00-14
Oesophageal cancer	C15
Liver cancer	C22
Laryngeal cancer	C32
Female breast cancer	C50
Alcoholic psychosis [10]	F10.3-10.9
Alcohol dependence/abuse [9]	F10.0-10.2
Alcoholic liver cirrhosis [9]	K70
Road injuries	V01.1-01.9, V02.1-02.9, V03.1-03.9, V04.1-04.9, V06.1-06.9, V09.2-09.3, V10.4-10.9, V11.4-11.9, V12.4-12.9, V13.4-13.9, V14.4-14.9, V15.4-15.9, V16.4-16.9, V17.4-17.9, V18.4-18.9, V19.4-19.9, V20.4-20.9, V21.4-21.9, V22.4-22.9, V23.4-23.9, V24.4-24.9, V25.4-25.9, V26.4-26.9, V27.4-27.9, V28.4-28.9, V29.4-29.9, V30.5-30.9, V31.5-31.9, V32.5-32.9, V33.5-33.9, V34.5-34.9, V35.5-35.9, V36.5-36.9 ,V37.5-37.9, V38.5-38.9, V39.4-39.9, V40.5-40.9, V41.5-41.9, V42.5-42.9, V43.5-43.9, V44.5-44.9, V45.5-45.9, V46.5-46.9, V47.5-47.9, V48.5-48.9, V49.4-49.9, V50.5-50.9, V51.5-51.9, V52.5-52.9, V53.5-53.9, V54.5-54.9, V55.5-55.9, V56.5-56.9, V57.5-57.9, V58.5-58.9, V59.4-59.9, V60.5-60.9, V61.5-61.9, V62.5-62.9, V63.5-63.9, V64.5-64.9, V65.5-65.9, V66.5-66.9, V67.5-67.9, V68.5-68.9, V69.4-69.9, V70.5-70.9, V71.5-71.9, V72.5-72.9, V73.5-73.9, V74.5-74.9, V75.5-75.9, V76.5-76.9, V77.5-77.9, V78.5-78.9, V79.4-79.9, V80.3-80.5, V80.9, V81.1, V82.1-82.9, V83.0-83.3, V84.0-84.3, V85.0-85.3, V86.0-86.4, V87.0-87.8, V89.2, V89.9, Y85
Alcoholic poly-neuropathy [9]	G62.1
Hypertension	I11, I13.0, I15
Ischaemic heart disease	I20-25
Alcoholic cardiomyopathy [9]	I42.6
Supraventricular cardiac dysrhythmias [9]	I47.1, I47.8-48.9
Heart failure [9]	I50-51, I97.1
Stroke - haemorrhagic/ischaemic	G45, I60-69
Oesophageal varicies [9]	I85, I98.2
Gastro-oesophageal haemorrhage [9]	K22.6
Alcoholic gastritis	K29.2
Unspecified liver cirrhosis [9]	K74.3-74.6, K76.0, K76.9
Cholelithiasis [9]	K80
Pancreatitis - acute/chronic	K85, K86.0-86.1
Alcoholic beverage & other EtOH poisoning [9]	X45 or Y15 & T51.0-51.1, T51.9
Fall injuries	W00-19, M80-82
Fire injuries	X00-19
Drowning	W65-74
Aspiration [9]	W78-79

Note: Table continued on next page.

Diseases and conditions	ICD-10 codes
Occupational and machine injuries	V01.0, 02.0, V03.0, V04.0, V05, V06.0, V09.0-09.1, V09.9, V10.0-10.3, V11.0-11.3, V12.0-12.3, V13.0-13.3, V14.0-14.3, V15.0-15.3, V16.0-16.3, V17.0-17.3, V18.0-18.3, V19.0-19.3, V20.0-20.3, V21.0-21.3, V22.0-22.3, V23.0-23.3, V24.0-24.3, V25.0-25.3, V26.0-26.3, V27.0-27.3, V28.0-28.3, V29.0-29.3, V30.0-30.4, V31.0-31.4, V32.0-32.4, V33.0-33.4, V34.0-34.4, V35.0-35.4, V36.0-36.4, V37.0-37.4, V38.0-38.4, V39.0-39.3, V40.0-40.4, V41.0-41.4, V42.0-42.4, V43.0-43.4, V44.0-44.4, V45.0-45.4, V46.0-46.4, V47.0-47.4, V48.0-48.4, V49.0-49.3, V50.0-50.4, V51.0-51.4, V52.0-52.4, V53.0-53.4, V54.0-54.4, V55.0-55.4, V56.0-56.4, V57.0-57.4, V58.0-58.4, V59.0-59.3, V60.0-60.4, V61.0-61.4, V62.0-62.4, V63.0-63.4, V64.0-64.4, V65.0-65.4, V66.0-66.4, V67.0-67.4, V68.0-68.4, V69.0-69.3, V70.0-70.4, V71.0-71.4, V72.0-72.4, V73.0-73.4, V74.0-74.4, V75.0-75.4, V76.0-76.4, V77.0-77.4, V78.0-78.4, V79.0-79.3, V80.0-80.2, V80.6-80.8, V81.0, V81.2-81.9, V82.0, V83.4-83.9, V84.4-84.9, V85.4-85.9, V86.5-86.9, V87.9, V88, V89.0-89.1, V89.3, V90-99, X20-39, X50-58, W20-45, W49-60, W64, W75-99, Y40-84, Y86, Y88.0-88.3
Suicide and self-inflicted injury	X60-84,Y87.0
Child abuse [11] & Assault	X85-Y09, Y87.1

Table 59, Tobacco-caused conditions and defining ICD-10 codes

Diseases and conditions	ICD-10 codes
Oropharyngeal cancer	C00-14
Oesophageal cancer	C15
Stomach cancer	C16
Pancreatic cancer	C25
Laryngeal cancer	C32
Lung cancer	C33-34
Cervical cancer [12]	C53, D06
Endometrial cancer (protective)	C54
Bladder cancer	C67
Kidney cancer	C64-66, C68
Ischaemic heart disease	I20-25
Chronic obstructive pulmonary disease	J40-44
Tobacco abuse [13]	F17, T65.2, Z72.0
Parkinson's disease (protective)	G20-21
Pulmonary circulation disease [12]	I26.0, I27-28
Cardiac dysrhythmias [12]	I46-49
Heart failure [12]	I50-51, I97.1
Stroke	I60-69, G45
Peripheral vascular disease	I70.0-I70.8, I72-74
Lower respiratory tract infection	J10-13, J15-18, J20.0, J20.2-20.9, J21-22
Crohn's disease	K50
Ulcerative colitis	K51
Antepartum haemorrhage [11]	O20, O44.1, O45-46, P02.0-02.1
Low birthweight	P05-07, P22
SIDS	R95
Fire injuries	X00-19
Asthma (under 15 years)	J45-46
Macular degeneration [14]	H35.3-52.4
Otitis media [13]	H65-66

Table 60, Illicit drug-caused conditions and defining ICD-10 codes

Diseases and conditions	ICD-10 codes
Opiate dependence	F11.2-11.4
Opiate abuse	F11.0-11.1
Opiate poisoning	Y12 & T40.0-40.4*
Accidental opiate poisoning[15]	X42 & T40.0-40.4*
Cannabis dependence	F12.2-12.4
Cannabis abuse	F12.0-12.1
Amphetamine dependence	F15.2-15.4
Amphetamine abuse	F15.0-15.1
Cocaine dependence	F14.2-14.4
Cocaine abuse	F14.0-14.1
Psychostimulant poisoning	Y11 & T43.6*
Accidental poison by psychostimulants [14]	X41 & T43.6*
Hallucinogen dependence	F16.2-16.4
Hallucinogen abuse	F16.0-16.1
Hallucinogen poisoning	Y12 & T40.8-40.9*
Other psychotropic drug poisoning	X42 & T40.5, T40.7*
Accidental poisoning by hallucinogens [14]	X42 & T40.8-40.9*
Anabolic steroid poisoning [16]	Y14 & T38.7*
Hepatitis B	B16, B17.0, B18.0-18.1
Hepatitis C	B17.1, B18.2
HIV/AIDS	B20-24, R75, Z20.6, Z21
Infective endocarditis	I33
Drug psychoses	F11.5-11.9, F12.5-12.9, F13.5-13.9, F14.5-14.9, F15.5-15.9, F16.5-16.9, F18.5-18.9, F19.5-19.9
Maternal drug dependence [15]	O35.5
Newborn drug toxicity [15]	P04.4, P96.1
Antepartum haemorrhage	O20, O44.1, O45-46, O67, P02.0-02.1
Low birth weight	P05-07, P22
Road injuries	V01.1-01.9, V02.1-02.9, V03.1-03.9, V04.1-04.9, V06.1-06.9, V09.2-09.3, V10.4-10.9, V11.4-11.9, V12.4-12.9, V13.4-13.9, V14.4-14.9, V15.4-15.9, V16.4-16.9, V17.4-17.9, V18.4-18.9, V19.4-19.9, V20.4-20.9, V21.4-21.9, V22.4-22.9, V23.4-23.9, V24.4-24.9, V25.4-25.9, V26.4-26.9, V27.4-27.9, V28.4-28.9, V29.4-29.9, V30.5-30.9, V31.5-31.9, V32.5-32.9, V33.5-33.9, V34.5-34.9, V35.5-35.9, V36.5-36.9 ,V37.5-37.9, V38.5-38.9, V39.4-39.9, V40.5-40.9, V41.5-41.9, V42.5-42.9, V43.5-43.9, V44.5-44.9, V45.5-45.9, V46.5-46.9, V47.5-47.9, V48.5-48.9, V49.4-49.9, V50.5-50.9, V51.5-51.9, V52.5-52.9, V53.5-53.9, V54.5-54.9, V55.5-55.9, V56.5-56.9, V57.5-57.9, V58.5-58.9, V59.4-59.9, V60.5-60.9, V61.5-61.9, V62.5-62.9, V63.5-63.9, V64.5-64.9, V65.5-65.9, V66.5-66.9, V67.5-67.9, V68.5-68.9, V69.4-69.9, V70.5-70.9, V71.5-71.9, V72.5-72.9, V73.5-73.9, V74.5-74.9, V75.5-75.9, V76.5-76.9, V77.5-77.9, V78.5-78.9, V79.4-79.9, V80.3-80.5, V80.9, V81.1, V82.1-82.9, V83.0-83.3, V84.0-84.3, V85.0-85.3, V86.0-86.4, V87.0-87.8, V89.2, V89.9, Y85
Suicide	X60-84, Y87.0
Schizophrenia [17]	F20-29

Note: Conditions with a code marked with an asterisk examined all cause of death fields.

Table 61, Age-specific aetiologic fractions for alcohol-caused deaths, males

Males	< 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Oropharyngeal cancer	0.000	0.000	0.000	0.000	0.156	0.341	0.374	0.354	0.375	0.369	0.385	0.383	0.344	0.344	0.277	0.289	0.195	0.178	0.178
Oesophageal cancer	0.000	0.000	0.000	0.000	0.207	0.391	0.422	0.400	0.428	0.418	0.436	0.434	0.401	0.398	0.334	0.350	0.281	0.254	0.254
Liver cancer	0.000	0.000	0.000	0.000	0.157	0.331	0.348	0.326	0.370	0.347	0.356	0.374	0.342	0.350	0.269	0.286	0.210	0.174	0.174
Laryngeal cancer	0.000	0.000	0.000	0.000	0.238	0.445	0.467	0.443	0.487	0.465	0.478	0.491	0.457	0.463	0.378	0.397	0.314	0.272	0.272
Female breast cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Alcoholic psychosis	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Alcohol dependence/abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Alcoholic liver cirrhosis	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Road injuries	0.328	0.328	0.328	0.328	0.299	0.394	0.394	0.397	0.397	0.397	0.397	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097
Alcoholic poly-neuropathy	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hypertension	0.000	0.000	0.000	0.000	0.028	0.091	0.099	0.090	0.107	0.098	0.099	0.110	0.092	0.010	0.063	0.068	0.029	0.021	0.021
Ischaemic heart disease	0.000	0.000	0.000	0.000	-0.049	-0.109	-0.126	-0.115	-0.128	-0.124	-0.138	-0.131	-0.117	-0.110	-0.091	-0.098	-0.085	-0.075	-0.075
Alcoholic cardiomyopathy	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Supraventricular cardiac dysrhythmias [1]	0.000	0.000	0.000	0.000	-0.140	-0.278	-0.297	-0.279	-0.311	-0.296	-0.309	-0.315	-0.290	-0.290	-0.233	-0.248	-0.203	-0.175	-0.175
Heart failure [2]	0.000	0.000	0.000	0.000	-0.016	0.007	-0.049	-0.081	-0.132	-0.112	-0.115	-0.119	-0.124	-0.130	-0.136	-0.139	0.139	-0.135	-0.135
Stroke - haemorrhagic/ischaemic	0.000	0.000	0.000	0.000	0.098	0.221	0.234	0.217	0.010	0.008	0.049	0.059	0.070	0.079	0.072	0.077	0.019	0.017	0.017
Oesophageal varices	0.000	0.000	0.000	0.000	0.273	0.549	0.548	0.519	0.599	0.550	0.546	0.599	0.560	0.590	0.448	0.473	0.308	0.205	0.205
Gastro-oesophageal haemorrhage [2]	0.000	0.000	0.000	0.000	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470
Alcoholic gastritis	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Unspecified liver cirrhosis	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cholelithiasis	0.000	0.000	0.000	0.000	-0.046	-0.126	-0.140	-0.126	-0.147	-0.131	-0.140	-0.142	-0.121	-0.116	-0.084	-0.091	-0.069	-0.054	-0.054
Pancreatitis - acute/chronic	0.000	0.000	0.000	0.000	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265
Alcoholic beverage & other EtOH poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Fall injuries	0.000	0.000	0.000	0.000	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.120	0.120	0.120	0.120	0.120
Fire injuries	0.000	0.407	0.407	0.407	0.407	0.000	0.407	0.407	0.407	0.364	0.407	0.358	0.407	0.407	0.364	0.407	0.407	0.277	0.277
Drowning	0.000	0.000	0.000	0.000	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190
Aspiration	0.000	0.000	0.000	0.000	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116
Occupational and machine injuries	0.000	0.000	0.000	0.000	0.079	0.083	0.084	0.084	0.085	0.085	0.084	0.084	0.082	0.079	0.074	0.073	0.073	0.073	0.073
Suicide and self-inflicted injury	0.000	0.000	0.000	0.000	0.125	0.264	0.281	0.262	0.298	0.280	0.291	0.302	0.275	0.279	0.216	0.230	0.177	0.149	0.149
Child abuse [2] & Assault	0.160	0.160	0.160	0.160	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470
Unspecified liver cirrhosis [2]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: 1. Aetiologic fractions (AF) derived from relative risk from Ridolfo and prevalence data from 2001 NHS (Begg et al., 2007). 2. AF obtained from Ridolfo.

Table 62, Age-specific aetiologic fractions for alcohol-caused deaths, females

Females	< 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Oropharyngeal cancer	0.000	0.000	0.000	0.000	0.112	0.214	0.196	0.214	0.278	0.228	0.244	0.243	0.204	0.193	0.155	0.134	0.120	0.213	0.213
Oesophageal cancer	0.000	0.000	0.000	0.000	0.140	0.298	0.264	0.280	0.331	0.289	0.307	0.311	0.266	0.265	0.220	0.196	0.172	0.238	0.238
Liver cancer	0.000	0.000	0.000	0.000	0.114	0.239	0.218	0.232	0.291	0.243	0.265	0.267	0.219	0.247	0.188	0.157	0.155	0.182	0.182
Laryngeal cancer	0.000	0.000	0.000	0.000	0.172	0.344	0.314	0.331	0.396	0.343	0.367	0.371	0.315	0.341	0.273	0.236	0.226	0.268	0.268
Female breast cancer	0.000	0.000	0.000	0.000	0.031	0.077	0.067	0.072	0.092	0.075	0.083	0.084	0.067	0.073	0.055	0.047	0.043	0.055	0.055
Alcoholic psychosis	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Alcohol dependence/abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Alcoholic liver cirrhosis	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Road injuries	0.107	0.107	0.107	0.107	0.078	0.155	0.155	0.184	0.184	0.184	0.184	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Alcoholic poly-neuropathy	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hypertension	0.000	0.000	0.000	0.000	-0.000	-0.036	-0.019	-0.018	0.006	-0.011	-0.007	-0.012	-0.016	-0.002	-0.014	-0.019	-0.005	0.001	0.001
Ischaemic heart disease	0.000	0.000	0.000	0.000	-0.026	-0.087	-0.068	-0.073	-0.081	-0.073	-0.078	-0.082	-0.067	-0.064	-0.053	-0.048	-0.037	-0.048	-0.048
Alcoholic cardiomyopathy	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Supraventricular cardiac dysrhythmias [1]	0.000	0.000	0.000	0.000	-0.092	-0.218	-0.190	-0.201	-0.237	-0.206	-0.222	-0.226	-0.189	-0.202	-0.161	-0.141	-0.127	-0.147	-0.147
Heart failure [2]	0.000	0.000	0.000	0.000	0.000	-0.045	0.004	0.028	-0.043	-0.082	-0.072	-0.084	-0.075	-0.102	-0.083	-0.086	-0.077	-0.099	-0.099
Stroke - haemorrhagic/ischaemic	0.000	0.000	0.000	0.000	0.033	-0.106	-0.090	-0.087	-0.053	-0.049	-0.156	-0.172	-0.111	-0.118	-0.120	-0.111	-0.081	-0.063	0.017
Oesophageal varices	0.000	0.000	0.000	0.000	0.247	0.397	0.395	0.413	0.528	0.442	0.482	0.480	0.398	0.489	0.368	0.291	0.339	0.331	0.331
Gastro-oesophageal haemorrhage [2]	0.000	0.000	0.000	0.000	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470
Alcoholic gastritis	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Unspecified liver cirrhosis	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cholelithiasis	0.000	0.000	0.000	0.000	-0.030	-0.089	-0.074	-0.079	-0.097	-0.079	-0.087	-0.090	-0.071	-0.073	-0.054	-0.046	-0.037	-0.048	-0.048
Pancreatitis - acute/chronic	0.000	0.000	0.000	0.000	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265	0.265
Alcoholic beverage & other EtOH poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Fall injuries	0.000	0.000	0.000	0.000	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.120	0.120	0.120	0.120	0.120
Fire injuries	0.000	0.407	0.407	0.000	0.000	0.000	0.407	0.407	0.407	0.333	0.000	0.407	0.407	0.407	0.407	0.407	0.222	0.284	0.277
Drowning	0.000	0.000	0.000	0.000	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190
Aspiration	0.000	0.000	0.000	0.000	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116
Occupational and machine injuries	0.000	0.000	0.000	0.000	0.075	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.074	0.073	0.072	0.072	0.072	0.072
Suicide and self-inflicted injury	0.000	0.000	0.000	0.000	0.086	0.197	0.174	0.185	0.228	0.192	0.209	0.212	0.174	0.192	0.148	0.126	0.119	0.139	0.139
Child abuse [2] & Assault	0.160	0.160	0.160	0.160	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470	0.470
Unspecified liver cirrhosis [2]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: 1. Aetiologic fractions (AF) derived from relative risk from Ridolfo and prevalence data from 2001 NHS (Begg et al., 2007). 2. AF obtained from Ridolfo.

Table 63, Age-specific aetiologic fractions for tobacco-caused deaths, males

Males	< 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Oropharyngeal cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.277	0.543	0.396	0.469	0.503	0.524	0.533	0.531	0.555	0.555
Oesophageal cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.245	0.502	0.358	0.428	0.462	0.482	0.492	0.490	0.514	0.514
Stomach cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.042	0.121	0.071	0.092	0.105	0.113	0.117	0.000	0.000	0.000
Pancreatic cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.085	0.223	0.137	0.176	0.197	0.210	0.217	0.215	0.232	0.232
Laryngeal cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.411	0.684	0.545	0.617	0.649	0.667	0.676	0.674	0.695	0.695
Lung cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.418	0.667	0.739	0.843	0.880	0.900	0.912	0.912	0.897	0.897
Cervical cancer [1]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Endometrial cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bladder cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.156	0.365	0.241	0.299	0.329	0.348	0.356	0.354	0.377	0.377
Kidney cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.242	0.497	0.354	0.424	0.457	0.478	0.488	0.485	0.510	0.510
Ischaemic heart disease	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.401	0.367	0.335	0.314	0.324	0.273	0.077	0.070	0.044	0.042	0.042
Chronic obstructive pulmonary disease	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.487	0.746	0.619	0.686	0.715	0.732	0.739	0.737	0.756	0.756
Tobacco abuse	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Parkinson's disease	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.162	-0.162	-0.162	-0.162	-0.162	-0.162	-0.162	-0.162	-0.162	-0.162	-0.162
Pulmonary circulation disease [2]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.487	0.746	0.619	0.686	0.715	0.732	0.739	0.737	0.756	0.756
Cardiac dysrhythmias [3]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.401	0.367	0.335	0.314	0.324	0.273	0.077	0.070	0.044	0.042	0.042
Heart failure [3]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.401	0.367	0.335	0.314	0.324	0.273	0.077	0.070	0.044	0.042	0.042
Stroke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.408	0.373	0.342	0.320	0.331	0.278	0.076	0.069	0.044	0.041	0.041
Peripheral vascular disease	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.334	0.302	0.274	0.255	0.264	0.219	0.163	0.149	0.097	0.092	0.092
Lower respiratory tract infection	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.133	0.117	0.103	0.094	0.099	0.079	0.056	0.051	0.032	0.030	0.030
Crohn's disease	0.000	0.000	0.000	0.000	0.087	0.234	0.230	0.236	0.230	0.205	0.184	0.170	0.177	0.143	0.104	0.095	0.061	0.057	0.057
Ulcerative colitis	0.000	0.000	0.000	0.000	0.047	0.094	0.093	0.094	0.094	0.089	0.084	0.080	0.082	0.071	0.055	0.051	0.034	0.032	0.032
Antepartum haemorrhage [4]	0.148	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Low birthweight	0.143	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SIDS	0.183	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fire injuries	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230
Asthma (under 15 years)	0.021	0.021	0.021	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Macular degeneration	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.249	0.231	0.239	0.197	0.145	0.133	0.086	0.082	0.082
Otitis media	0.084	0.084	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lung cancer (passive)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.001
Ischaemic heart disease (passive)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.001	0.001	0.001	0.000	0.001	0.002	0.002	0.001	0.004	0.004

Notes: 1. AF derived from RR in Ridolfo and method outlined in ABOD report. 2. AF same as COPD in ABOD report. 3. AF same as IHD in ABOD report. 4. AF from Ridolfo.

Table 64, Age-specific aetiologic fractions for tobacco-caused deaths, females

Females	< 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Oropharyngeal cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.289	0.439	0.401	0.503	0.452	0.533	0.556	0.549	0.549
Oesophageal cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.256	0.399	0.362	0.462	0.412	0.492	0.515	0.508	0.508
Stomach cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.045	0.083	0.072	0.105	0.087	0.117	0.000	0.000	0.000
Pancreatic cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.159	0.139	0.197	0.167	0.217	0.233	0.228	0.228
Laryngeal cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.426	0.588	0.550	0.649	0.601	0.676	0.696	0.689	0.689
Lung cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.437	0.563	0.668	0.703	0.787	0.781	0.795	0.804	0.735	0.735
Cervical cancer [1]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.079	0.142	0.124	0.176	0.148	0.194	0.209	0.204	0.204
Endometrial cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.116	-0.097	-0.155	-0.123	-0.178	-0.199	-0.192	-0.192
Bladder cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.164	0.275	0.245	0.329	0.286	0.356	0.378	0.371	0.371
Kidney cancer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.253	0.395	0.358	0.458	0.408	0.488	0.511	0.503	0.503
Ischaemic heart disease	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.326	0.339	0.275	0.286	0.232	0.235	0.048	0.069	0.041	0.012	0.012
Chronic obstructive pulmonary disease	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.501	0.660	0.624	0.715	0.672	0.739	0.756	0.751	0.751
Tobacco abuse	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Parkinson's disease	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.112	-0.120	-0.086	-0.091	-0.067	-0.068	-0.034	-0.051	-0.029	-0.008	-0.008
Pulmonary circulation disease [2]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.501	0.660	0.624	0.715	0.672	0.739	0.756	0.751	0.751
Cardiac dysrhythmias [3]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.326	0.339	0.275	0.286	0.232	0.235	0.048	0.069	0.041	0.012	0.012
Heart failure [3]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.326	0.339	0.275	0.286	0.232	0.235	0.048	0.069	0.041	0.012	0.012
Stroke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.333	0.346	0.281	0.291	0.238	0.240	0.048	0.068	0.041	0.012	0.012
Peripheral vascular disease	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.266	0.277	0.221	0.230	0.185	0.187	0.106	0.147	0.091	0.028	0.028
Lower respiratory tract infection	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.099	0.105	0.080	0.084	0.065	0.065	0.035	0.050	0.030	0.009	0.009
Crohn's disease	0.070	0.000	0.000	0.000	0.159	0.373	0.376	0.363	0.348	0.361	0.295	0.306	0.250	0.253	0.149	0.203	0.129	0.041	0.041
Ulcerative colitis	0.070	0.000	0.000	0.000	0.127	0.266	0.267	0.261	0.253	0.260	0.222	0.228	0.193	0.194	0.119	0.159	0.104	0.034	0.034
Antepartum haemorrhage [4]	0.148	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Low birthweight	0.143	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SIDS	0.183	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fire injuries	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230
Asthma (under 15 years)	0.021	0.021	0.021	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Macular degeneration	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.199	0.208	0.166	0.167	0.094	0.131	0.081	0.025	0.025
Otitis media	0.081	0.093	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lung cancer (passive)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.004	0.003	0.005	0.004	0.005	0.005	0.003	0.002	0.004	0.004
Ischaemic heart disease (passive)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.011	0.008	0.006	0.001	0.008	0.008	0.001	0.007	0.004	0.006	0.006

Notes: 1. AF derived from RR in Ridolfo and method outlined in ABOD report. 2. AF same as COPD in ABOD report. 3. AF same as IHD in ABOD report. 4. AF from Ridolfo.

Table 65, Age-specific aetiologic fractions for illicit drug-caused deaths, males

Females	< 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Opiate dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Opiate abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Opiate poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Accidental opiate poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Cannabis dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Cannabis abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Amphetamine dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Amphetamine abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Cocaine dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Cocaine abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Psychostimulant poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Accidental poison by psychostimulants	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hallucinogen dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hallucinogen abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hallucinogen poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Other psychotropic drug poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Accidental poisoning by hallucinogens	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Anabolic steroid poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hepatitis B	0.000	0.000	0.000	0.000	0.523	0.523	0.523	0.523	0.523	0.523	0.523	0.523	0.523	0.523	0.523	0.523	0.523	0.523	0.523
Hepatitis C	0.000	0.000	0.000	0.000	0.886	0.886	0.886	0.886	0.886	0.886	0.886	0.886	0.886	0.886	0.886	0.886	0.886	0.886	0.886
HIV/AIDS	0.000	0.000	0.000	0.000	0.370	0.370	0.000	0.370	0.333	0.667	0.370	0.370	0.370	0.370	0.370	0.370	0.370	0.370	0.370
Infective endocarditis	0.000	0.000	0.000	0.000	0.140	0.140	0.140	0.140	0.140	0.140	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Drug psychoses	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Maternal drug dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Newborn drug toxicity	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Antepartum haemorrhage	0.000	0.000	0.000	0.000	0.045	0.071	0.054	0.044	0.026	0.017	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Low birthweight	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Road injuries	0.000	0.000	0.000	0.000	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Suicide	0.000	0.000	0.000	0.000	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Schizophrenia	0.000	0.000	0.000	0.000	0.036	0.034	0.056	0.039	0.034	0.019	0.009	0.007	0.001	0.000	0.001	0.000	0.000	0.000	0.000
Licit/unspecified/combined	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 66, Age-specific aetiologic fractions for illicit drug-caused deaths, females

Males	< 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Opiate dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Opiate abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Opiate poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Accidental opiate poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Cannabis dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Cannabis abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Amphetamine dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Amphetamine abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Cocaine dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Cocaine abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Psychostimulant poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Accidental poison by psychostimulants	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hallucinogen dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hallucinogen abuse	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hallucinogen poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Other psychotropic drug poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Accidental (b) poisoning by hallucino-gens	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Anabolic steroid poisoning	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hepatitis B	0.000	0.000	0.000	0.000	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529
Hepatitis C	0.000	0.000	0.000	0.000	0.940	0.940	0.940	0.940	0.940	0.940	0.940	0.940	0.940	0.940	0.940	0.940	0.940	0.940	0.940
HIV/AIDS	0.000	0.000	0.000	0.000	0.076	0.076	0.000	0.000	0.059	0.083	0.200	0.125	0.000	0.000	0.000	0.000	0.076	0.076	0.076
Infective endocarditis	0.000	0.000	0.000	0.000	0.140	0.140	0.140	0.140	0.140	0.140	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Drug psychoses	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Maternal drug dependence	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Newborn drug toxicity	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Antepartum haemorrhage	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Low birthweight	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Road injuries	0.000	0.000	0.000	0.000	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Suicide	0.000	0.000	0.000	0.000	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Schizophrenia	0.000	0.000	0.000	0.000	0.031	0.095	0.101	0.081	0.087	0.055	0.043	0.016	0.003	0.004	0.000	0.000	0.000	0.000	0.000
Licit/unspecified/combined	0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 67, Age-specific aetiologic fractions for conditions where the AF for morbidity differed from the AF for deaths

Alcohol caused	Sex	< 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Stroke	M	0.000	0.000	0.000	0.000	0.098	0.221	0.234	0.217	0.063	0.053	0.039	0.051	0.049	0.058	0.043	0.047	0.004	0.001	0.001
	F	0.000	0.000	0.000	0.000	0.033	-0.106	-0.130	-0.134	-0.105	-0.097	-0.189	-0.203	-0.148	-0.147	-0.135	-0.124	-0.091	-0.093	-0.093
Fire, burns & scold	M	0.037	0.046	0.070	0.095	0.094	0.098	0.098	0.089	0.094	0.095	0.084	0.092	0.083	0.078	0.086	0.086	0.068	0.063	0.063
	F	0.040	0.045	0.059	0.061	0.068	0.070	0.067	0.074	0.062	0.067	0.077	0.071	0.066	0.069	0.062	0.064	0.062	0.057	0.057
Road injuries	M	0.246	0.246	0.246	0.246	0.205	0.327	0.327	0.240	0.240	0.240	0.240	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
	F	0.106	0.106	0.106	0.106	0.095	0.150	0.150	0.125	0.125	0.125	0.125	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Heart failure [1]	M	0.000	0.000	0.000	0.000	0.061	0.075	0.055	0.018	-0.036	-0.077	-0.089	-0.102	0.098	0.096	-0.090	-0.092	-0.075	-0.070	-0.070
	F	0.000	0.000	0.000	0.000	-0.038	-0.038	-0.054	-0.064	-0.028	-0.041	-0.024	-0.008	-0.020	-0.034	-0.019	-0.041	-0.052	-0.065	-0.065
Unspecified liver cirrhosis [1]	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	F	0.000	0.000	0.000	0.000	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
Occupational and machine injuries	M	0.000	0.000	0.000	0.000	0.200	0.218	0.217	0.231	0.218	0.214	0.210	0.206	0.208	0.205	0.159	0.157	0.157	0.154	0.152
	F	0.000	0.000	0.000	0.000	0.180	0.178	0.172	0.173	0.179	0.180	0.181	0.178	0.171	0.156	0.143	0.144	0.143	0.143	0.142

Tobacco caused	Sex	< 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Ulcerative colitis	M	0.000	0.000	0.000	0.000	-0.040	-0.140	-0.136	-0.142	-0.137	-0.116	-0.010	-0.090	-0.094	-0.072	-0.049	-0.044	-0.027	-0.025	-0.025
	F	0.000	0.000	0.000	0.000	-0.032	-0.107	-0.109	-0.102	-0.095	-0.101	-0.073	-0.077	-0.058	-0.058	-0.029	-0.043	-0.025	-0.007	-0.007

Illicit drug caused	Sex	< 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
HIV/AIDS	M	0.000	0.000	0.000	0.000	0.200	0.581	0.568	0.703	0.771	0.760	0.720	0.745	0.751	0.368	0.368	0.368	0.368	0.368	0.368
	F	0.000	0.000	0.000	0.000	0.000	0.000	0.083	0.150	0.432	0.333	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: 1. AF from Ridolfo

Footnotes to appendices

Appendix B

[1] Unlike DUMA which collects details on all charges and then creates a most serious offence profile, female DUCO only collected two charges. The DUCO estimates have used the Williams (2005) original estimates without any adjustments.

Appendix C

[2] http://www.health.gov.au/internet/wcms/publishing.nsf/Content/health-casemix-costing-fc_r8

[3] English D.R., Holman C.D.J., Milne E., Winter M.G., Hulse G.K., Codde J.P., Bower C.I., Corti B., de Klerk N., Knuiman M.W., Kurinczuk J.J., Lewin G.F., Ryan G.A. *The quantification of drug-caused morbidity and mortality in Australia,* 1995 edition, Commonwealth Dept of Human Services and Health, Canberra, 1995.

[4] Ridolfo B, Stevenson C. *The quantification of drug-caused mortality and morbidity in Australia, 1998*. AIHW Cat No. PHE 29, Canberra (Drug Statistics Series no. 7), 2001.

[5] Begg, S., Vos, T., Goss, J., Barker, B., Stevenson, C., Stanley, L., and Lopez, A. (2007), *The burden of disease and injury in Australia 2003*. PHE 82, Australian Institute of Health and Welfare.

[6] Australian Bureau of Statistics, 2001 National Health Survey, Catalogue: 4364.0, 2002.

[7] 2004 National Drug Strategy Household Survey, AIHW Cat No. PHE 66 (Drug Statistics Series No. 16), 2005,

[8] http://web.med.unsw.edu.au/nchecr/

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

[10] In the ABOD methodology, these conditions are viewed as drug-caused but grouped into a broader category of diseases and not shown separately; ICD-10 codes from Ridolfo.

[11] In the ABOD methodology, child abuse (aged < 15 years) is not included in the 'Assault' classification.

[12] Not viewed as a tobacco-caused disease in ABOD but included in this study due to evidence from the US Surgeon General's report; ICD-10 codes from Ridolfo.

[13] In the ABOD methodology, these conditions are viewed as drug-caused but grouped into a broader category of diseases and not shown separately; ICD-10 codes from Ridolfo.

[14] Added by ABOD based on evidence released since Ridolfo's report.

[15] ABOD does not attempt to identify the specific illicit drug and allocates all cases to heroin.

[16] Not included by ABOD; ICD-10 codes from Ridolfo.

[17] New from the ABOD report.