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The cost of drug-related hospital stays in Australia, 1999–2005

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Every effort has been made to ensure that the analysis of the data and the figures and tables presented in this report are accurate. It should be noted, that the respective State and Territory Health Departments have not verified the analysis.

LIST OF ABREVIATIONS

ACT	Australian Capital Territory
AF	Aetiological fraction
AIHW	Australian Institute of Health and Welfare
ALOS	Average length of stay
AR-DRG	Australian Refined – Diagnostic Related Group (referred to as DRG)
DRG	Diagnostic Related Group
EDRS	Ecstasy and Related Drugs Reporting System
HIV	Human Immunodeficiency Virus
ICD	International Classification of Disease (WHO coding system)
IDRS	Illicit Drug Reporting System
IDU	Injecting drug user
NHMD	National Hospital Morbidity Database
NIDIP	National Illicit Drug Indicators Project
NSP	Needle and Syringe Program
NSW	New South Wales
NT	Northern Territory
QLD	Queensland
SA	South Australia
TAS	Tasmania
US	United States (of America)
VIC	Victoria
WA	Western Australia
WHO	World Health Organisation

GLOSSARY

Additional diagnosis	Conditions or complaints which coexist either with the principal diagnosis or arise during the separation (episode of care).
Aetiological fraction	Used to estimate the proportion of each separation that was directly attributable to either an illicit drug or alcohol.
Amphetamine-related separation	A hospital separation where the principal diagnosis was amphetamine-related.
Australian Refined Diagnosis Related Group (AR-DRG)	An Australian system of Diagnosis Related Groups (DRGs). DRGs provide a clinically meaningful way of relating the number and type of patients treated in a hospital (that is, its casemix) to the resources required by the hospital. Each AR-DRG represents a class of patients with similar clinical conditions requiring similar hospital services. For a detailed description of casemix and DRGs see appendix.
Average length of stay (ALOS)	The average number of patient days for admitted patient episodes. Patients admitted and separated on the same day are allocated a length of stay of 1 day.
Cannabis-related separation	A hospital separation where the principal diagnosis was cannabis-related.
Casemix	The range and types of patients (the mix of cases) treated by a hospital or other health service. Casemix classifications (such as AR-DRGs) provide a way of describing and comparing hospitals and other services for management purposes.
Cocaine-related separation	A hospital separation where the principal diagnosis was cocaine-related.
Constant costs	Denotes that the "current prices" have been adjusted to reflect the prices of the reference year, 2004 – 05, using the health price index.

Cost weight	Represents the costliness of an AR-DRG relative to all other AR-DRGs such that the average cost weight for all separations is 1.00. A separation for an AR-DRG with a cost weight of 5.0 therefore, on average, costs 10 times as much as a separation with a cost weight of 0.5. There are separate cost weights for AR-DRGs in the public and private sectors, reflecting the differences in the range of costs in the different sectors. The cost weights used in this report correspond to the version of AR-DRGs for that particular year; for instance in 2004/05 the AR-DRG version 5.0 was used whereas in 2002/03 the AR-DRG version 4.2 was used.
Current costs	The expenditures for a particular year; these expenditures reflect changes in both price and volume as indicated by the AIHW each year in their Cost Weights Report.
Diagnosis Related Group (DRG)	See AR-DRG.
Drug-exposed separation	An episode of care in which any of the additional diagnoses is for opioids, amphetamine, cannabis or cocaine.
Drug-related separation	An episode of care in which the principal diagnosis was related to the use of opioids, amphetamine, cannabis or cocaine.
Health Price Index	A proportion of the Consumer Price Index (or measure of inflation/deflation) which includes all expenditure relating to health products and health services and evaluates the level at which these expenditures have increased or decreased each year.
Hospital separation	Refers to an episode of care for an admitted patient, which can be a total hospital stay (from admission to discharge, transfer or death), or a portion of a hospital stay beginning or ending in a change of type of care.

Opioid-related separation	A hospital separation where the principal diagnosis was opioid-related.
Principal diagnosis	The diagnosis established after study to be chiefly responsible for occasioning an episode of admitted patient care.

EXECUTIVE SUMMARY

Aims

This report examines total costs and costs trends over time for specific drug-related hospital separations in Australia from 1999/00 to 2004/05. The report presents data on the costs for people being treated in hospital for opioid-, amphetamine-, cannabis- and cocaine-related problems including the cost of separations which are considered to be "drug-caused" but not identified as so by the recorded ICD-10-AM codes.

Method

Hospital separation data from the National Hospital Morbidity Database (NHMD), coded according to the International Statistical Classification of Disease and Related Health Problems – 10th revision, Australian Modification (ICD-10-AM), were analysed for the period of 1999/00 to 2004/05. A patient's hospital stay is coded according to the conditions which are considered to be significant in terms of treatment and resources used. All separations are also allocated an Australian Refined – Diagnostic Related Group (DRG). Each DRG has a cost weight allocated which is a reflection of resource use within that DRG.

Separations with a drug-related (opioid, amphetamine, cannabis and cocaine) principal diagnosis and drug-related DRG were analysed. Appropriate DRG cost weights were applied. Both 'current' (at the time of separation) and 'constant' (adjusted for inflation to reflect prices of the reference year – 2004/05) are presented. Costs are reported separately for each drug class as well as the overall total and average cost per separation.

Costs were also calculated for hospital separations where the principal diagnosis was drug-related but the DRG into which the separation was classified was not necessarily drug-related (for instance, mechanical ventilation). Similarly, costs were also calculated for some separations which were considered to be "drug-caused" and estimated using established aetiological fractions. Average length of stay, cost by age group, and jurisdiction by drug type are provided.

Results

a) Overall costs

The main results for the overall costs include:

- The total current costs by DRG for separations with a drug-related principal diagnosis ranged from $30.2 million in 1999/00 to $35.7 million in 2004/05.
- Drug intoxication DRGs had the largest expenditure ($9.6 million in 2000/01 to $14.6 million in 2004/05).

- The total constant costs decreased from $41.3 million in 1999/00 to $33.6 million in 2002/03. The DRG with the most variability in cost over time was that for opioid use which peaked in 1999/00 at $15.4 million, and then more than halved to a cost of $6.8 million in 2003/04.
- Overall expenditures are greater among the 20–29 year age group (ranging from $13,130 in 1999/00 to $10,371 in 2003/04).
- QLD had the highest expenditure per 1000 population across all years (range $8,265 per 1000 population in 1999/00 to $6,604 in 2003/04). The second highest expenditures varied between SA, WA and NSW.

b) Opioids

The main results for opioid-related separations include:

- The total current costs for all opioid DRGs peaked in 1999/00 at $19.2 million.
- The total constant costs of opioid-related separations decreased considerably between 1999/00 ($26.6 million) and 2001/02 ($15.2 million).
- The DRG for opioid use was responsible for most of the costs, peaking at $15.4 million in 1999/00, then declining to $8 million in 2001/02.
- The cost per 1000 population was greatest among the 20–29 year age group, with decreasing costs recorded among this group between 1999/00 and 2004/05.
- New South Wales (NSW) had the highest expenditure per 1000 population for opioid-related separations across all years.

c) Amphetamines

The main results for amphetamine-related separations include:

- The 'drug intoxication' DRG consumed the most 'current cost' resources (47–60%).
- The 'constant costs' increased from $7.8 million in 1999/00 to a peak of $11.3 million in 2001/02, which appears to be driven by the drug intoxication DRG.
- The constant costs by age categories for amphetamine-related separations were greatest among the 20–29 year age group, ranging from $1507 per 1000 population in 1999/00 to $2013 in 2001/02.
- QLD and WA had the highest expenditure per 1000 population for amphetamine-related separations.

d) Cannabis

The main results for cannabis-related separations include:

- The overall current costs each year for cannabis-related separations ranged between $5.0 million and $8.4 million.
- Constant costs rose from $6.5 million in 1999/00 to $8.4 million in 2004/05 and was largely due to increases in drug intoxication DRG costs (from $3.7 million in 1999/00 to $5.8 million in 2001/02).
- The constant costs for cannabis-related separations were greatest among the 20 to 29 year age group; however, the second largest expenditure per 1000 population varied between the 10 to 19 year and the 30 to 39 year age groups.

- NSW, TAS and the NT had the highest expenditure on cannabis-related separations per 1000 population during the study period.

e) Cocaine

The main results for cocaine-related separations include:

- The total constant costs for cocaine-related separations increased from 1999/00 ($331,386) to a peak of $691,789 in 2004/05.
- The trend in the total constant costs for cocaine-related separations was driven largely by the other drug use DRG, which doubled between 1999/00 ($198,471) and 2001/02 ($400,840).

f) "Drug caused"

The main results for "drug caused" separations include:

- The overall current costs for "drug caused" separations increased, from $7.7 million in 1999/00 to $11.6 million in 2004/05.
- The total constant costs ranged between $10.0 million in 2000/01 and $11.6 million in 2004/05.
- Low birth-weight newborns was the most costly diagnosis, and increased by 18% from $4.7 million in 1999/00 to $5.5 million in 2004/05.
- Ante partum haemorrhage was one of the least expensive diagnoses over time however there was a proportional increase of approximately 30%, from $414,542 in 1999/00 to $544,731 in 2004/05.

g) Total costs and average cost per separation

- Opioid-related separations were responsible for most of the expenditure across all years.
- "Drug caused" separations contributed significantly to the total costs and were second only behind opioids.
- Cannabis-related per separation costs were the most expensive, ranging from $2,896 to $3,412.
- The average costs of "drug caused" separations were greater, particularly for pregnancy/neonatal (low birth-weight newborns and ante partum haemorrhage) separations, than those for the opioid-, amphetamine- and cocaine-related separations.

h) Average length of stay (ALOS)

The main results for ALOS include:

- The ALOS for opioid-related separations in the drug intoxication DRG was considerably shorter (up to 40%) than the national average.
- The ALOS observed for opioid-related separations in the opioid use DRG was generally longer than the national average (up to 55% longer).
- Similar patterns were also observed for the other drug classes.

Discussion

The current costs for drug-related separations increased from $30.2 million to $35.7 million for all drug-related separations, which is in contrast to the constant costs (which will be used for the remainder of this discussion). These costs actually decreased over time by $4.2 million. Costs were highest for opioid-related separations followed by amphetamine-, cannabis- and cocaine-related separations. The total constant costs, when drug-related and "drug caused" costs were combined, were greater than previous estimates (Collins et al., 2007).

The change in costs among opioid-related separations in 2001/02 is consistent with a considerable decrease in the number of separations seen at this time (Roxburgh and Degenhardt, 2006) and evidence of a marked reduction in the availability of heroin in Australia (Day et al., 2003). This study showed an increase in costs related to amphetamine, cannabis and cocaine separations in 2001/02. Research has suggested that as a result of the reduction in heroin availability, a number of users "switched" use to other drugs, such as methamphetamine (Degenhardt and Day, 2004, Topp et al., 2002, Australian Institute of Health and Welfare, 2005a). This may explain the increasing costs seen among the other drug classes at this time.

The total costs for the "drug caused" separations in this study ranged from approximately $10 to $11.6 million, which is less than the annual expenditure on opioid-related separations but greater than annual costs for amphetamine-, cannabis- and cocaine-related separations. Of the "drug caused" diagnoses, costs for separations for low birth-weight babies were considerably higher than any of the other principal diagnoses. The average cost per separation was also considerably greater for a number of "drug caused" diagnoses than the average costs for separations with a drug-related principal diagnoses. This was particularly the case with separations for low birth-weight newborns and infective endocarditis, despite these separations occurring much less frequently. Therefore, a reduction in these separations would have a considerable decrease on the associated costs.

Costs were highest among the 20-29 year age group across all four drug classes, which is not surprising given population surveys reporting high prevalence of use among this age group (Australian Institute of Health and Welfare, 2005a). Generally, the 30–39 year age group was the second most expensive per 1000 population across drug classes. Costs among the 10 to 19 year age group for cannabis-related separations, however, were higher than or equal to those for the 30 to 39 year age group. According to the 2004 National Drug Strategy Household Survey, although prevalence of cannabis use wasn't highest among 10 to 19 year olds, this group was more likely to report using a greater amount of cannabis per occasion of use (Australian Institute of Health and Welfare, 2005a).

Looking at jurisdictional differences, NSW had higher hospital costs per 1000 population for opioid- and cocaine-related separations compared to other jurisdictions. This is not surprising given that heroin and cocaine have historically been more readily available in NSW than other jurisdictions (Stafford et al., 2006a). The cost for amphetamine-related separations was highest in QLD and WA. Again, this result is not surprising given that

among injecting drug users in WA, amphetamines were reported to be the drug most often injected in the month prior to interview between 2000 and 2005. There have also been increases in the number of clandestine methamphetamine laboratories detected in QLD during this period (McKetin et al., 2005). The NT recorded the highest costs per 1000 population for cannabis-related separations which is also not surprising given that prevalence of cannabis use in the population is relatively higher in the NT than the other jurisdictions (Australian Institute of Health and Welfare, 2005b).

When drug-related and "drug caused" costs are combined, the costs estimates presented in this study are greater than previous estimates (Collins et al., 2007). However, these estimates are most likely to be conservative due to exclusion of other drugs and some principal diagnoses from analysis. In the most part, reducing presentations of these diagnoses could be avoided through effective early intervention and harm-reduction strategies, and therefore costs would be reduced. Future research needs to continue to monitor long-term trends in hospital costs for these drugs, as well as other drugs.

1. INTRODUCTION

The negative health effects of using illicit drugs are well documented (Barker et al., 2003, Hando et al., 1997, Kaye and Darke, 2000). Australia has several systems that are designed to monitor trends in illicit drug use and related harms. Some of these include the National Drug Strategy Household Survey (NDSHS) the National Illicit Drug Indicators Project (NIDIP), the Illicit Drug Reporting System (IDRS) and the Ecstasy and Related Drugs Reporting System (EDRS – formerly known as the PDI – Party Drug Initiative). Both the IDRS and the EDRS are designed to detect emerging drug trends among sentinel groups of regular drug users, and while they provide important data on use and related harms, they do not examine economic costs associated with these harms (Stafford et al., 2006a, Stafford et al., 2006b).

Although the economic costs of illicit drug use in Australia have been examined (Collins and Lapsley, 1991, Collins and Lapsley, 1996, Collins and Lapsley, 2002), the focus of these reports has been relatively broad, including crime, health-care costs, and productivity. Specific estimates have been made for the costs related to alcohol and tobacco use; however, estimates for illicit drug use have been made collectively, with no distinction between drug classes. Given the diversity in harms that may occur as a result of the use of different drug classes, it is not unreasonable to expect that costs of treatment of these harms may also differ across drug class.

The National Hospital Morbidity Database (NHMD) holds data on all separations from public and private hospitals in Australia. Detailed analyses of trends in drug-related hospital separations by drug type were conducted as part of the NIDIP (Roxburgh and Degenhardt, 2006), and findings showed that the numbers of opioid-related hospital separations were highest across the four drug types reported (opioids, amphetamines, cannabis and cocaine) during the eleven year period. Additional analysis of the relative cost of drug-related separations by drug type may provide important information about the economic burden of these separations on the health care system, as well as document any changes over time.

1.1. Aims

There have been one-off cost estimates related to illicit drug use overall (Collins and Lapsley, 1991, Ridolfo and Stevenson, 2001), as well as annual cost estimates of the alcohol and drug use and disorders, injuries and poisonings, mental disease and disorders which involve illicit drugs. However, there have been no studies carried out in Australia which have specifically investigated the direct economic impact of specific drug classes in hospital settings over time. Building on previous research (Roxburgh and Degenhardt, 2006), this study will examine the cost trends of all hospital separations where the principal diagnosis was related to (the use of) opioids, cannabis, cocaine and amphetamines. This study aims to do the following:

1) estimate the frequency of hospital separations where the principal diagnosis was related to (the use of) opioids, amphetamine, cannabis or cocaine;
2) using Diagnostic Related Group (DRG) cost weights, estimate the total costs (both "current and "constant") for all hospital separations where the principal diagnosis was related to (the use of) opioids, amphetamine, cannabis or cocaine;
3) compare the average length of stay (ALOS) for opioid-, amphetamine-, cannabis- and cocaine-related principal diagnoses by DRG with national estimates;
4) examine the costs per drug-related separation by age and jurisdiction;
5) estimate the number of "drug caused" principal diagnoses that have an applicable aetiological fraction and calculate their costs.

2. METHODS

2.1. Data

Data from the National Hospital Morbidity Database (NHMD) were analysed for the period of 1999/00 to 2004/05. This database is managed by the Australian Institute of Health and Welfare (AIHW), and is a collection of electronic confidentialised summary records of patient separations from public and private hospitals in Australia. Data for all hospital separations were supplied by all jurisdiction and territory health authorities with the exception of TAS which only supplied separations where either the principal or an additional diagnosis was drug-related. The primary data of interest for this study were separations where diagnoses related to opioids (heroin, methadone, morphine, opium, other opioids), amphetamine (amphetamine, methamphetamine, 'ecstasy'), cannabis or cocaine were recorded.

Each separation includes a principal diagnosis and up to thirty-one additional diagnoses. For a number of later years, up to 50 additional diagnoses were available for some states; however, for consistency the data extracted was limited to thirty-one additional diagnoses. Since 1999/00, both the principal and the additional diagnoses for each separation were coded according to the ICD-10-AM (National Centre for Classification in Health, 1998). Where each of the four drug types were recorded as the principal diagnosis, these separations are referred to in this report as opioid-related, amphetamine-related, cannabis-related and cocaine-related separations as appropriate.

2.2. Australian Refined – Diagnostic Related Group (AR-DRG)

In order to estimate the costs and trends of these costs over time among drug-related hospital separations, the cost weights associated with each Australian Refined – Diagnostic Related Group (AR-DRG) were used (referred to as DRGs from this point forward).

All hospital separations in the NHMD are allocated a DRG by a 'grouper' software that assigns each episode of care to the appropriate DRG. The system categorises separations into groups with similar primary conditions and similar usage of hospital resources, using variables such as the principal diagnosis, additional diagnoses (complications and co-morbidities), significant procedures, patient age, separation status, gender, length of stay, newborn's admission weight, use of mechanical ventilation, same day status and mental health legal status (Commonwealth Department of Health and Aging, 2002b).

Each DRG has a cost weight allocated to it and this cost weight reflects the resource use, on average, for one case in that particular DRG relative to the overall average of all separations from a given year. In order to calculate the cost for a case in a particular DRG, the case weight is multiplied by an overall average cost for all cases. It should be noted that cost weights for each DRG vary from year to year, as does the overall average cost for all cases.

Although there were changes over time within individual DRGs, there are four groups of DRGs which are assigned to separations that have a drug as a principal reason for their hospital stay. These include:

- drug intoxication and withdrawal;
- opioid use disorder and dependence;
- other drug use disorder and dependence; and
- poisoning/toxic effects of drugs and other substances.

Changes to the DRG classifications specific to this study occurred in 2003/04. "Opioid use disorder and dependence", previously one DRG, was divided into two DRGs, to reflect separations with and without complications. "Drug intoxication and withdrawal" was reduced from two DRGs to one (See Table 1 for a complete list of the DRGs and applicable DRG coding) (Commonwealth Department of Health and Aging, 2002b, Commonwealth Department of Health and Aging, 2002a)

DRGs do not distinguish between the various drug classes. Therefore, the principal diagnosis (opioids, cannabis, methamphetamine or cocaine) was used to classify the separations into specific drug classes. Although the two DRGs 'Other injuries, poisonings and toxic effects' contain a number of cases with a principal diagnosis of illicit drugs, they also included a number of other cases which involve poisonings due to prescription drugs and other substances. Given that the focus is on illicit drugs, these were excluded from our analyses.

There are also some instances when the principal diagnosis is related to opioids, amphetamine, cannabis or cocaine, but the existence of an additional diagnosis, such as requiring mechanical ventilation, or being a "para/quadriplegic" takes precedence in the allocation of DRGs. This occurs most often when the additional diagnosis results in considerable resource use. The DRGs assigned to these cases are different from those listed above for the illicit drugs and thus have different cases weights. These cases are included in the analysis and are classified in the tables and figures as 'Other' DRGs.

Preliminary analysis of the data found few separations where the person was over the age of 60 years and had a principal diagnosis that was related to illicit drugs. The only drug-related DRG which was age-dependent was DRG X62A – poisoning/toxic effects of drugs and other substances Age > 59 *or* with complications (*Poisoning 1*). Accordingly, all those over 59 years of age were excluded from this analysis. By excluding separations of persons over the age of 60 years from the analysis, the counts for poisoning DRGs were combined into one DRG of poisoning with or without complications. This was done for classification only and it is important to note that applicable DRG cost weights were applied to separations which fell into either poisoning 1 or 2.

Table 1 shows the mapping of the DRGs to the applicable drug-related principal diagnoses. This table indicates the principal diagnoses which are generally captured by each DRG and the applicable ICD-10-AM code to that diagnosis. It is of note that not all of the separations within the DRGs will be drug-related (particularly in the poisoning DRGs, for instance, the principal diagnosis is a result of poisoning by pesticides). Likewise, not all of the drug-related

principal diagnoses will be captured by the DRGs listed below; for instance, even though the principal diagnosis was drug-related, the DRG assigned to the separation may have been for a DRG where greater resources are considered to have been used, e.g. ventilation.

Table 1: Mapping between DRGs, applicable principal diagnoses and corresponding ICD-10-AM codes

DRG name and code	Principal Diagnosis	ICD-10-AM Codes included
1999/00–2002/03 **Drug Intoxication and Withdrawal** DRG Code V61A – with complications (*Drug Intoxication 1*) V61B – without complications (*Drug Iintoxication 2*) **2003/04–2004/05** **Drug Intoxication and Withdrawal** DRG Code: V61Z (*Drug Intoxication 1*)	Withdrawal state	F11.3 - opioids F12.3 - cannabis F14.3 - cocaine F15.3 - amphetamine
	Withdrawal state with delirium	F11.4 - opioids F12.4 - cannabis F14.4 - cocaine F15.4 - amphetamine
	Psychotic disorder	F11.5 - opioids F12.5 - cannabis F14.5 - cocaine F15.5 - amphetamine
	Amnesic syndrome	F11.6 - opioids F12.6 - cannabis F14.6 - cocaine F15.6 - amphetamine
	Residual and late on-set psychotic disorder	F11.7 - opioids F12.7 - cannabis F14.7 - cocaine F15.7 - amphetamine
	Other mental and behavioural disorder	F11.8 - opioids F12.8 - cannabis F14.8 - cocaine F15.8 - amphetamine
	Unspecified mental and behavioural disorder	F11.9 - opioids F12.9 - cannabis F14.9 - cocaine F15.9 - amphetamine

Table 1 continued

1999/00–2002/03 **Opioid Use Disorder and Dependence** DRG Code: V63Z (*Opioid Use 1*) **2003/04–2004/05** **Opioid Use Disorder and Dependence** DRG Code V63A – not left against medical advice (*Opioid Use 1*) V63B – left against medical advice (*Opioid Use 2*)	Mental and behavioural disorder due to opioid use	F11.0 - opioids
	Mental and behavioural disorder due to harmful opioid use	F11.1 - opioids
	Mental and behavioural disorder due to opioid use dependence syndrome	F11.2 - opioids
Other Drug Use Disorder and Dependence DRG Code: V64Z (*Other Drug Use*)	Intoxication	F12.0 - cannabis F14.0 - cocaine F15.0 - amphetamine
	Harmful use	F12.1 - cannabis F14.1 - cocaine F15.1 - amphetamine
	Dependence syndrome	F12.2 - cannabis F14.2 - cocaine F15.2 - amphetamine
Poisoning/Toxic effects of Drugs and Other Substances (overdose of these substances) DRG Code: X62A – with complications (*Poisoning 1*) X62B – without complications (*Poisoning 2*)	Opium	T40.0
	Heroin	T40.1
	Other opioids	T40.2
	Methadone	T40.3
	Other synthetic narcotics	T40.4
	Cocaine	T40.5
	Cannabis	T40.7
	Psychostimulants	T43.6

2.3. Aetiological fractions

In addition to those separations where the principal diagnosis was related to the use of an illicit drug, there were other separations where illicit drug use may have played a major factor in hospital resource use. In this situation aetiological fractions (AFs) are often used to estimate the proportion of each separation (and thus resource use) that was directly attributable the use of the illicit drug.

The use of AFs provides a mechanism for estimating the effects of a particular health risk factor on the mortality or hospital use of a given population. An AF, 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 illicit drug use). Also, an AF can be used to estimate the proportion of the disease in a specific population that would be eliminated in the absence of that particular risk factor (Ridolfo and Stevenson, 2001).

AFs are calculated by estimating relative risk. This is calculated by dividing the incidence of a disease occurring from a population of those exposed to the drug compared with those not exposed to the drug, and applying these relative risks to equations as outlined by English and colleagues.

There has been limited research into the estimation or calculation of AFs where an illicit drug is considered to be a risk factor for increasing the morbidity (or occurrence) of a disease. Estimations were first calculated by English et al. and then later revised for the use of heroin, cannabis, cocaine, amphetamine as well as intravenous drug use (Ridolfo and Stevenson, 2001), and these are used in this current study. Application of AFs can be for the general population, a population exposed to a specific risk factor, and gender and age groupings. Table 2 provides a list of existing AFs where illicit drugs are considered to be causal.

Table 2: Available aetiological fractions for illicit drugs

Principal Diagnosis	Drug Type	Aetiological Fraction (population)
HIV	IDU	0.007 (males) 0.667 (females)
AIDS	IDU	0.045 (males) 0.188 (females)
Ante partum haemorrhage	Opioids Cocaine	0.013 0.044
Low birth-weight newborns	Opioids Cocaine	0.022 0.031

Table 2 continued

Hep B	IDU	0.29 (males) 0.98 (IDU exposed)
	IDU	0.29 (females) 0.98 (IDU exposed)
Hep, non-A, non-B	IDU	0.42 (males) 0.98 (IDU exposed)
		0.42 (females) 0.98 (IDU exposed)
Infective endocarditis	IDU	0.14

(Source: Ridolfo and Stevenson, 2001)

An AF of less than one indicates that the particular medical condition has more than one cause. Occasionally these fractions can be negative, indicating that the drug in question has a protective effect against the medical condition. Therefore, calculation of the AF requires two essential pieces of information – the relative risk (measuring the causal relationship between exposure to the risk of the particular drug and the condition being studied) and prevalence (measuring the proportion of the relevant population engaging in the risky drug-using activity).

In this study, once the AFs were applied, and the frequency of "drug caused" cases identified, costs were then estimated for those separations. In order to calculate the costs associated with these principal diagnoses, the number of separations for each principal diagnosis was multiplied by the relevant AF. This estimated number of "drug caused" separations was then multiplied by the weight-adjusted cost for each DRG in each year. Any comparisons over time, such as comparing across jurisdictions/territories or between age categories, are made with the "constant" dollars and per 1000 of the population.

A number of issues arose during the estimation of the AF. The methodology used by English and colleagues, and Ridolfo and Stevenson, to calculate the relative risk for cocaine use among ante partum haemorrhage and low birth-weight newborns, is dependent upon risk ratios which were calculated from studies carried out in the Unites States (US). The estimate of relative risk used to calculate the AF for cocaine and ante partum haemorrhage was derived from eight US studies, and for cocaine and low birth-weight the relative risk used to calculate an AF was estimated from three US studies (Chasnoff et al., 1989, Dombrowski et al., 1991, Hadeed and Siegel, 1989, Handler et al., 1991, Keith et al., 1989, Kelley et al., 1991, Neerhof et al., 1989, Oro and Dixon, 1987, Petitti and Coleman, 1990).

The cocaine markets within the US and Australia are vastly different. The majority of cocaine production is limited to South America, particularly Columbia, Bolivia and Peru (United Nations Office on Drugs and Crime, 2006). Cocaine has been much more readily available in the US than it has in Australia, most likely due to the US proximity to the countries of production. The difference in the price of cocaine may also reflect the difference in its availability between the US (US$ 112.5 per gram) and Australia (US$ 208.2 per gram).

The AFs specifically estimated for cocaine were for ante partum haemorrhage and low birth-weight newborns. In the US an estimated 5.5% (n=885,000) of women aged between 18–25

years had recently used cocaine and a further 0.9% (n=145,000) had recently used 'crack' (Department of Health and Human Services, 2006). By comparison, in Australia 2.3% (n=31,000) of females aged between 20–29 years report recently having used cocaine (Australian Institute of Health and Welfare, 2005a).

Given these differences in the rates of use of cocaine among women of child-bearing ages and that it was predominately US literature used by English, and then Ridolfo, to construct the risk ratios and the AFs for cocaine, it was determined that the AFs were not considered to be accurate for this study. Therefore the AFs for cocaine were not used in this study.

AFs were also available for the principal diagnoses of HIV and AIDS. A preliminary analysis of the number of separations with a principal diagnosis of HIV or AIDS indicated a large increase in separations from 2002/03 in one jurisdiction only. This increase, however, was not concordant with the number of newly acquired cases of HIV for the time period, nor with the number of deaths following AIDS in that jurisdiction (National Centre in HIV Epidemiology and Clinical Research, 2006). Discussions with relevant personnel in the health department of that jurisdiction did not reveal a clear cause for the increase, and accordingly, HIV/AIDS cases were not included.

2.4. Average length of stay (ALOS)

In addition to the case weight, each AR-DRG has an accompanying average length of stay (ALOS) (Commonwealth Department of Health and Ageing, 2005). These ALOS reflect, in part, the hospital resources used in providing care. As noted above, the case weights and ALOS used in this study were the Public Hospital case weights, as Private Hospital case weights were not available for the complete period of analysis.

An ALOS for each DRG was calculated for separations where the principal diagnosis was drug-related (opioids, amphetamine, cannabis or cocaine) as well as for each drug class. This allows for comparisons between ALOS from the national case weight with those of the NHMD, and between drug classes.

2.5. Calculation of costs

Once the cost for each separation was estimated by multiplying the case weight by the average cost per case, the costs are presented in two ways. First using "current prices" which are the expenditures in a given year; these expenditures reflect changes in both price and volume. The second method which is referred to as "constant prices" denotes that the "current prices" have been adjusted to reflect the prices of the reference year, 2004–05 using the health price index (Australian Bureau of Statistics, 2006). This removes the effects of inflation, permitting expenditures from different years to be compared on an equal dollar-for-dollar basis (Australian Bureau of Statistics, 2006).

The current costs, followed by the constant costs, are first presented for all cases when the principal diagnosis is drug-related (opioids, amphetamine, cannabis and cocaine) as well as for all AF estimated "drug caused" cases. For all selected cases in the "drug caused" principal diagnoses, where the separation was deemed completely attributable to drug use (hepatitis B, hepatitis non-A non-B, infective endocarditis and ante partum haemorrhage), the total costs were included. However, for low birth-weight newborns, only a proportion of the costs which may be attributable to drug use are included. This partial estimate was obtained by subtracting the average costs for a normal weight newborn from the costs of low birth-weight newborns. Comparisons over time, such as comparing across jurisdictions or between age categories, are also made with the "constant" dollars and per 1000 population.

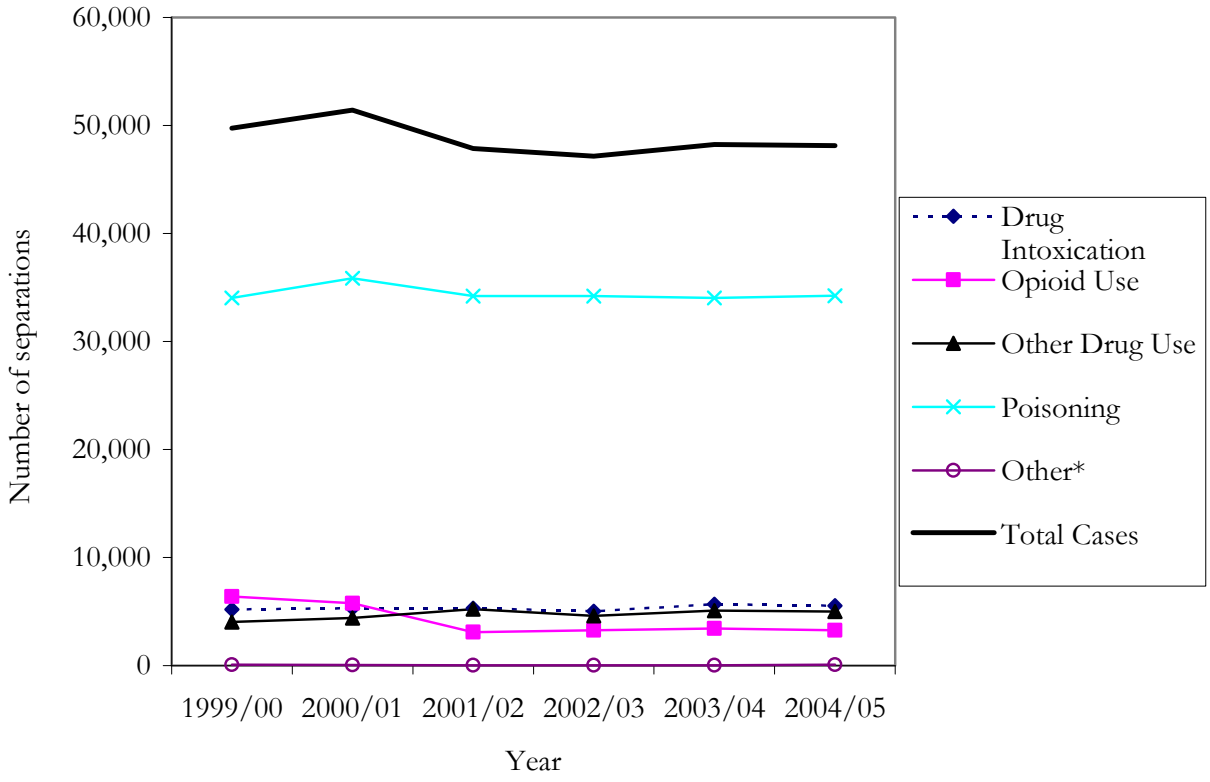
3. RESULTS

3.1. All cases in selected DRGs

3.1.1. Frequency of separations

Figure 1 presents data for all separations that fall into a drug-related DRG. This data also includes a large number of poisoning cases from prescription drugs and other toxic substances.

Figure 1: All drug-related separations by DRG among 0 to 59 year olds



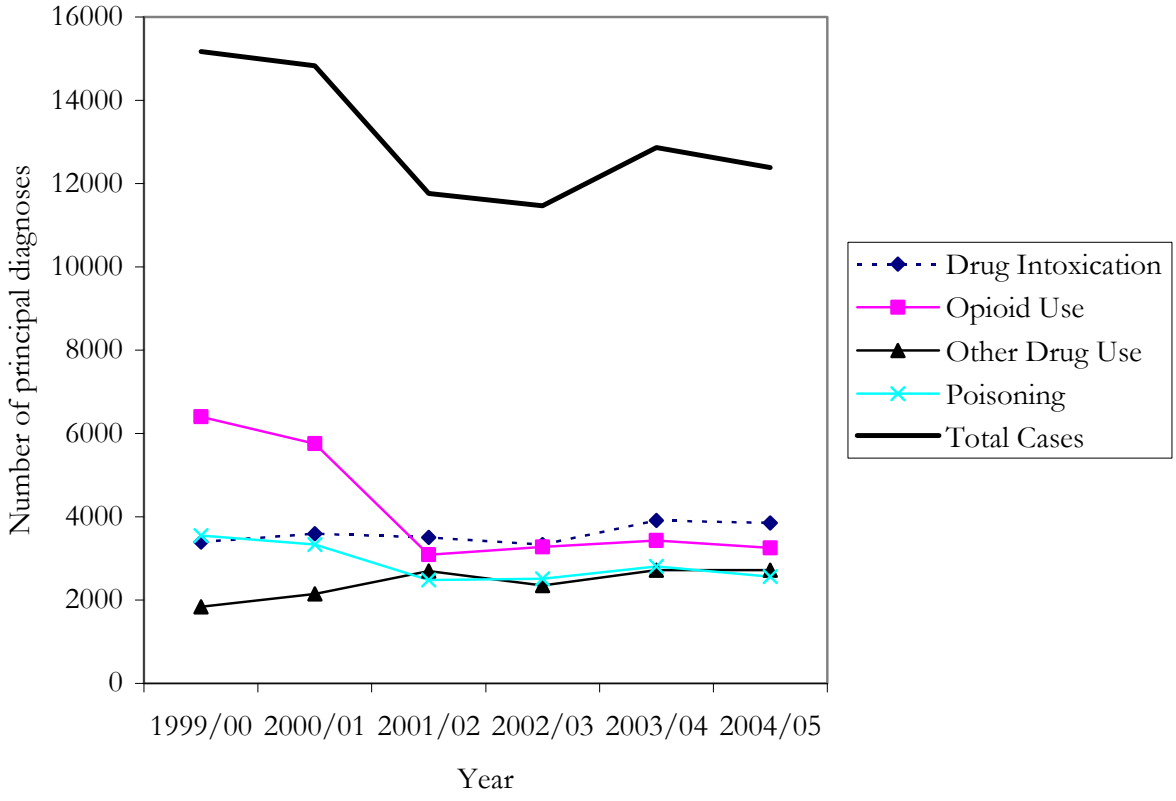
*'Other' is comprised of cases having a drug-related principal diagnosis, they also have a concurrent diagnosis which better reflects the resources used.

3.2. Total drug-related separations (opioids, amphetamine, cannabis and cocaine only)

3.2.1. Frequency of separations

As we were unable to ascertain the specific drug classes to which these poisonings related, we have limited all further analyses to four drug classes (opioids, amphetamine, cannabis or cocaine). The data for opioid-, amphetamine-, cocaine- and cannabis-related separations are shown in Figure 2. These data mirror trends previously reported (Roxburgh and Degenhardt, 2006), with a decline from 14,827 principal drug-related hospital separations in 2000/01 to 11,763 in 2001/02, and an apparent increase in 2003/04. The numbers differ somewhat to those of Roxburgh & Degenhardt, as the cases they used were ICD-defined compared to DRG-defined in this study. The age categories also differed – the previous study used 15–54 years whereas in this study, 0–60 years was used.

Figure 2: Frequency of drug-related separations by DRG among 0 to 59 year olds



3.2.2. Costs of drug-related separations by DRG

Descriptions of the current costs will include comparisons between DRGs within a drug category and between drugs (opioids, amphetamine, cannabis and cocaine). Comparisons will be made across years for constant costs. This same format will be used for each drug class.

3.2.2.1. **Current costs**

The total current costs by DRG for separations where the principal diagnosis was related to opioids, amphetamine, cannabis or cocaine ranged between $30.2 million in 1999/00 and $35.7 million in 2004/05. Examining the costs by DRG, it is clear from Figure 3 that apart from 1999/00, separations that fall into the drug intoxication DRGs have the largest expenditure ($14.6 million in 2004/05 to $9.6 million in 2000/01). This comprises up to approximately 45% of the costs per year (see Table 3). Separations in the opioid use DRG were responsible for the second largest amount of resources, ranging between $6.7 million in 2001/02 to $11.7 million in 1999/00. The cost of separations allocated to the poisoning DRG was the third largest for 1999/00 and 2000/01, and ranged from $3.7 million in 2001/02 to $5.4 million in 1999/00. Following 2001/02, the 'other drug use' DRG accounted for greater costs than poisonings. Despite the low percentage of total separations related to the 'other' DRG, they account for approximately 7% of the expenditure each year, reflecting the high resource intensity of these DRGs.

Figure 3: Current costs for drug-related separations ($AUS)

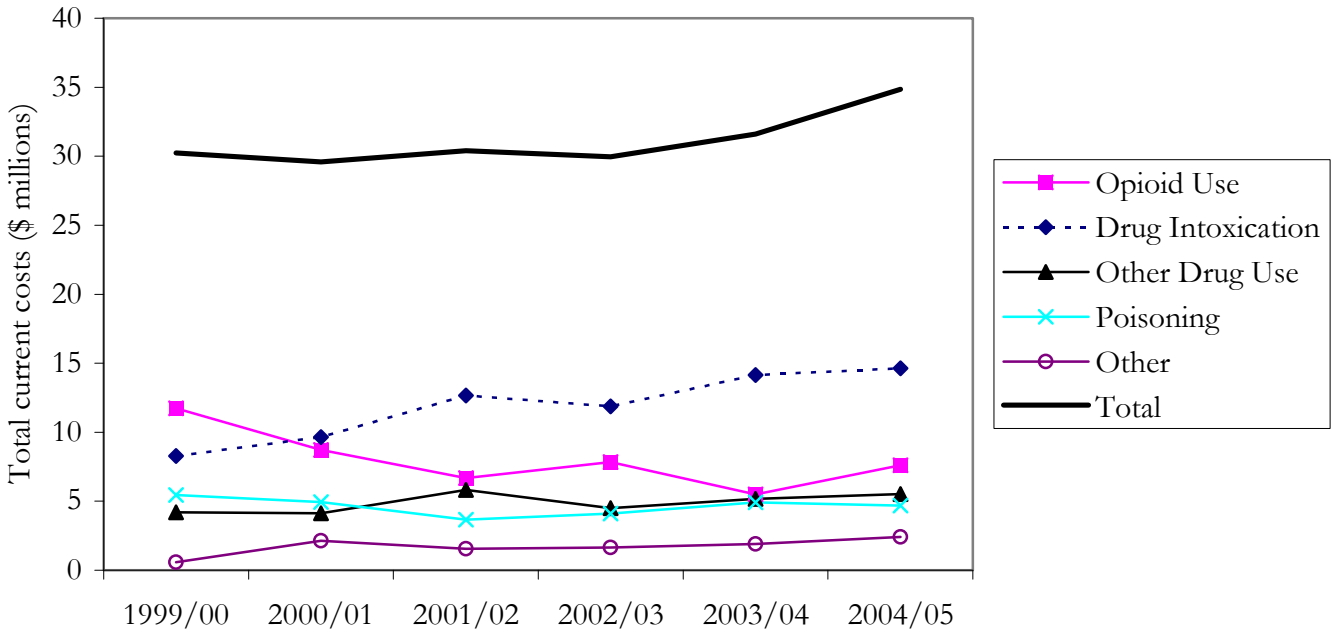


Table 3: Distribution of current costs by DRG (for all drug-related separations)

	Drug Intoxication (%)	Opioid Use (%)	Other Drug Use (%)	Poisoning (%)	Other (%)
1999/00	27.4	38.8	13.9	18.0	1.9
2000/01	32.6	29.5	14.0	16.7	7.3
2001/02	41.6	22.0	19.2	12.1	5.1
2002/03	39.6	26.1	15.0	13.7	5.5
2003/04	44.7	17.4	16.4	15.5	6.0
2004/05	42.0	21.8	15.8	13.5	6.9

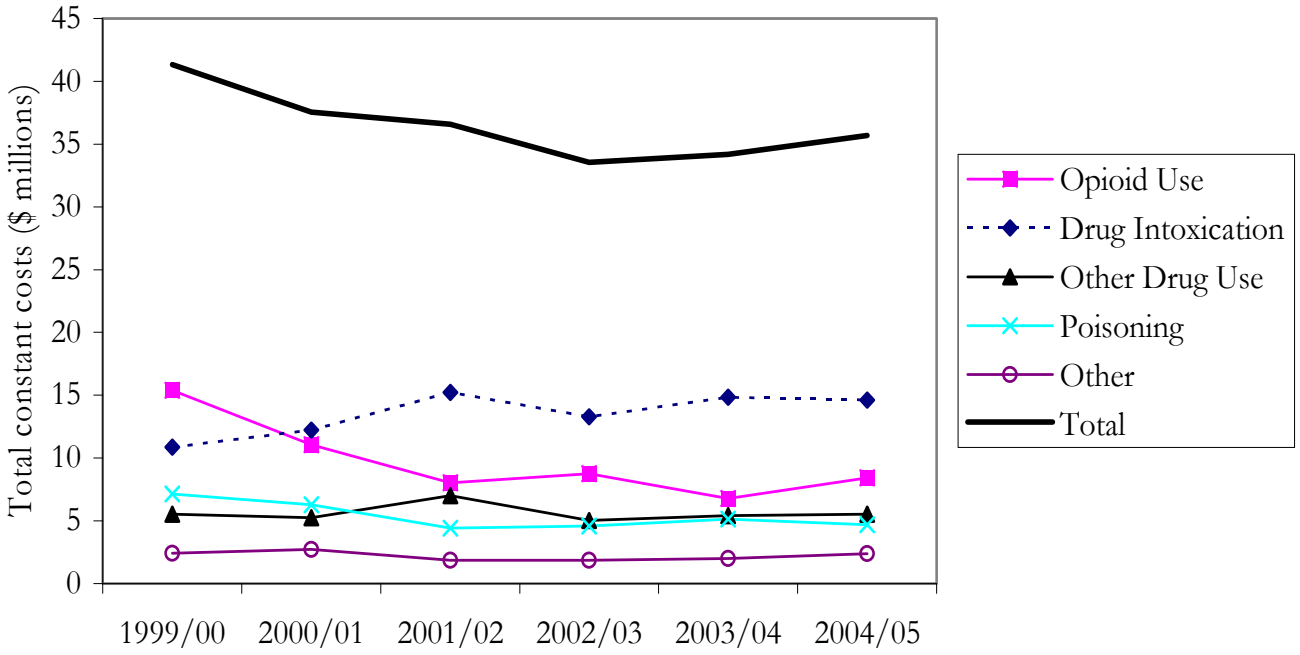
3.2.2.2. **Constant costs**

The total constant costs were calculated by adjusting the current costs by the health index with 2004/05 as the base year.

In contrast to the current costs, which steadily increased over time, the total constant costs decreased from $41.3 million in 1999/00 to $33.6 million in 2002/03, with a slight increase noted each year to 2004/05 ($35.7 million) (Figure 4). A similar trend was observed for the poisoning and the opioid use DRGs, whereas the costs for drug intoxication and other drug use DRGs remained relatively constant after peaking in 2001/02. The costs of 'other' DRGs remained stable across time.

The relative ordering of the DRGs for the constant costs remains similar to that of the current costs, with the drug intoxication DRG consuming the most resources ($15.2 million in 2001/02) in all years except 1999/00 ($15.4 million for opioid use). The DRG with the most variability in costs over time was that for opioid use. This cost peaked in 1999/00 at $15.4 million, and then more than halved to a cost of $6.8 million in 2003/04.

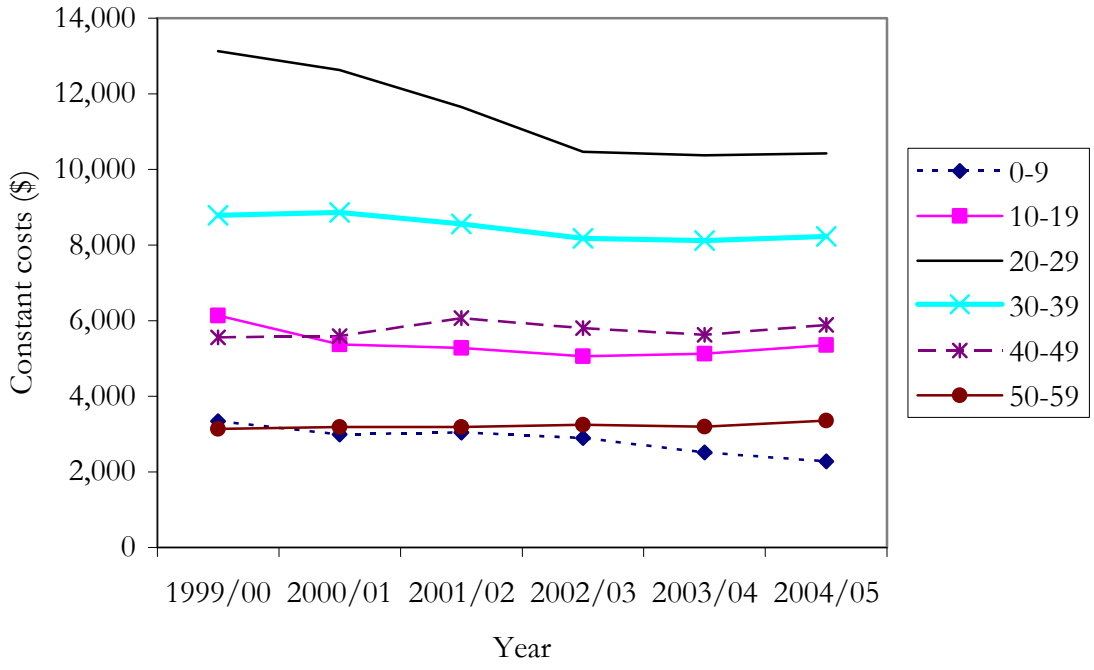
Figure 4: Constant costs for drug-related separations by DRG (standardised to 2005 costs, $AUS)



3.2.2.3. **Constant costs per 1000 population by age**

In constant dollars the costs per 1000 population for separations among the 20–29 year age group was greater than all other age groups, and followed the overall trend, with decreasing costs from $13,130 in 1999/00 to $10,371 in 2003/04. Otherwise, the costs per 1000 population for each year across the ten year age groups were relatively constant, with only slight variations. The 30–39 year age group was the second most costly group, ranging between $8,120 in 2003/04 to $8,867 per 1000 population in 2000/01 (Figure 5). The costs in the 0–9 year age group were most often recorded in the poisoning DRG with some decrease noted over time.

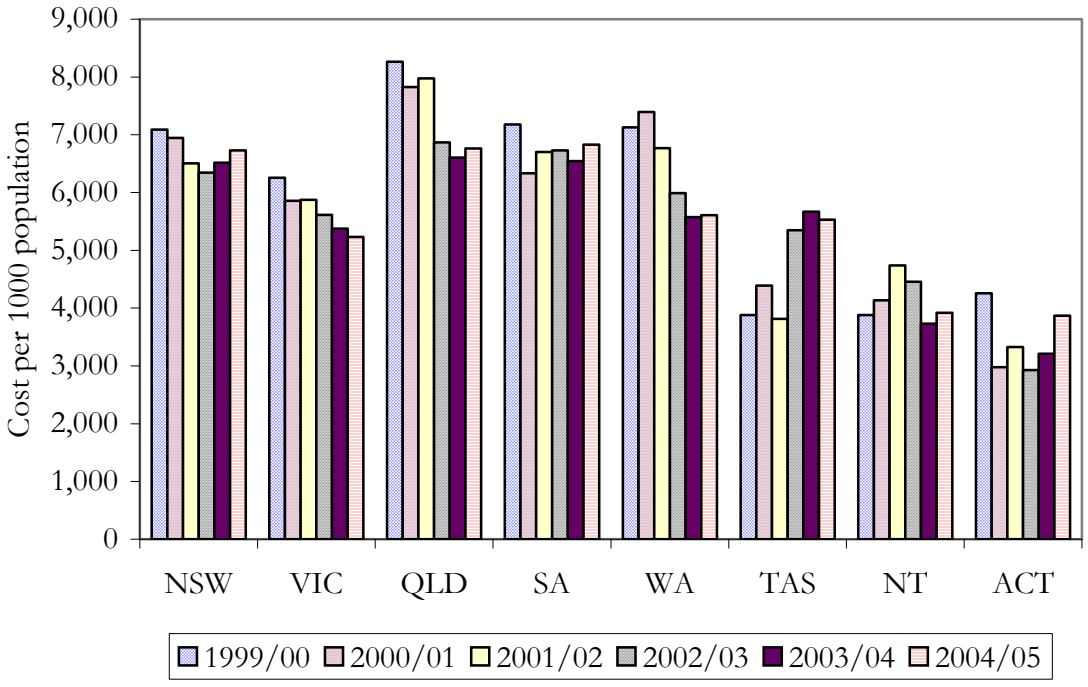
Figure 5: Constant costs per 1000 population for drug-related separations by 10 year age group (standardised to 2005 costs, $AUS)



3.2.2.4. **Constant costs across jurisdictions**

Following the national pattern, the trend in costs across most jurisdictions decreased over time. The exceptions to this trend were for TAS and the NT, two of the least populated jurisdictions, both of which had cost fluctuations. Increases in costs for TAS after 2001/02, however, may be due to an increase in the number of detoxification facilities supplying details to the NHMD at this time (Roxburgh and Degenhardt, 2006). QLD had the highest expenditure per 1000 population across all years, ranging between $6,604 in 2003/04 to $8,265 per 1000 population in 1999/00. Following QLD, the second highest expenditures varied from year to year between SA, WA and NSW. The NT and ACT tended to have the lowest expenditure per 1000 population, with the ACT recording the lowest expenditure ($2,976 per 1000 population in 2000/01).

Figure 6: Constant costs per 1000 population of drug-related separations by jurisdiction (standardised to 2005 costs, $AUS)



(Note: increasing costs after 2001/02 in TAS is most likely due to additional detoxification facilities in Tasmania supplying details to the NHMD at this time).

3.3. Opioid-related separations

3.3.1. Opioids: Separations by DRG

The number of separations where the principal diagnosis was opioid-related declined from 10,245 in 1999/00 to 5,373 in 2001/02, after which there was a slight increase (Figure 7).

Although it is evident that the 'opioid use' DRG accounts for a large proportion of the separations (Table 4; 62.5% in 1999/00 to 56.5% in 2004/05), it is also evident from Figure 7 that the decrease in the frequency of separations with the 'opioid use' DRG from 6,398 in 1999/00 to 3,090 in 2001/02 accounts for much of the overall decline in opioid-related separations.

Figure 7: Frequency of opioid-related separations by DRG

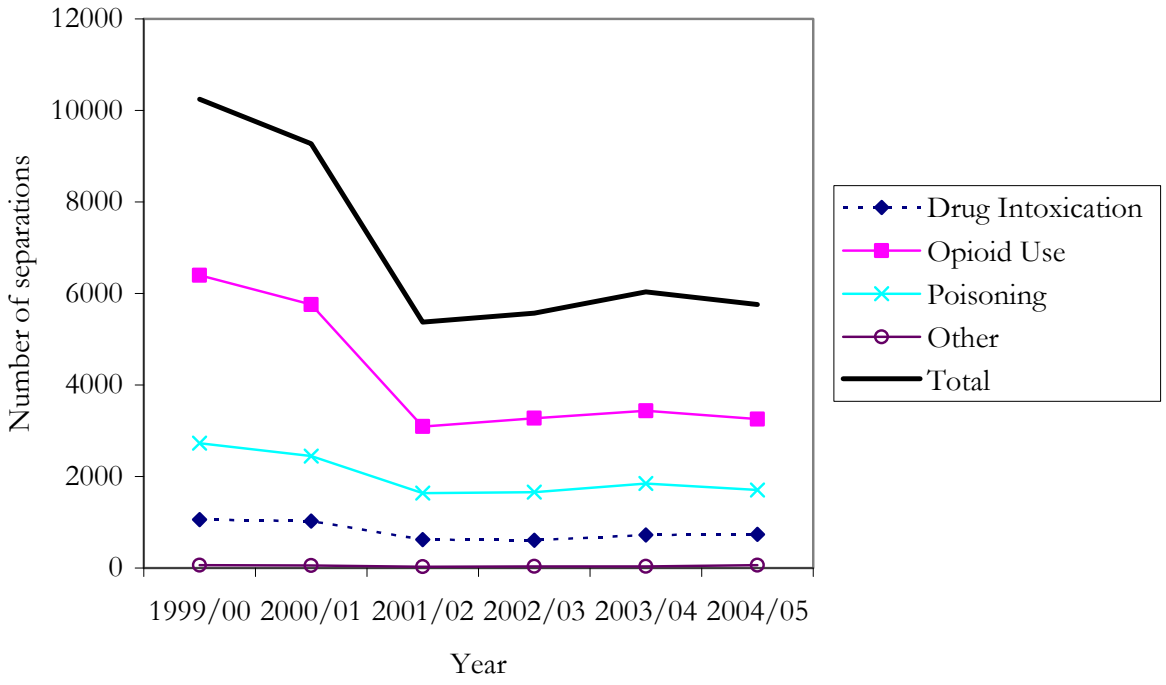


Table 4: Distribution of opioid-related separations by DRG

	Drug Intoxication (%)	Opioid Use (%)	Poisoning (%)	Other (%)
1999/00	10.3	62.5	26.6	0.6
2000/01	11.0	62.0	26.4	0.6
2001/02	11.5	57.5	30.4	0.6
2002/03	10.8	58.8	29.8	0.6
2003/04	11.9	56.9	30.6	0.6
2004/05	12.8	56.5	29.6	1.1

3.3.2. Opioids: Costs

3.3.2.1. **Opioids: Current costs**

The total current costs for opioid-related separations (Figure 8) follow a somewhat similar pattern as that of the separations. Costs for all opioid DRGs peaked in 1999/00 at $19.2 million (Figure 8). The total costs for the opioid use DRG were the highest, even though the costs decreased by almost half from $11.7 million in 1999/00 to $6.7 million in 2001/02. The poisoning DRG was second in expenditure among opioid-related separations.

Even though there was a substantial decrease in the constant costs between 1999/00 and 2004/05, the distribution of costs across DRGs remained relatively stable across all years, with opioid use accounting for approximately 50% and drug intoxication ranging between 12.9% in 1999/00 to 18.5% in 2003/04 (Table 5). It is worth noting that despite the low percentage of total separations related to the 'other' DRG (< 1%), they account for approximately 10% of the expenditures each year. This is due to the higher case weights due to costs, applied to DRGs such as ventilation following overdose.

Figure 8: Current costs for opioid-related separations by DRG ($AUS)

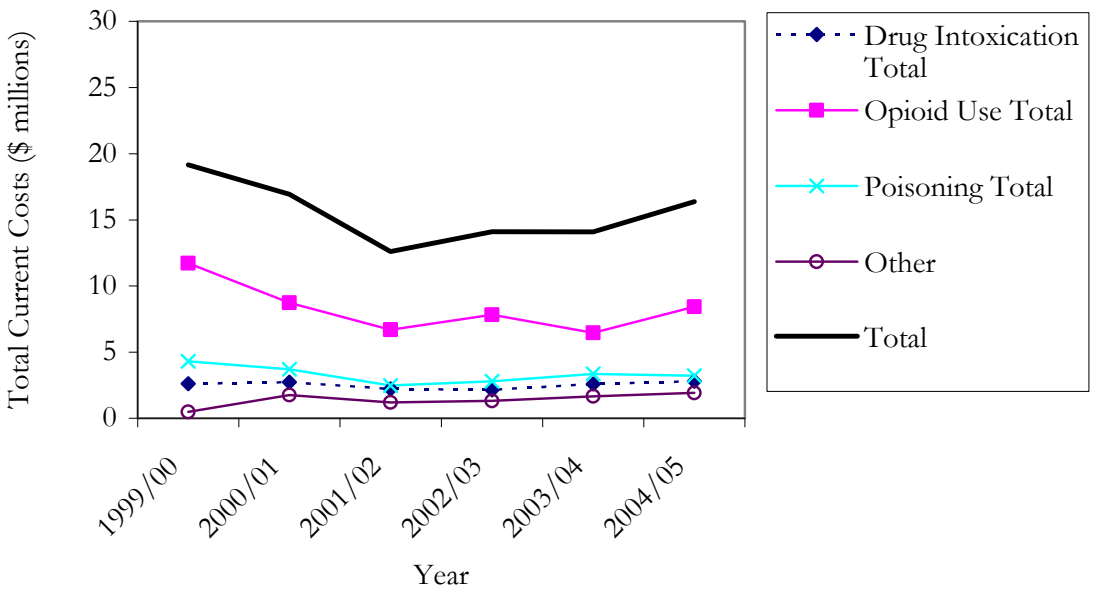


Table 5: Distribution of current costs for opioid-related separations by DRG

	Opioid Use (%)	Drug Intoxication (%)	Poisoning (%)	Other (%)
1999/00	57.8	12.9	21.2	8.1
2000/01	51.5	16.2	21.9	10.4
2001/02	53.1	17.7	19.7	9.5
2002/03	55.5	15.2	19.9	9.3
2003/04	45.9	18.5	23.9	11.8
2004/05	51.4	17.1	19.7	11.8

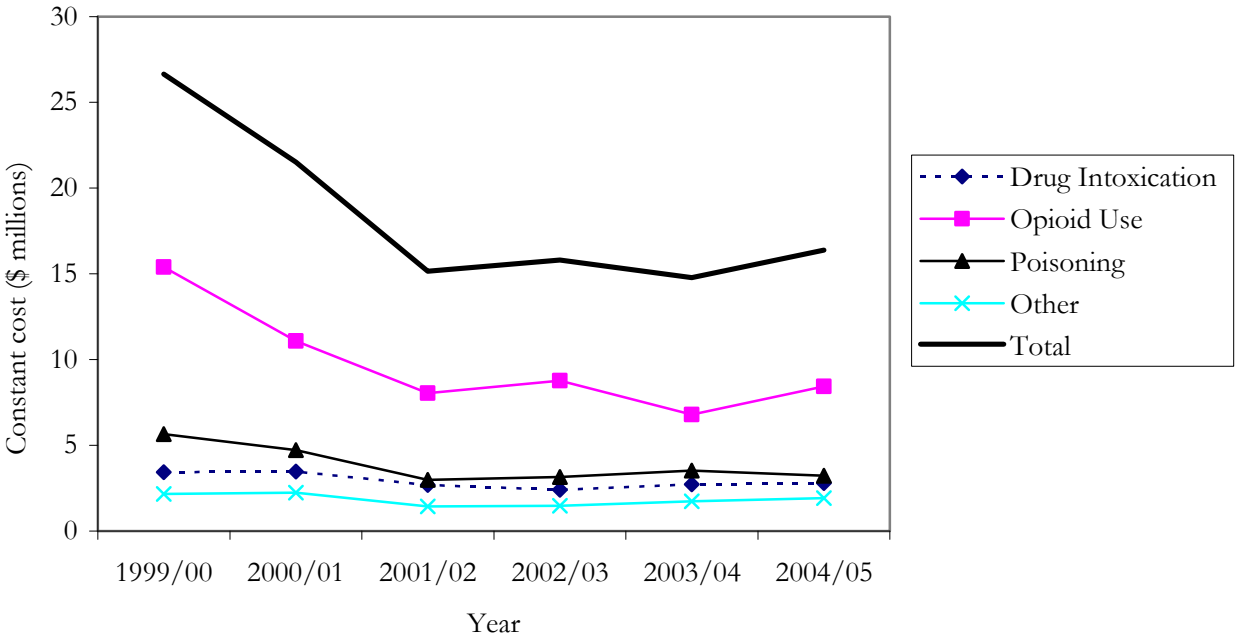
3.3.2.2. **Opioids: Constant costs**

The total constant costs of opioid-related separations decreased considerably between 1999/00 ($26.6 million) and 2001/02 ($15.2 million), reflecting the decrease in the number of separations that year. Costs were relatively stable until 2003/04, after which there appeared to be a slight increase (Figure 9).

The DRG for opioid use was responsible for most of the opioid-related separation costs. At its peak in 1999/00, the constant cost of opioid use was $15.4 million. This amount declined to $8.0 million in 2001/02. Following a similar trend was the poisoning DRG, second in total costs, which peaked in 1999/00 at $5.6 million and then decreased to approximately $3

million in 2001/02. There was a subsequent increase in expenditure for the poisoning DRG in 2003/04 to approximately $3.5 million. There was less variation across time for the drug intoxication DRG, which consumed the next largest amount of resources, with the two most costly years being 1999/00 ($3.4 million) and 2000/01 ($3.5 million).

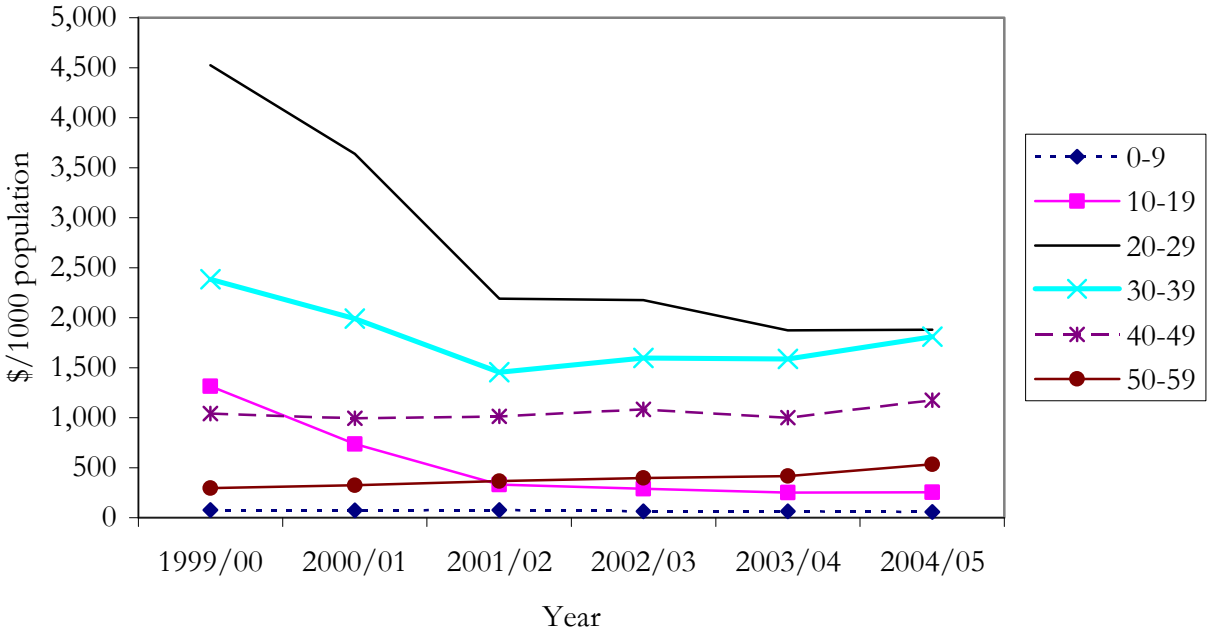
Figure 9: Constant costs for opioid-related separations by DRG (standardised to 2005 costs, $AUS)



3.3.2.3. **Opioids: Constant costs by age**

The cost per 1000 population was greatest among the 20–29 year age group. The pattern of costs among this group over time is a reflection of the overall costs, decreasing considerably between 1999/00 and 2001/02 and continuing to decrease up to 2004/05 (Figure 10). The 30–39 year age group was the second most costly, with costs decreasing between 1999/00 and 2001/02. Costs among this group, however, have subsequently increased. The cost per 1000 population among the 0–9, 40–49 and 50–59 age group remained relatively stable over time.

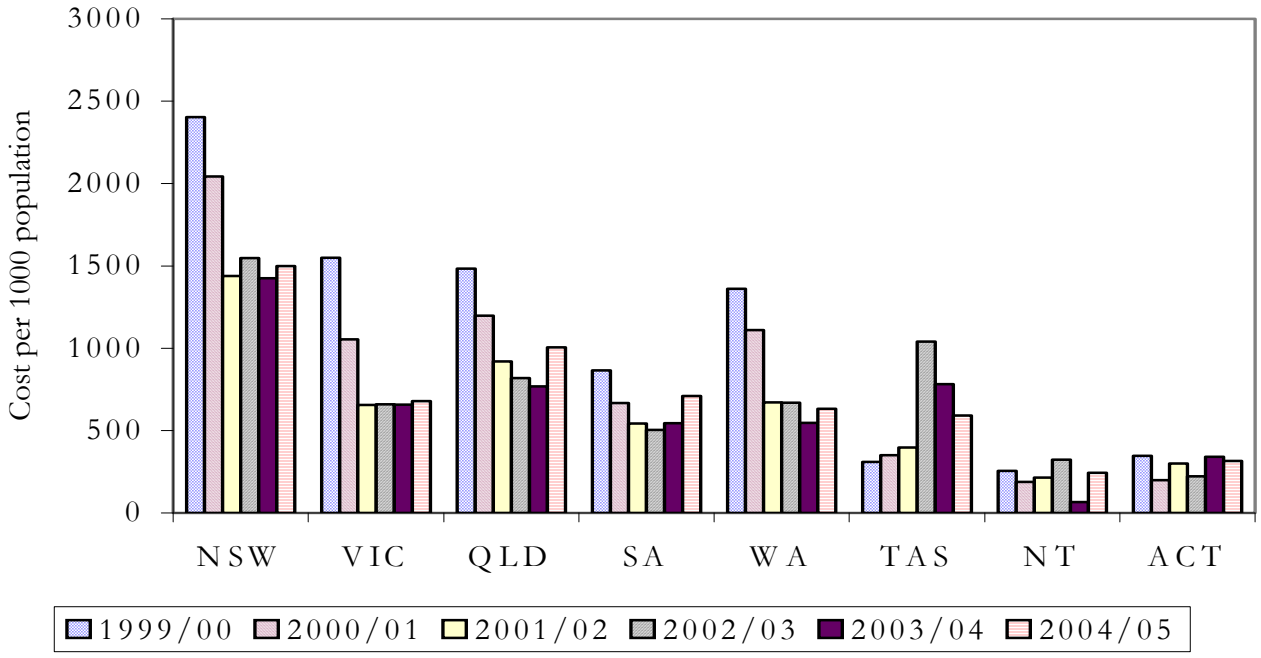
Figure 10: Constant costs per 1000 population for opioid-related separations by 10 year age group (standardised to 2005 costs, $AUS)



3.3.2.4. **Opioids: Constant costs by jurisdiction**

Consistent with data on opioid use patterns in Australia (Stafford et al., 2006a), NSW had the highest expenditure per 1000 population for opioid-related separations across all years (Figure 11). A decline in expenditure per 1000 population was evident in all jurisdictions with the exception of the three least populated states, NT, TAS and ACT, which were relatively low at the start. In most jurisdictions (NSW, VIC, QLD, SA and WA) there was a considerable decrease in cost observed in 2001/02, which corresponds to the overall decrease in separations that year. The costs per 1000 population in QLD, SA and WA decreased between 1999/00 and 2002/03, but have subsequently increased in 2004/05. The increase in costs after 2001/02 in TAS is most likely due to additional detoxification facilities in Tasmania supplying details to the NHMD at this time (Roxburgh and Degenhardt, 2006).

Figure 11: Constant costs per 1000 population for opioid-related separations by jurisdiction (standardised to 2005 costs, $AUS)



(Note: increasing costs after 2001/02 in TAS is most likely due to additional detoxification facilities in Tasmania supplying details to the NHMD at this time).

3.4. Amphetamine-related separations

3.4.1. Amphetamine: Separations by DRG

The number of amphetamine-related separations has increased from 2738 in 1999/00 to a peak of 4032 in 2003/04 (Figure 12). However, there are fewer amphetamine-related separations than for opioids. These trends have been discussed in detail elsewhere (Roxburgh and Degenhardt, 2006).

The most common DRG for amphetamine-related separations was drug intoxication (which includes diagnoses such as psychosis and withdrawal) (see Table 1), ranging from 42.6% of amphetamine-related separations in 1999/00 to 46.8% in 2004/05 (

Table 6). The next most common DRG among amphetamine-related separations was other drug use, which accounted for approximately 31% to 36%, followed by poisonings (accounting for 20– 25%). Similar to opioids, there were few amphetamine-related separations in the 'other' DRG.

Figure 12: Frequency of amphetamine-related separations by DRG

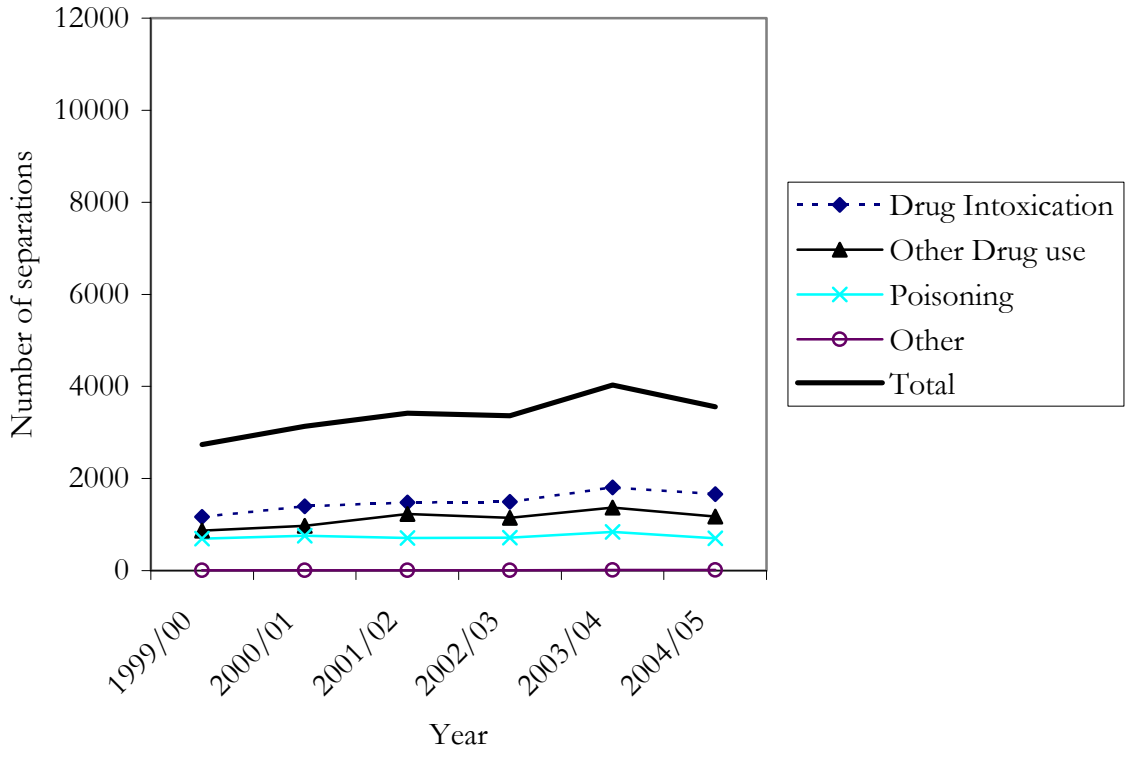


Table 6: Distribution of amphetamine-related separations by DRG

	Drug Intoxication (%)	Other Drug use (%)	Poisoning (%)	Other (%)
1999/00	42.6	31.7	25.4	0.3
2000/01	44.5	31.0	24.1	0.3
2001/02	43.2	35.9	20.7	0.2
2002/03	44.5	34.1	21.3	0.1
2003/04	44.9	34.0	20.8	0.3
2004/05	46.8	32.9	19.8	0.4

3.4.2. Amphetamine: Costs

3.4.2.1. **Amphetamine: Current costs**

The 'drug intoxication' DRG consumed the most resources (47–62%) among amphetamine-related separations. This is in contrast to opioids where the 'opioid use' DRG was the most costly. The drug intoxication DRG also consumed a higher percentage of the total costs related to these admissions. Costs associated with other drug use and poisoning DRGs among amphetamine-related separations declined over time. It is also of note that although only 0.4% of separations each year were accounted for by 'other' DRGs, the cost of these DRGs accounted for up to 4% of the overall cost.

Figure 13: Current costs for amphetamine-related separations by DRG ($AUS)

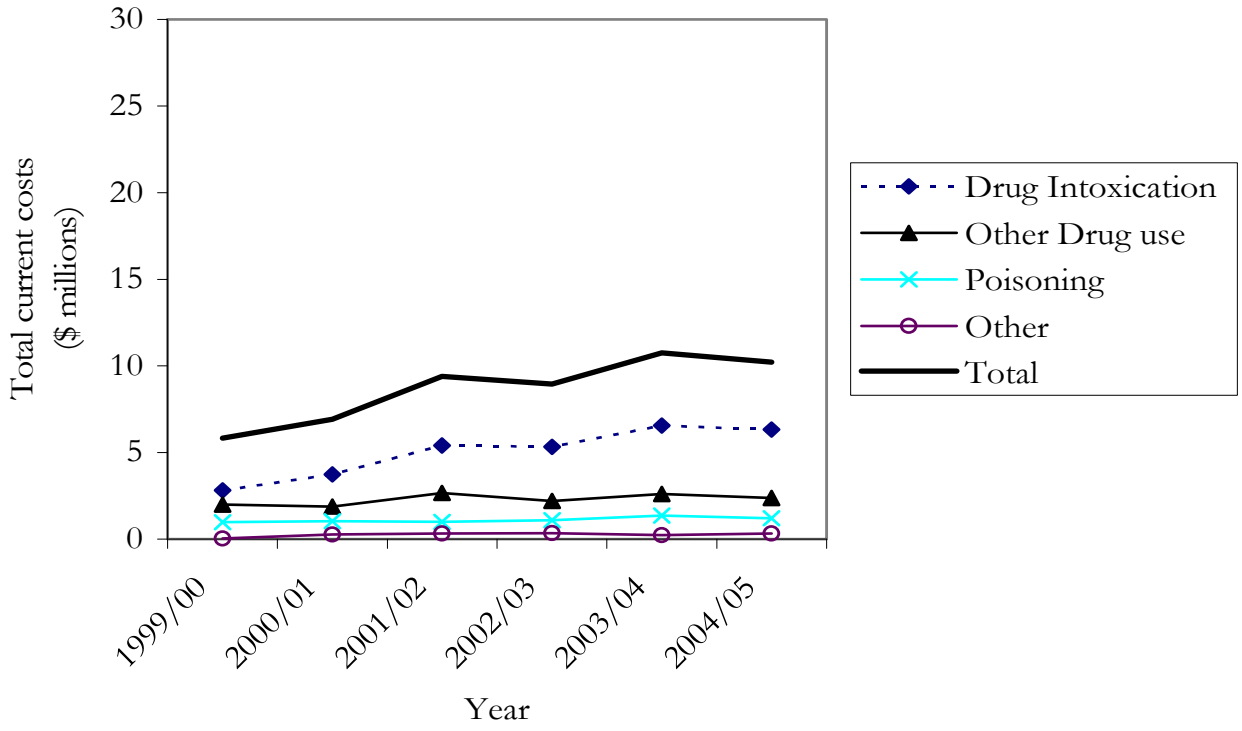


Table 7: Distribution of current costs for amphetamine-related separations by DRG

	Drug Intoxication (%)	Other Drug use (%)	Poisoning (%)	Other (%)
1999/00	47.3	33.4	16.3	3.0
2000/01	54.1	27.0	15.1	3.7
2001/02	57.5	28.3	10.7	3.5
2002/03	59.4	24.5	12.1	4.0
2003/04	60.9	24.2	12.7	2.1
2004/05	61.8	23.3	11.8	3.1

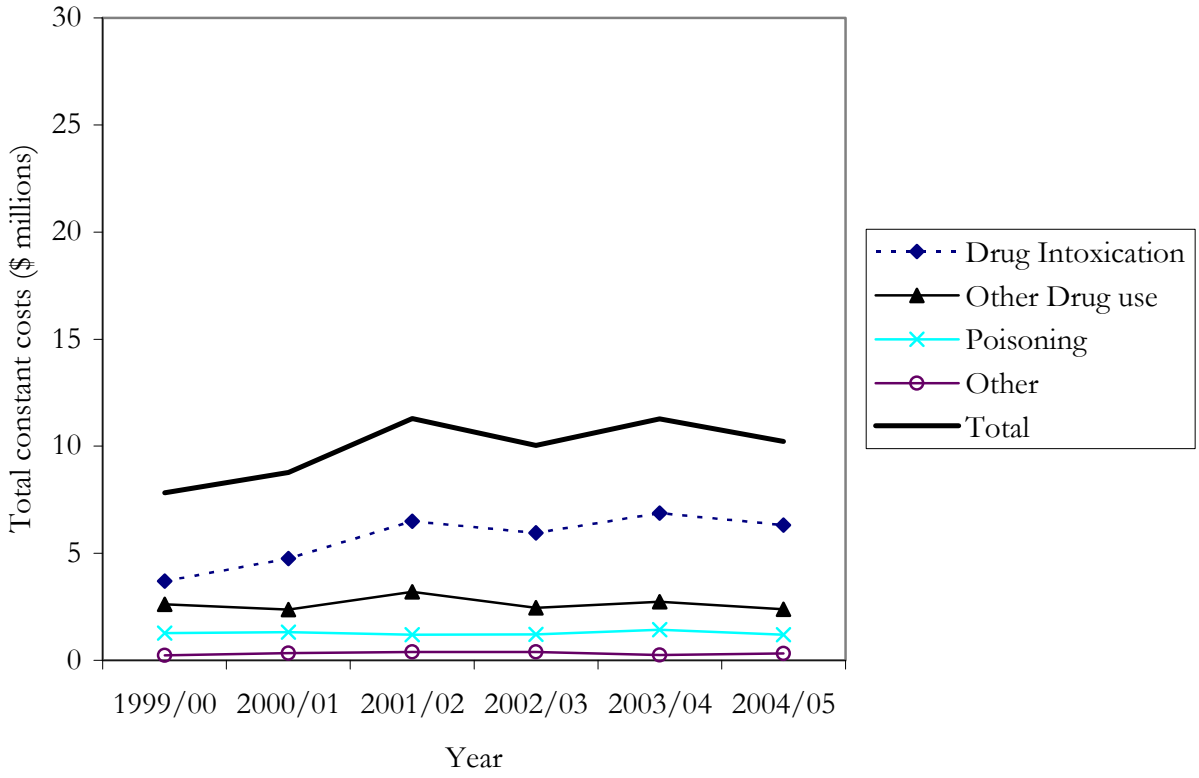
3.4.2.2. **Amphetamine: Constant costs**

Following adjustment for inflation and standardising to 2005 dollars, there was an overall increasing trend for the costs related to amphetamine-related separations (Figure 14). In contrast to the constant costs of opioids, which decreased from $26.6 million in 1999/00 to $15.2 million in 2001/02, the constant costs for amphetamine-related separations increased from $7.8 million in 1999/00 to a peak of $11.3 million in 2001/02.

The increase in the total constant costs appears to be driven by the drug intoxication DRG, which almost doubled between 1999/00 ($3.7 million) and 2003/04 ($6.9 million) (Figure 14). Across the period of 1999/00 to 2004/05, the constant costs for other drug use were the next most costly and peaked in 2001/02 ($3.2 million). The constant costs for poisoning remained relatively stable over time. Notably, in 1999/00, the costs of the poisoning DRG was approximately four times greater for opioid-related separations than for amphetamines, and approximately double for all other years.

The constant costs of the 'other' DRG was lower for amphetamine-related separations compared with opioid-related separations. As with opioids, there was a small proportion of amphetamine-related separations which were not allocated a drug-related DRG. The proportion of costs per year for the 'other' DRGs is considerably greater than the number of separations, indicating that the 'other' DRGs have relatively longer ALOS and more resources are consumed compared with the drug-related DRGs.

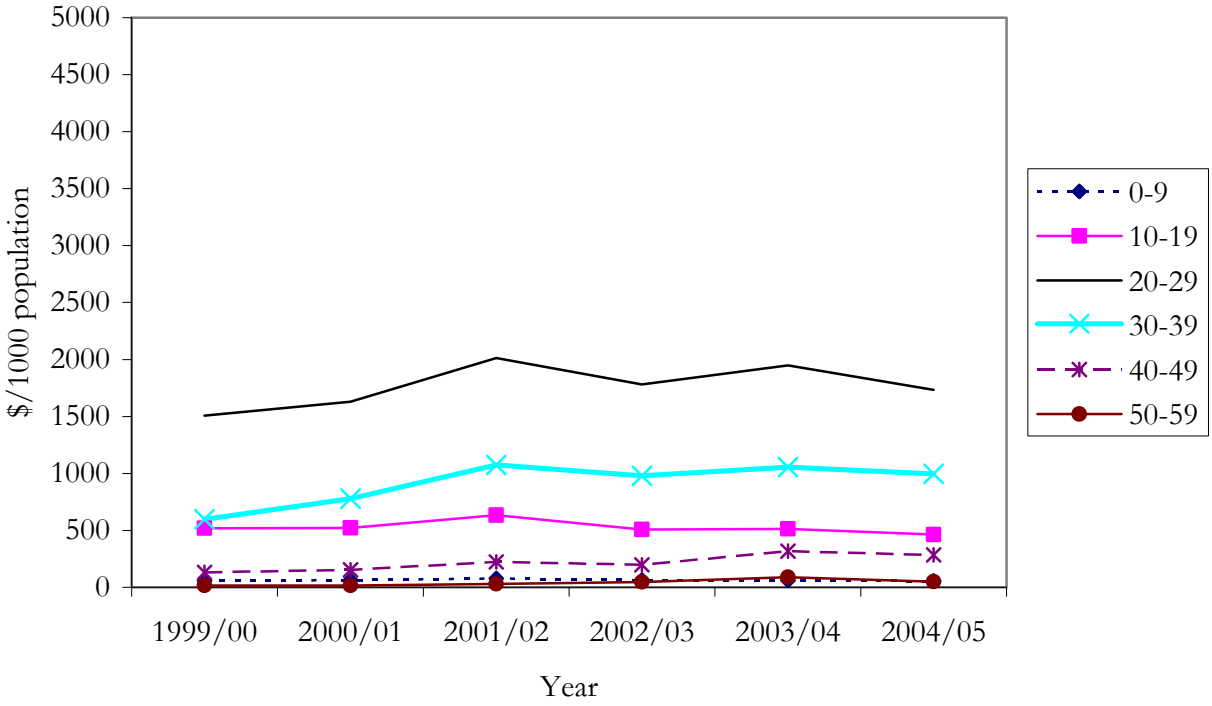
Figure 14: Constant costs for amphetamine-related separations by DRG (standardised to 2005 costs, $AUS)



3.4.2.3. **Amphetamine: Constant costs by age**

Similar to opioid-related separations, the constant costs by age categories for amphetamine-related separations (Figure 15) was greatest among the 20–29 year age group, ranging from $1507 per 1000 population in 1999/00 to $2013 in 2001/02. Notably, after 2001/02, the expenditure per 1000 population among amphetamine-related separations was similar to that for opioids among the 20–29 age group. Again, similar to opioids, the 30–39 year olds had the second largest expenditure per 1000 population.

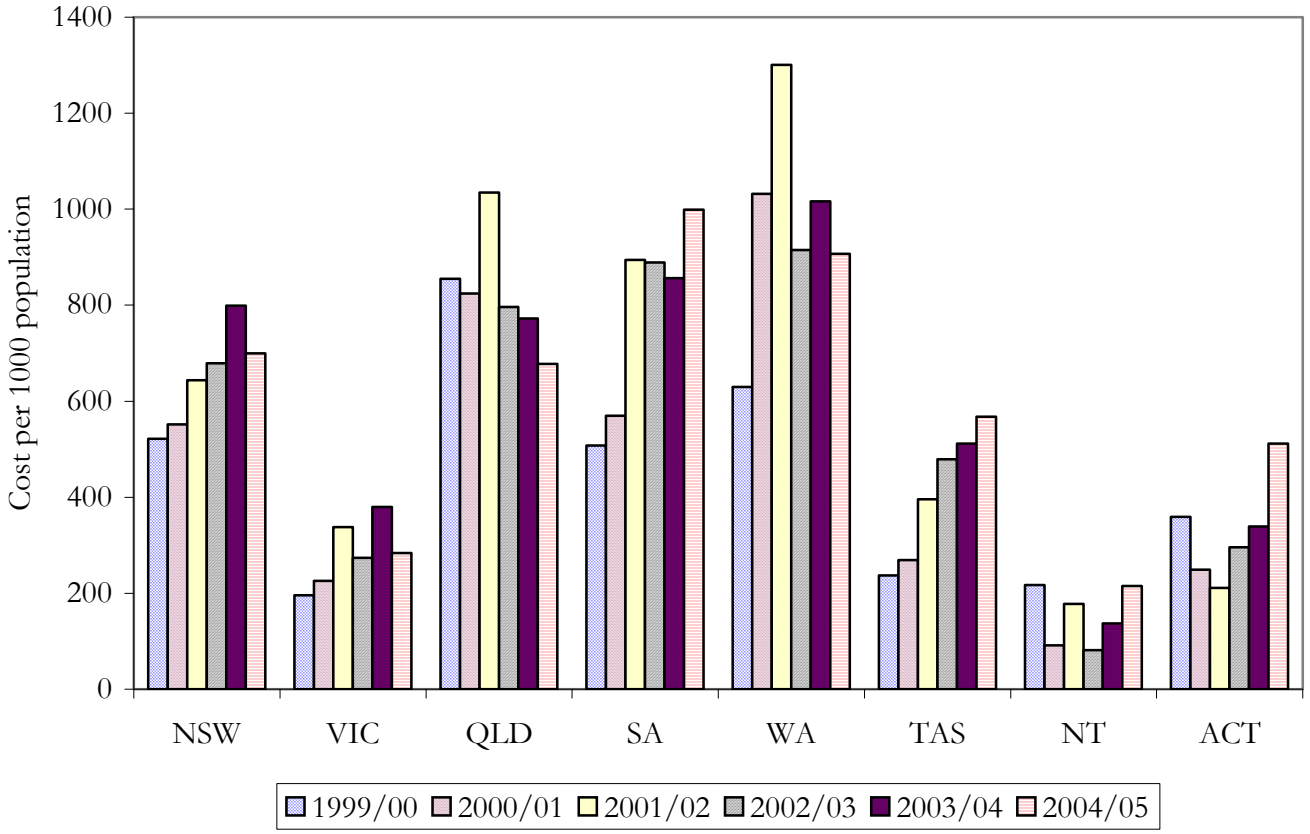
Figure 15: Constant costs per 1000 population for amphetamine-related separations by 10 year age group (standardised to 2005 costs, $AUS)



3.4.2.4. **Amphetamine: Constant costs by jurisdiction**

Among amphetamine-related separations, QLD and WA had the highest expenditure per 1000 population (Figure 16), in contrast to opioids where NSW expenditure was the highest. With the exception of QLD, there was a general trend of increasing costs per 1000 population over time for amphetamine-related separations. Overall, expenditure per 1000 population on amphetamine-related separations was lower in all jurisdictions when compared with expenditure on opioids (with the exception of SA and WA from 2001/02 onwards, when expenditure on amphetamines was greater).

Figure 16: Constant costs per 1000 population for amphetamine-related separations by jurisdiction (standardised to 2005 costs, $AUS)



(Note: increasing costs after 2001/02 in TAS is most likely due to additional detoxification facilities in Tasmania supplying details to the NHMD at this time).

3.5. Cannabis-related separations

3.5.1. Cannabis: Separations by DRG

Overall, the number of cannabis-related hospital separations increased from 2135 in 1999/00 to 2867 in 2004/05. However, these figures were lower than for opioids and amphetamine, and these results have been discussed elsewhere (Roxburgh and Degenhardt, 2006).

There was a small increase in the frequency of both the drug intoxication and other drug use DRGs (Figure 17). The drug intoxication DRG accounted for a slightly larger proportion (48% to 53%) of these separations, followed by the other drug use DRG (42% to 48%) (see Table 8). In contrast to opioid- and amphetamine-related separations, drug intoxication and other drug use accounted for more than 95% of all cannabis-related separations. The proportion of poisonings among cannabis-related separations was much lower than for opioid- and amphetamine-related separations.

Figure 17: Frequency of cannabis-related separations by DRG

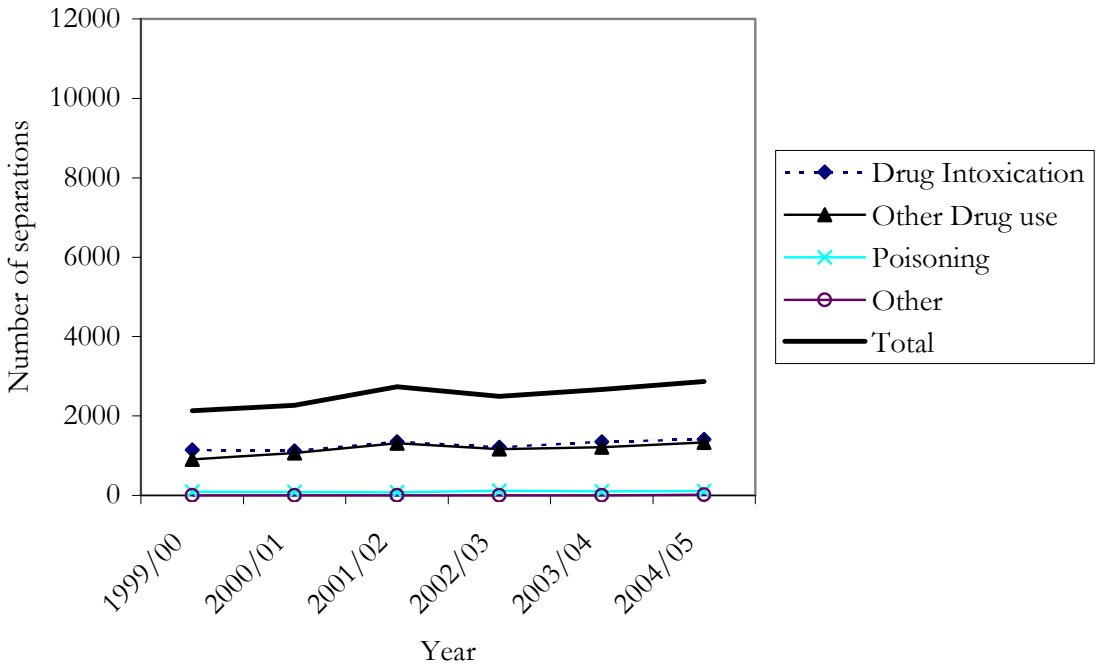


Table 8: Distribution of cannabis-related separations by DRG

	Drug Intoxication (%)	Other Drug use (%)	Poisoning (%)	Other (%)
1999/00	53.49	42.20	4.22	0.09
2000/01	49.38	47.00	3.57	0.04
2001/02	49.18	47.86	2.92	0.04
2002/03	48.49	46.93	4.58	0.00
2003/04	50.77	45.59	3.60	0.04
2004/05	49.18	46.53	3.66	0.63

3.5.2. Cannabis: Costs

3.5.2.1. **Cannabis: Current costs**

The overall current costs each year for cannabis-related separations were considerably less than those for opioid- and amphetamine-related separations. The DRG that consumed the most resources among cannabis-related separations was drug intoxication, followed by other drug use (Figure 18) which, combined, accounted for over 95% of the total costs during the period 1999/00 to 2004/05 (Table 9). Poisoning and 'other' DRGs had the lowest expenditures, and their costs remained fairly stable over time. This is in contrast to opioid- and amphetamine-related separations, where the distribution of costs was more evenly spread across the four DRGs.

Figure 18: Current costs for cannabis-related separations by DRG (in $AUS)

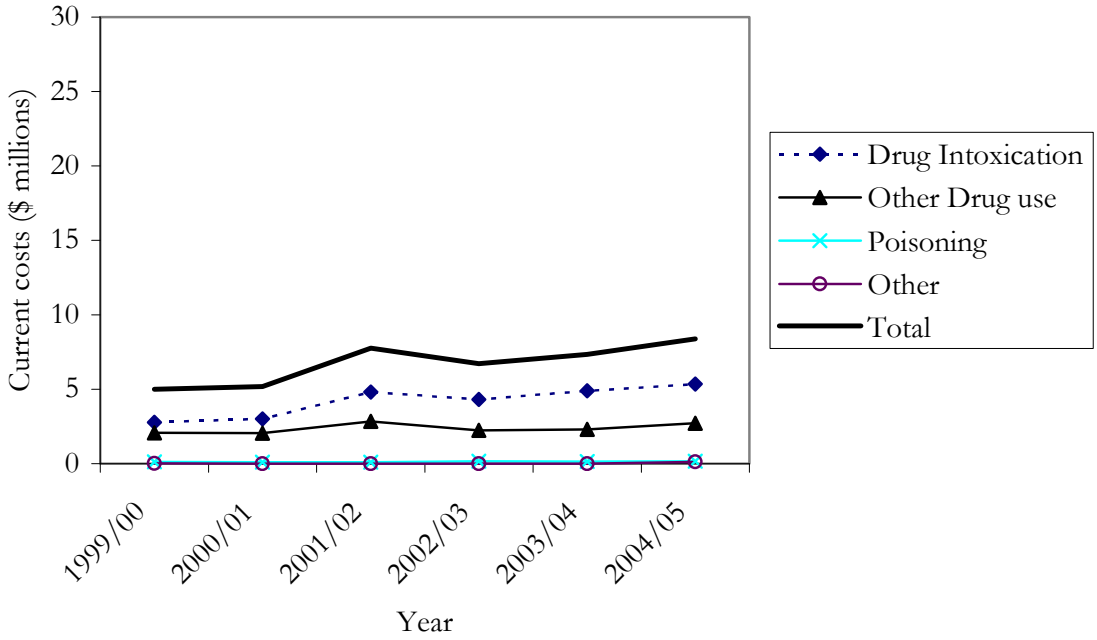


Table 9: Distribution of current costs for cannabis-related separations by DRG

	Drug Intoxication (%)	Other Drug use (%)	Poisoning (%)	Other (%)
1999/00	55.7	41.3	2.4	0.6
2000/01	58.2	39.6	2.2	0.1
2001/02	62.0	36.5	1.4	0.1
2002/03	64.1	33.4	2.5	n/a
2003/04	66.6	31.4	1.9	0.1
2004/05	64.0	32.4	2.1	1.6

3.5.2.2. **Cannabis: Constant costs**

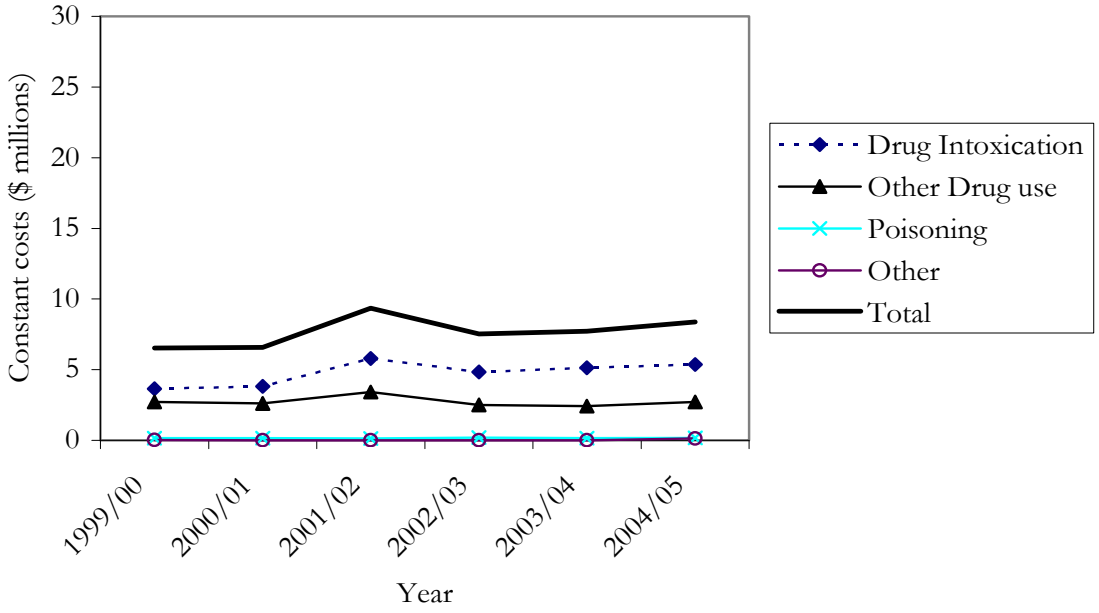
After adjusting for inflation and standardising to 2005 dollars, the overall constant costs for cannabis-related separations increased. Costs rose from $6.5 million in 1999/00 to $9.3 million in 2001/02 before decreasing to $8.4 million in 2004/05 (Figure 19). This is a similar trend to amphetamine costs.

As with amphetamine, the increase in costs for cannabis-related separations was largely due to increases in drug intoxication costs, from $3.7 million in 1999/00 to $5.8 million in 2001/02. Unlike amphetamine, however, other drug use costs also had a large influence on

the increase in constant costs over time for cannabis-related separations (from $2.7 million in 1999/00 to $3.4 million in 2001/02).

Across the period 1999/00 to 2004/05, the constant costs for poisoning remained relatively stable, ranging between $129,629 in 2001/02 and $188,087 in 2002/03. Costs for the 'other' DRG among cannabis-related separations were lower than those found for the corresponding DRG among opioid- and amphetamine-related separations, and with the exception of 2004/05 remained relatively stable over time.

Figure 19: Constant costs for cannabis-related separations by DRG (standardised to 2005 costs, $AUS)

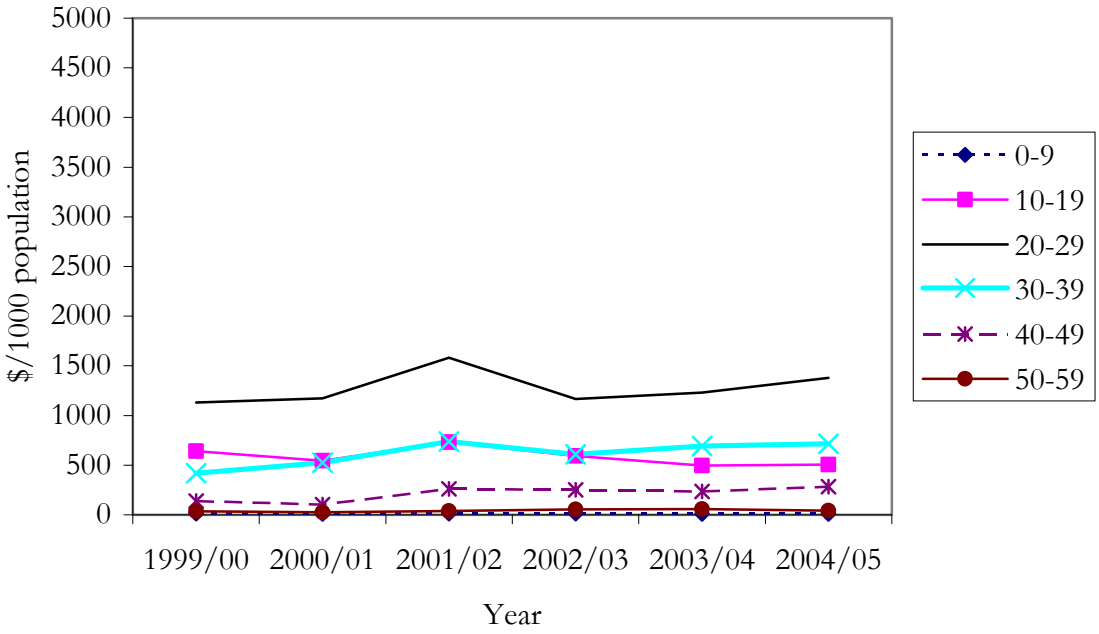


3.5.2.3. **Cannabis: Constant costs by age**

Similar to opioids and amphetamine, the constant costs for cannabis-related separations was greatest among the 20 to 29 year age group, ranging from $1129 in 1999/00 to $1581 in 2001/02 (Figure 20). The costs increased over time for all age groups, with a sharp increase in costs occurring in 2001/02. This is consistent with the pattern of costs among amphetamine-related separations, but contrasts with the costs seen among opioid-related separations. Unlike amphetamine and opioids, the second largest expenditure per 1000 population for cannabis-related separations varied between the 10 to 19 year and the 30 to 39 year age groups (Figure 17). The costs among the 30 to 39 year age group for cannabis-related separations was lower than for the similar age group among opioid- and amphetamine-related separations, whereas the costs among the 10 to 19 year age group was greater than those costs for opioids. For example, in 2001/02, the expenditure for the 10–19

year age group for cannabis-related separations was $734 per 1000 population compared with $329 for opioids.

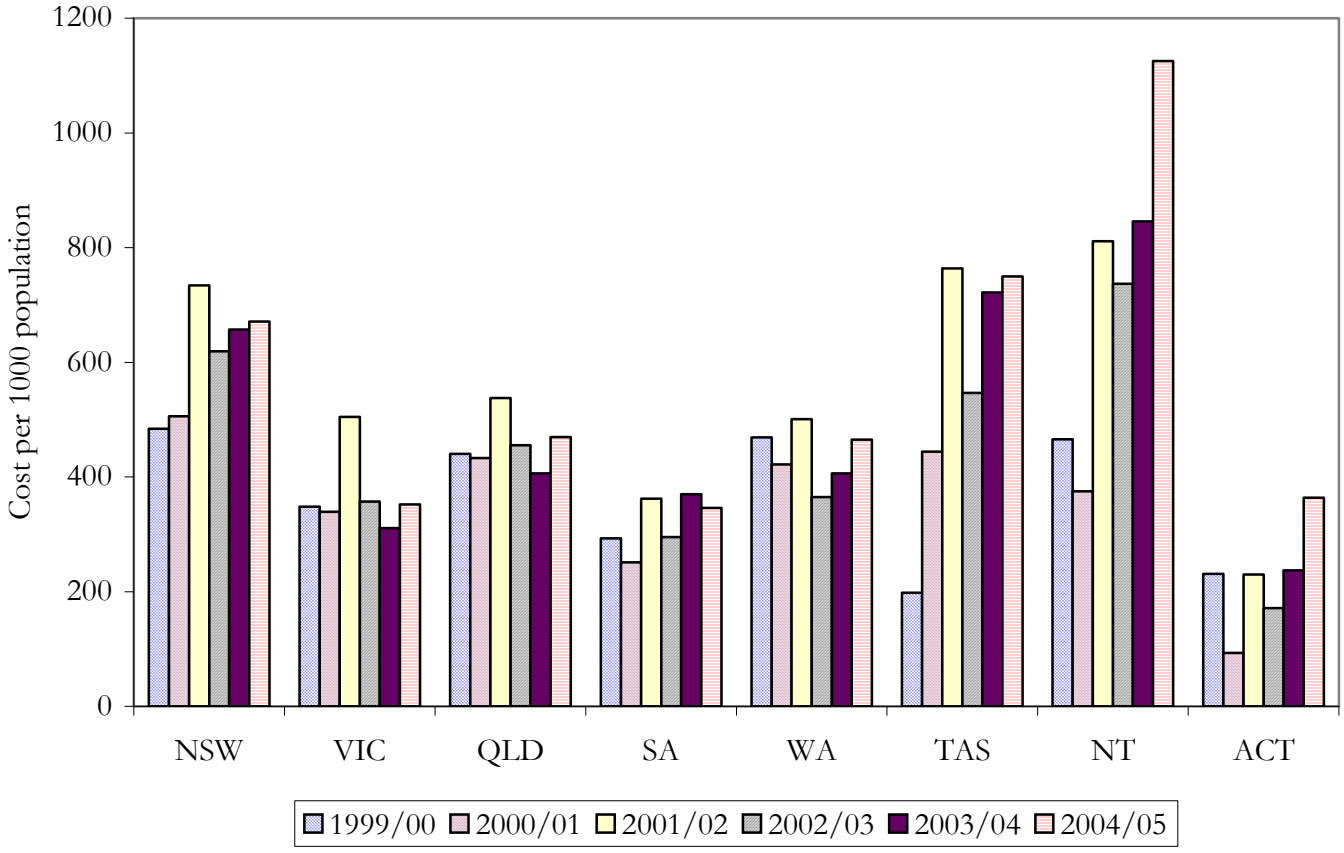
Figure 20: Constant costs per 1000 population for cannabis-related separations by 10 year age group (standardised to 2005 costs, $AUS)



3.5.2.4. **Cannabis: Constant costs by jurisdiction**

NSW, TAS and the NT generally had the highest expenditure during the study period (Figure 21). From 2000/01, QLD consistently had the fourth highest expenditure on cannabis-related separations per 1000 population. The costs across all years for VIC, QLD, SA and WA remained relatively stable, and in most years the cost per 1000 population was less than for amphetamine- and opioid-related separations. Of note are the costs per 1000 population for cannabis-related separations in TAS and the NT, which, for most of the period, were higher than amphetamine- and opioid-related separations in these jurisdictions.

Figure 21: Constant costs per 1000 population for cannabis-related separations by jurisdiction (standardised to 2005 costs, $AUS)



(Note: increasing costs after 2001/02 in TAS is most likely due to additional detoxification facilities in Tasmania supplying details to the NHMD at this time).

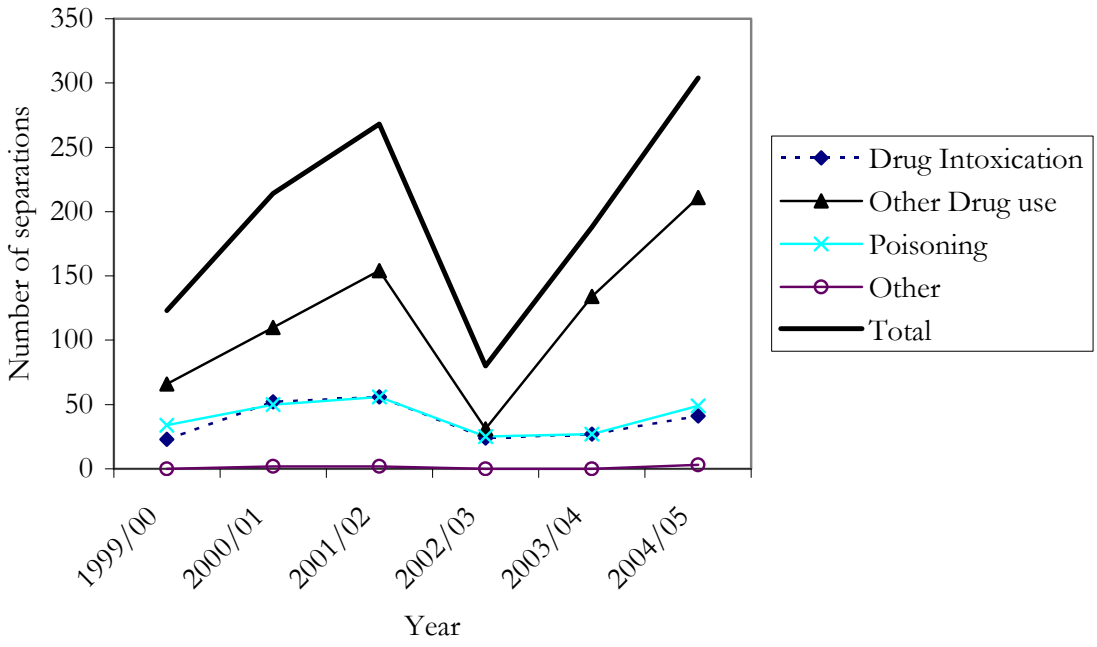
3.6. Cocaine-related separations

3.6.1. Cocaine: Separations by DRG

The total number of cocaine-related separations increased from 123 in 1999/00 to 304 in 2004/05, although there was a notable decrease in separations in 2002/03. The overall trend in the number of cocaine-related separations was influenced most by the other drug use DRG (Figure 22). The number of cocaine-related separations was considerably lower than opioid-, amphetamine- and cannabis-related separations in all years. These results have been discussed elsewhere (Roxburgh & Degenhardt, 2006).

The other drug use DRG accounted for the largest proportion of cocaine-related separations (51%–71%), between 1999/00 and 2004/05 (Table 10). The number of separations in both drug intoxication and poisonings were similar, and each accounted for approximately 20% of cocaine-related separations. There were very few separations among the 'other' DRG.

Figure 22: Frequency of cocaine-related separations by DRG



(Note: change of scale from previous figures)

Table 10: Distribution of cocaine-related separations by DRG

	Drug Intoxication (%)	Other Drug use (%)	Poisoning (%)	Other (%)
1999/00	18.7	53.7	27.6	0.0
2000/01	24.3	51.4	23.4	0.9
2001/02	19.6	53.8	19.6	0.7
2002/03	30.0	38.8	31.3	0.0
2003/04	14.4	71.3	14.4	0.0
2004/05	13.5	69.4	16.1	1.0

3.6.2. Cocaine: Costs

3.6.2.1. **Cocaine: Current costs**

The overall current costs for cocaine-related separations were considerably lower than for the other three drug classes for all DRGs during the period. In contrast to amphetamine and cannabis, the other drug use DRG was the most costly among cocaine-related separations, ranging from $188,721 in 2002/03 to $691,789 in 2004/05 (Figure 23). This was followed by drug intoxication and poisonings.

The results in Table 11 demonstrate the variation of costs for cocaine-related separations across years. The distribution of costs for other drug use varied from 32% to 64% of the total, whereas drug intoxication varied between 20% and 46%. Notably, in 2000/01, the 'other' DRG makes up almost one-quarter of the total costs.

Figure 23: Current costs for cocaine-related separations by DRG ($AUS)

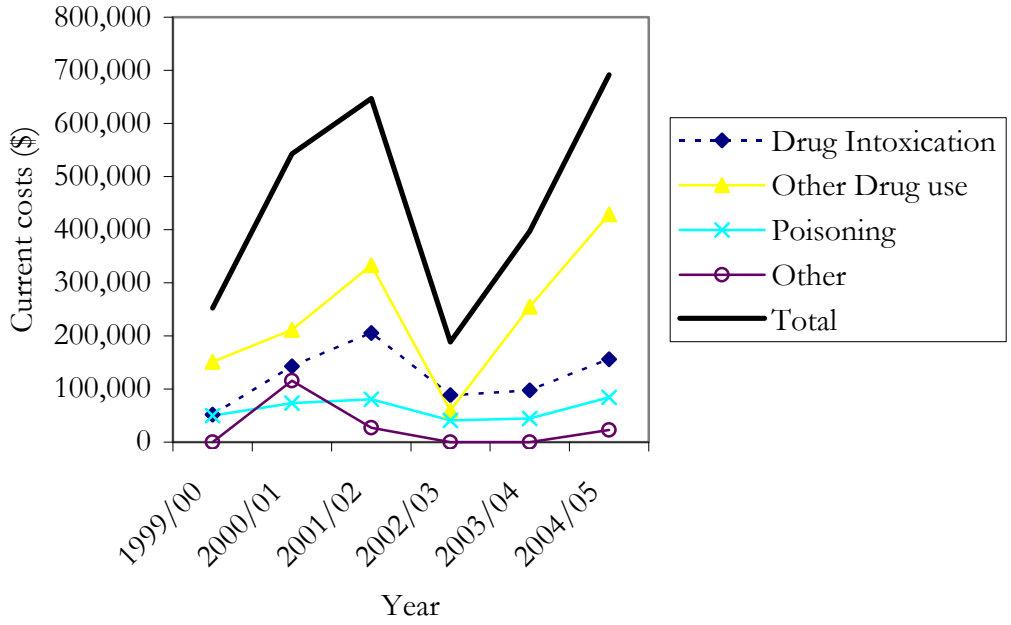


Table 11: Distribution of current costs for cocaine-related separations by DRG

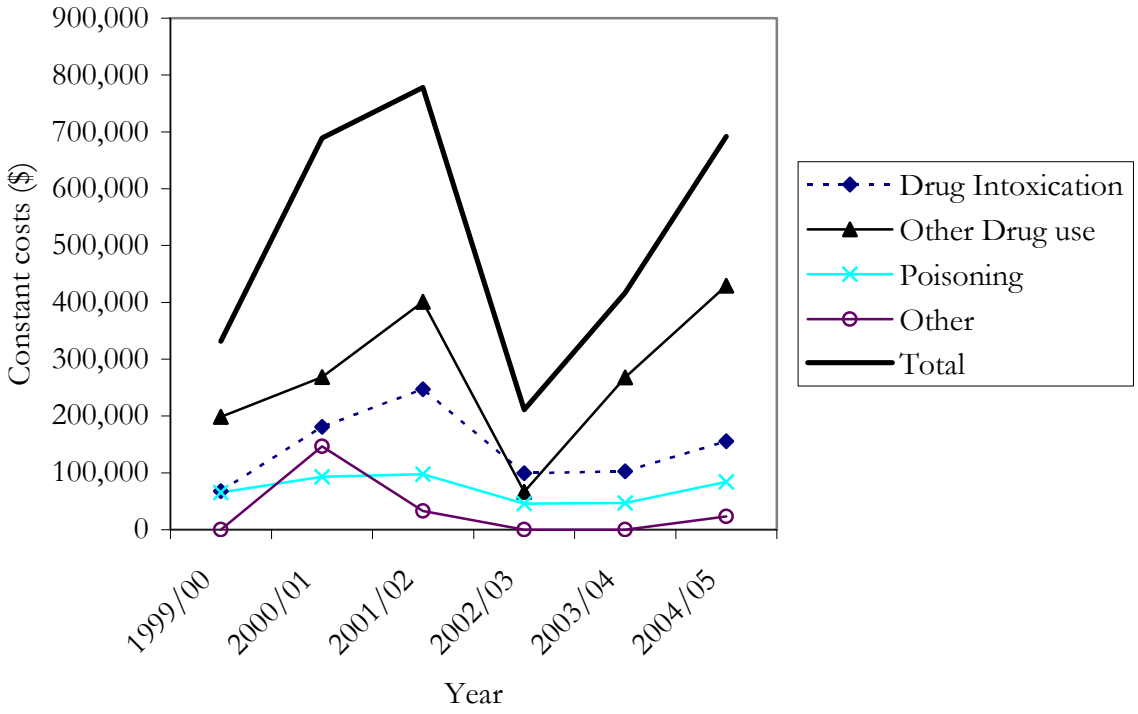
	Drug Intoxication (%)	Other Drug use (%)	Poisoning (%)	Other (%)
1999/00	20.4	59.9	19.7	n/a
2000/01	26.3	39.0	13.5	21.3
2001/02	31.8	51.5	12.5	4.2
2002/03	46.9	31.5	21.6	n/a
2003/04	24.6	64.2	11.2	n/a
2004/05	22.5	62.0	12.2	3.3

3.6.2.2. **Cocaine: Constant costs**

Following adjustment for inflation and standardising costs to 2005 dollars, the total constant costs for cocaine-related separations increased from 1999/00 ($331,386) to a peak of $691,789 in 2004/05. The exception to this trend was a decline to $211,176 in 2002/03 (Figure 24). The overall costs over time for cocaine-related separations remains substantially lower than all three other drugs being analysed (Figure 24).

There was considerable variability over time in the constant costs for all of the DRGs among cocaine-related separations. The trends in the total constant costs for cocaine-related separations was driven mostly by the other drug use DRG, which more than doubled between 1999/00 ($198,471) and 2001/02 ($400,840), before declining to about one-quarter of the previous expenditure in 2002/03 ($66,560).

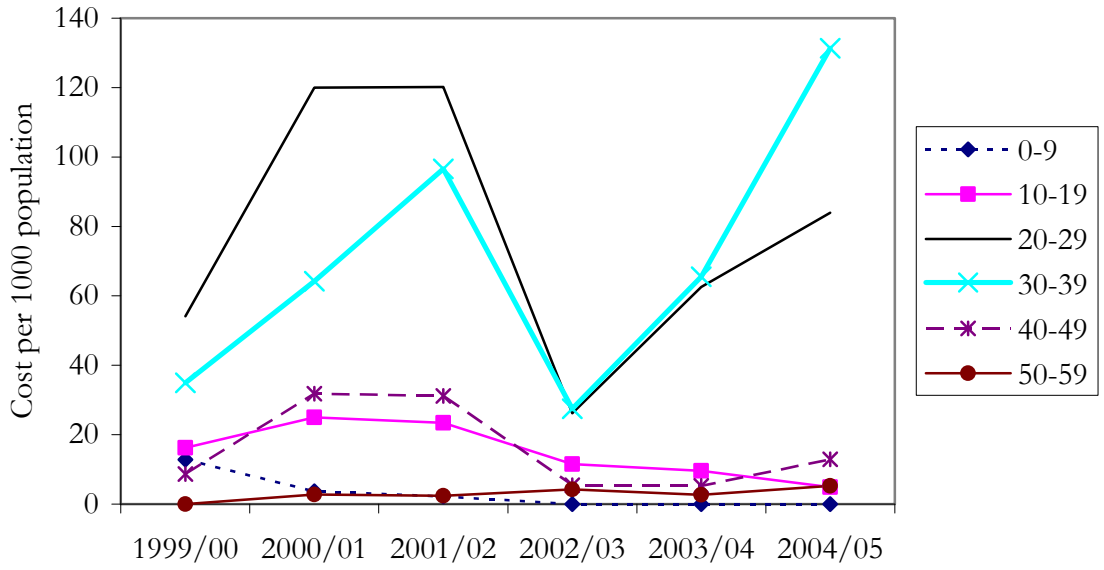
Figure 24: Constant costs for cocaine-related separations by DRG (standardised to 2005 costs, $AUS)



3.6.2.3. **Cocaine: Constant costs by age**

In contrast to the other three drug classes, the largest expenditure per 1000 population among cocaine-related separations varied between the 20–29 and 30–39 year age groups. Between 1999/00 and 2001/02 the constant costs for cocaine-related separations was greatest among the 20–29 year age group, ranging from $54 per 1000 population in 1999/00 to $120 per 1000 population in 2001/02. From 2002/03 the highest expenditure was among the 30–39 year age group (Figure 25). There were slight variations in cost among the other age groups, but overall, the costs remained relatively stable. The costs per 1000 population for all age groups were noticeably less than for opioids, amphetamine and cannabis.

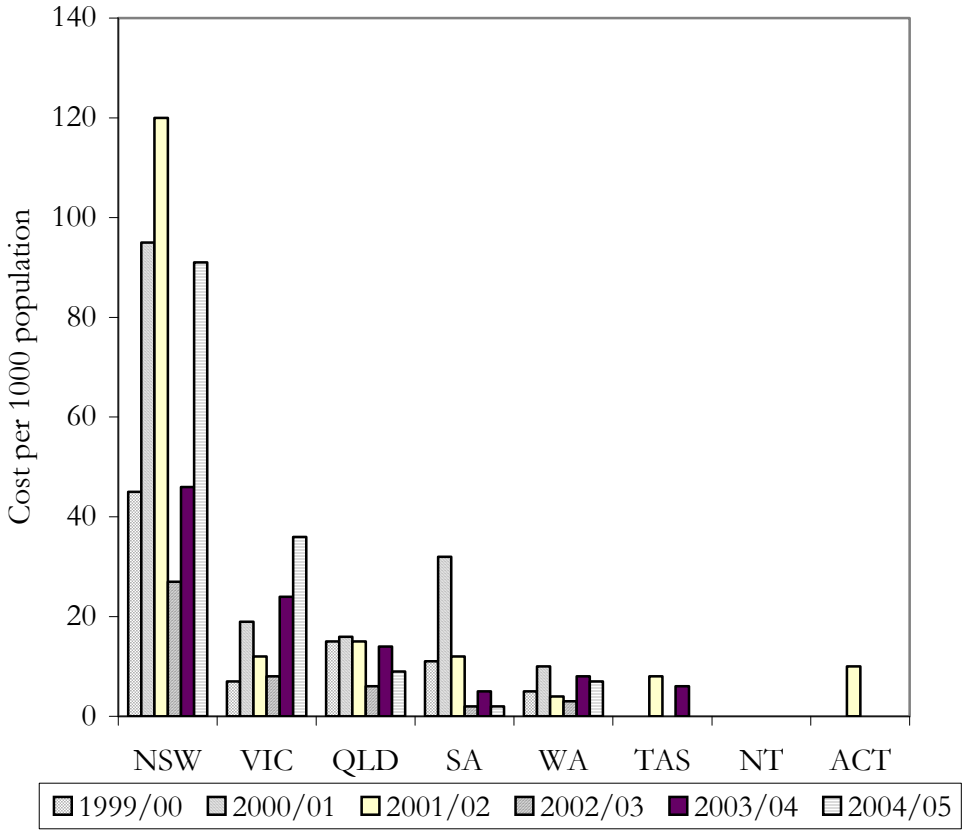
Figure 25: Constant costs per 1000 population for cocaine-related separations by 10 year age group (standardised to 2005 costs, $AUS)



3.6.2.4. **Cocaine: Constant costs by jurisdiction**

As with opioid-related separations, expenditure for cocaine-related separations was highest in NSW, albeit at much lower amounts. What is apparent is that there was some fluctuation in costs, with some jurisdictions recording no cocaine-related separations.

Figure 26: Constant costs per 1000 population for cocaine-related separations by jurisdiction (standardised to 2005 costs, $AUS)



3.7. "Drug caused" principal diagnoses: Aetiological fraction (AF)

3.7.1. Frequency of "drug caused" cases

As discussed previously, there are a number of illnesses that are, in part, caused by, or related to, the use of a drug; however, the illness is listed as the principal diagnosis. Table 12 provides the total number of cases for some of these diagnoses as well as estimates of the number of separations that are "drug caused" for each diagnosis (i.e. the total number of separations in each principal diagnosis multiplied by the AF). Also shown is the number of recorded drug-exposed cases for each diagnosis (i.e. separations where a drug mention was found among the 31 additional diagnoses).

The results indicate that among all of the "drug caused" principal diagnoses across all years, the actual number of cases for which there was mention of drug exposure (in an additional diagnosis) was found to be considerably less than the estimates obtained using the AFs. For example, in 2001/02 there were a total number of 452 male hepatitis B separations. The number of drug-exposed cases found among the hepatitis B separations was 19, noticeably less than the "drug caused" estimate of 131 (452 multiplied by 0.29, see Table 2 for AF). The exception to this trend was infective endocarditis, where, for all years, the number of drug-exposed cases found within the data set was greater than the number of "drug caused" separations.

It is also important to note that there may be a slight underestimate of the total cases estimated using the AFs as the data provided for TAS only included drug-related separations. It is thought that the impact of this is likely to be negligible overall.

Table 12: Total number of "drug caused" principal diagnoses separations estimated using AFs

			Hepatitis B		Hepatitis non-A, non-B	
				"drug caused"		"drug caused"
1999/00	male	Total cases	471		1832	
		IDU Exposed	17	137	61	769
	female	Total cases	144		770	
		IDU Exposed	8	42	24	323
2000/01	male	Total cases	443		1577	
		IDU Exposed	15	128	44	662
	female	Total cases	155		698	
		IDU Exposed	14	45	27	293
2001/02	male	Total cases	452		1764	
		IDU Exposed	19	131	53	741
	female	Total cases	122		701	
		IDU Exposed	6	35	18	294
2002/03	male	Total cases	465		1778	
		IDU Exposed	13	135	15	747
	female	Total cases	167		803	
		IDU Exposed	3	48	4	337
2003/04	male	Total cases	369		1697	
		IDU Exposed	11	107	32	713
	female	Total cases	168		828	
		IDU Exposed	4	49	31	348
2004/05	male	Total cases	389		1789	
		IDU Exposed	16	113	54	751
	female	Total cases	167		856	
		IDU Exposed	8	48	26	360

Table 12 continued

		Infective endocarditis		Ante partum haemorrhage		Low birth-weight newborns	
			"drug caused"		"drug caused"		"drug caused"
1999/00	Total cases	562	79	13663	178	12346	272
	IDU Exposed	84		80		1	
2000/01	Total cases	534	75	13889	181	12595	277
	IDU Exposed	107		81		1	
2001/02	Total cases	417	58	13529	172	12290	270
	IDU Exposed	93		87		1	
2002/03	Total cases	562	79	14124	184	12593	277
	IDU Exposed	81		82		2	
2003/04	Total cases	518	73	13906	181	12993	286
	IDU Exposed	71		75		1	
2004/05	Total cases	389	55	14528	189	13562	298
	IDU Exposed	96		80		1	

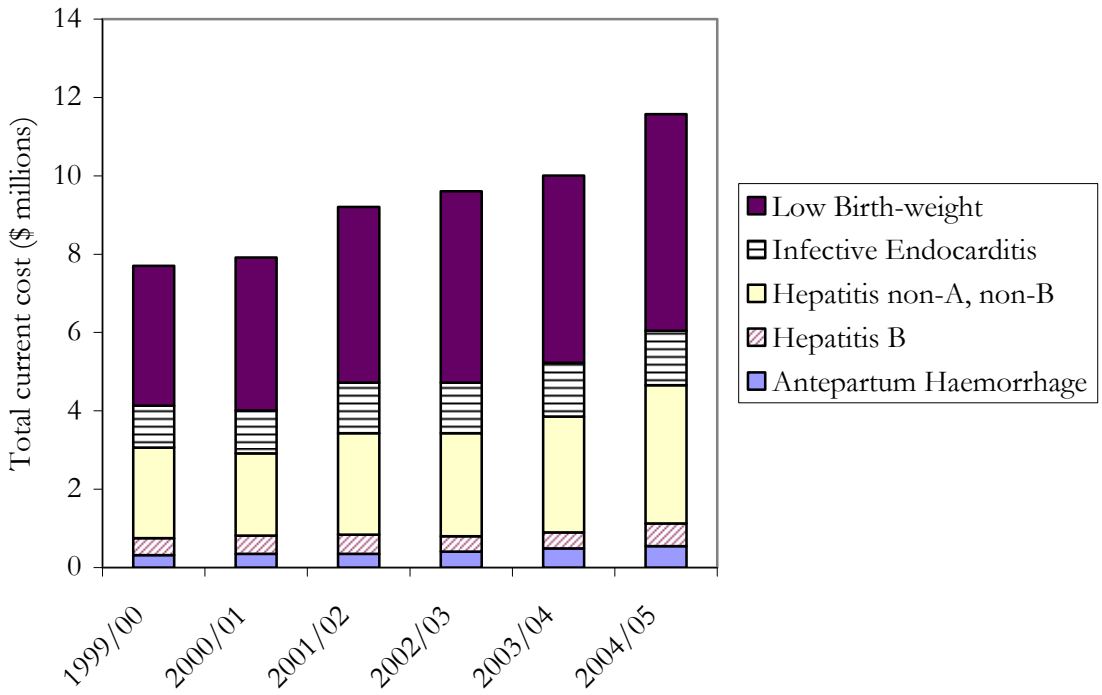
3.7.2. "Drug caused": Costs

3.7.2.1. **"Drug caused": Current costs**

Once the number of cases was determined, as with the other DRGs the total current costs were calculated by multiplying the number of cases by the appropriate weighted cost. Where there were multiple DRGs associated with a diagnosis, and therefore multiple case weights, a weighted average of the appropriate case weights was used. The overall current costs for "drug caused" separations increased from 1999/00 ($7.7 million) to 2004/05 ($11.6 million).

Low birth-weight newborns as a principal diagnosis incurred the greatest proportion of expenditure, ranging from 46% to 51%. The second highest proportion of expenditure was for hepatitis non-A non-B, which in all years was approximately 30% of the total expenditure. Infective endocarditis was the next greatest in expenditure, and accounted for approximately 14% of total "drug caused" expenditure each year. The costs for ante-partum haemorrhage and hepatitis B were less than costs for the other principal diagnoses, and accounted for similar proportions of total "drug caused" expenditure over time.

Figure 27: Current costs for "drug caused" separations ($AUS)



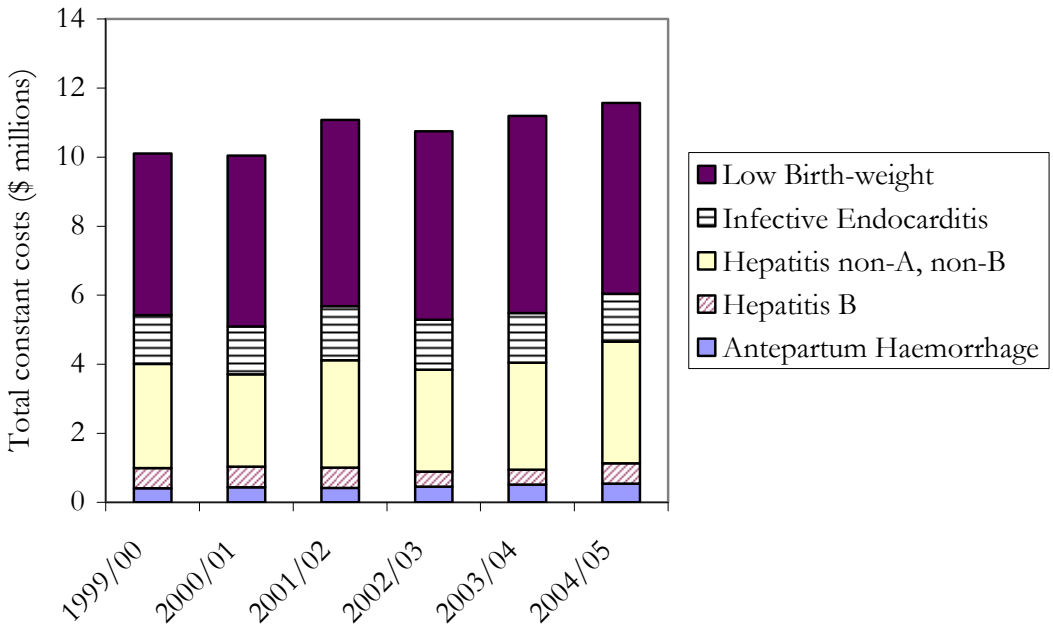
3.7.2.2. **"Drug caused": Constant costs**

After adjusting for inflation and standardising costs to 2005 dollars, there was a slight increase over time in the total costs for "drug caused" separations. Compared with the current costs, however, the increase in the constant costs over time was considerably less. The total constant costs ranged between $10.0 million in 2000/01 and $11.6 million in 2004/05.

The costs for low birth-weight newborns ranged between $4.7 million in 1999/00 to $5.5 million in 2004/05, an increase of approximately 18%. Even though ante partum haemorrhage consumed the least resources over time, it showed a proportional increase in costs of approximately 30% from $414,542 in 1999/00 to $544,731 in 2004/05.

The costs for those diagnoses related to IDU, hepatitis non-A and non-B and hepatitis B, increased slightly between 1999/00 and 2004/05 with some minor fluctuations. The exception to this general pattern of increasing costs was infective endocarditis, where costs remained relatively stable between 1999/00 and 2004/05.

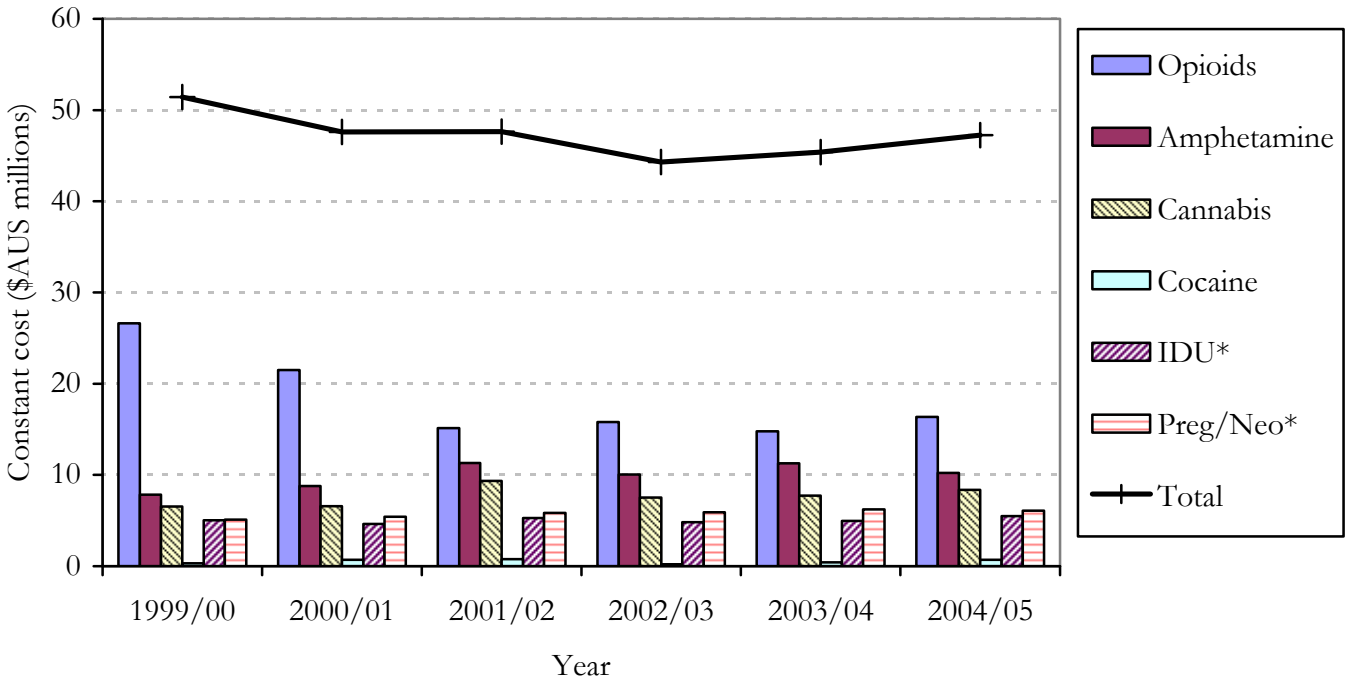
Figure 28: Constant costs for the "drug caused" separations (standardised to 2005 costs, $AUS)



3.8. Total constant costs

Figure 29 presents all costs by drug class, "drug caused" separations, and the overall total. The results illustrate that opioid-related separations were responsible for most of the expenditure across all years. A decline in costs for these separations corresponds with a relatively large increase in the constant costs for both amphetamine- and cannabis-related separations 2001/02. The "drug caused" separations contributed significantly to the total costs. (Note: Pregnancy/Neonatal [Preg/Neo] includes ante partum haemorrhage and low birth-weight newborns. IDU includes infective endocarditis, hepatitis B and hepatitis non-A, non-B).

Figure 29: Total constant costs for drug-related and "drug caused" separations per year (standardised to 2005 costs, $AUS)



Note: * estimated using aetiological fractions and not attributable to a given drug class

3.9. Average constant costs per separation

The average cost (in constant dollars) for each year is shown in Table 13. These averages reflect both the DRG case weights and the distribution of them across the drug classes. With the exception of the last two years (where cocaine was the lowest), the average cost of opioid

cases was the lowest overall. Within the drug classes, cannabis-related separations were the most expensive, ranging from $2,896 to $3,412.

The average constant cost of an amphetamine-related separation was marginally lower than the average costs for cannabis-related separations. The average costs of "drug caused" separations were greater, particularly for neonatal separations, than those for the three drug classes, reflecting the high intensity resource use in these cases – for example in the care of low birth-weight newborns.

Table 13: Average constant costs for all separations (standardised to 2005 costs $AUS)

	Opioids ($)	Amphetamine ($)	Cannabis ($)	Cocaine ($)	Pregnancy/ Neonatal* ($)	IDU* ($)
1999/00	2,601	2,857	3,061	2,694	11,332	3,708
2000/01	2,319	2,801	2,898	3,219	11,781	3,864
2001/02	2,820	3,301	3,412	2,903	13,158	4,178
2002/03	2,835	2,985	3,020	2,640	12,837	3,587
2003/04	2,451	2,799	2,896	2,218	13,344	3,850
2004/05	2,847	2,875	2,921	2,276	12,474	4,142

(Note: * is the constant costs calculated by aetiological fractions per year)

3.10. Distribution of separations across public and private sectors by DRG

Most drug intoxication and poisoning separations were from the public sector, whereas for the opioid use disorder and dependence and the other drug use disorder and dependence, a relatively large proportion of these separations were from the private sector (approximately 35%–40%). It is of note that the coverage of private hospitals in the NHMD has varied since 1999/00 and, as not all private sector separations are included in the NHMD, the frequency of private sector separations may be slight underestimates (Australian Institute of Health and Welfare, 2006).

Table 14: Proportion of separations that are from public hospitals by DRG

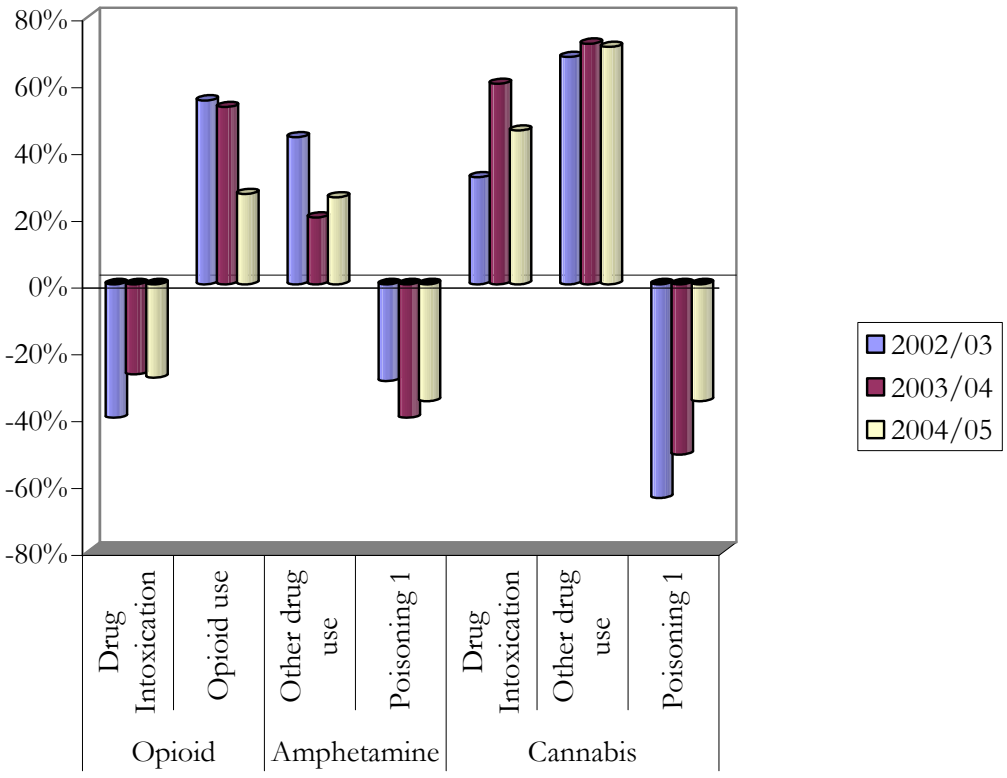
	1999/00 (%)	2000/01 (%)	2001/02 (%)	2002/03 (%)	2003/04 (%)	2004/05 (%)
Drug Intoxication 1	90.63	92.01	92.51	91.34	88.63	91.18
Drug Intoxication 2	89.75	88.64	88.75	88.39	n/a	n/a
Opioid use 1	66.08	67.26	67.13	70.72	64.57	62.05
Opioid use 2	n/a	n/a	n/a	n/a	93.48	94.09
Other drug use	64.04	64.71	58.81	61.99	61.77	63.8
Poisoning 1	88.96	88.82	89.52	90.31	91.56	91.79
Poisoning 2	93.19	93.21	94.32	94.35	94.27	94.41

3.11. ALOS: Comparing the ALOS to the national ALOS by drug type

Length of stay is an important factor in determining resource utilisation during hospitalisation. Therefore it is useful to contrast the ALOS that accompany the case weights with the ALOS in our analysis. For a number of DRGs and drug classes, the ALOS was quite similar to the national average. However, for some DRGs there were considerable differences, some of which are presented in Figure 30 (all data are presented in the Appendix). Examining opioids, the ALOS for separations in the drug intoxication DRG was considerably shorter than the national average, particularly in 2002/03 when the ALOS was almost 40% shorter. In contrast, the ALOS observed in the opioid use DRG was generally longer than the national average, at its peak 55% greater than the national average. Among amphetamine-related separations, the ALOS for other drug use was also considerably longer than the national average (up to 20%), whereas the ALOS for poisoning among amphetamine-related separations was consistently shorter.

Similar to the amphetamine-related separations, the ALOS for two of the cannabis-related DRGs were noticeably longer than the national average (by up to 72%). However, the ALOS for the poisoning 1 DRG was considerably shorter (refer to the appendix for ALOS tables for the overall data set and each drug class).

Figure 30: The average length of stay for drug-related separations by DRG (ratio of ALOS among drug-related separations to the national average for public hospitals)



4. DISCUSSION

In Australia the costs for drug-related hospital separations have been previously calculated (Collins and Lapsley, 1991, Collins and Lapsley, 1996, Collins and Lapsley, 2002). More recently, as part of a larger cost of illness study on the economic burden related to the use of alcohol and illicit drugs, the costs for hospital use among illicit drug users for one year (2003) was estimated at $40 million (Collins et al., 2007). Hospital costs are a minority of the total economic burden of illicit drug use and as such detailed information is not provided.

This report, which examined the costs for drug-related separations across four drug types, (opioids, cannabis, amphetamine and cocaine) for the period 1999/00 to 2004/05, builds on previous research examining the trends of drug-related separations between 1993/94 and 2004/05 in Australia (Roxburgh and Degenhardt, 2006). Among other findings, the number of principal drug-related hospital separations was found to be highest for opioids followed by amphetamine, cannabis and cocaine. Here, supplementing these findings, with the use of DRGs and case weights we document estimates of resource use (costs) by drug type. Additionally, expenditures by jurisdiction and by age group are also presented.

Given we already have total hospital expenditure, (Collins, Lapsley et al. 2007) and rates of separations, one might ask why are we interested in this detailed information? There are a number of reasons. For example, the use of dollars as a common metric allows jurisdictions to understand the resource implications of changes in drug use over time, to assess where drug prevention or harm minimisation activities may provide the best value, and to generally understand the burden to the hospital system of illicit drug use. This information also assists with documenting the savings or increased burden to the hospital system when drug use patterns change.

Although the number of drug-related separations has decreased over time, the current costs in dollars increased from $37.9 million in 1999/00 to $47.2 million in 2004/05 for all drug-related separations. However, when adjustment is made for inflation (standardising the costs to the year 2004/05), the real (or constant) costs decreased over time by $4.2 million (the remainder of this discussion will report only constant costs).

Estimates of drug-related hospital costs have been carried out in the United States (Fox et al., 1995), France (Fenoglio et al., 2003) and Canada (Rehm et al., 2006). However, these studies do not indicate which drug or drug type was responsible for the most resource use or trends in costs over time. Much of the overall decrease in costs found in this study was as the result of a decline in opioid-related separation costs between 1999/00 and 2001/02 at which time there was evidence of a marked reduction in the availability of heroin in Australia. Research has suggested that, as a result of this reduction in availability, a number of users may have "switched" use to other drugs (Degenhardt and Day, 2004), including more potent forms of methamphetamine (Topp et al., 2002) or decreased their use of illicit drugs (particularly for cannabis) (Australian Institute of Health and Welfare, 2005a). Despite the decrease in costs for opioid-related separations, they still accounted for the largest proportion of total expenditure for drug-related separations in every year (ranging from $26

million to $15.4 million per year). The total expenditures for amphetamine- and cannabis-related separations, while increasing during the period where the costs of opioid-separations declined, remained second and third respectively.

While the findings in this report are informative in and of themselves, it is useful to consider these findings with other data. Despite the fact that the costs related to opioids are the largest, the prevalence of recent use of heroin use in Australia was estimated at 0.2% of the population aged 14 years or greater in 2004; yet 11.3% of Australians over the age of 14 reported recent use of cannabis. The prevalence of the use for methamphetamine was approximately 3.2% and for cocaine 1.0% (Australian Institute of Health and Welfare, 2005a). These data together demonstrate the absolute and relative burden of opioid use. Cannabis, which is more widely used, has a lower relative cost but the total identified real cost to the hospital system is still a significant amount at $6.5 million to $9.3 million per year. Even though the resource use for cannabis was lower than for opioids and amphetamines, it is of note, however, that cannabis was the only drug class for which the costs among the 10–19 year age group were second only to 20–29 year age groups but also greater than costs found for opioid among the same age category.

There was also a small group of separations where the principal diagnosis was drug-related; however, the DRG assigned was not. In most instances, this is because another diagnosis resulted in greater resource use; for example, quadriplegics with a drug-related primary reason for admission, or an overdose who required mechanical ventilation in an intensive care unit, would likely require higher resource use than a patient without these additional diagnoses. There were very few of these separations, in some years as few as 0.5% of the separations, yet they accounted for up to 7.3% of the resources used (Table 3), demonstrating not only the severity of illness but also the significant costs of this group.

In addition to the above data where the principal diagnosis was reported as opioids-cannabis-, amphetamine- or cocaine-related, there are a number of separations where these drugs are considered to be partially attributable. Diagnoses for which drug use can be attributed include low birth-weight babies, ante partum haemorrhage, infective endocarditis, and hepatitis. There is considerable research between drug use and the "drug caused" principal diagnoses included in this study (Hulse et al., 1998, Broyles and Korniewicz, 2002, MacDonald et al., 2000, Ludlow et al., 2004). For instance, Hulse and colleagues found that there was more than a two-fold greater risk of ante partum haemorrhage following maternal opioid use. None of these studies have costed these diagnoses in relation to hospital resource use however.

The total annual costs for the "drug caused" separations in this study ranged from $10 million to $11.6 million. Combined, these separations account for between 24–33% of the total expenditures in this study (second only behind opioid-related costs), with low birth-weight babies accounting for between 11–17% of the total cost, reflecting the considerable economic burden associated with "drug caused" separations.

For most of these "drug caused" diagnoses, the average cost per separation was considerably greater than that found for the drug classes, particularly for low birth-weight newborns and infective endocarditis. Although there were fewer separations in these diagnoses compared with the drug classes, they resulted in significant costs. This suggests that a moderate

increase in such "drug caused" diagnoses would have a considerable impact on the total burden. While it is true for most drug admissions, many "drug caused" admissions could be prevented through well constructed harm-minimisation strategies such as targeting drug using pregnant women, and increased uptake of safe injecting practice among injecting drug users.

While the use of attributable fractions has permitted the inclusion of additional episodes of care, there are likely to be significant other costs not included. For example, we excluded cocaine-related low birth-weight newborns, HIV and AIDS due to challenges around the data and existing aetiological fractions. Additionally, costs related to trauma as a result of drug use, injecting related problems, and burns occurring at methamphetamines laboratories are not included in this study.

The costs were highest among the 20–29 year age group (a total of $5084 per 1000 population in 2004/05) across the four drug classes. This is not surprising given that this age group has the highest prevalence of recent use for heroin, amphetamine and cannabis (Australian Institute of Health and Welfare, 2005a). The only exception was among cocaine-related separations, where in the latter part of the study period (from 2002/03) the 30–39 year age group had the highest cost per 1000 population. This is also consistent with other research on cocaine markets in Australia, which suggests that cocaine use is more prevalent among older age groups (Shearer et al., 2005). With the exception of cannabis-related separations, the 30–39 year age group was the second most expensive per 1000 population across drug classes. As discussed above, the costs among the 10 to 19 year age group for cannabis-related separations were similar and in some years greater than those for the 30 to 39 year age group up until 2002/03. This result emphasises the impact on hospital resources of cannabis use among younger age groups compared with the other drug classes.

Expenditure per 1000 population varied across jurisdictions for the different drug classes. NSW was found to have the highest costs per 1000 population for opioid and cocaine-related separations, whereas QLD, WA, and SA recorded relatively high expenditure for amphetamine separations. Expenditure for cannabis-related separations was highest in TAS and the NT. The ACT and NT recorded the lowest expenditure for opioids, and VIC the lowest for amphetamine-related separations.

Once again these difference are not unexpected given the difference in availability and uptake of different drugs across the country (Stafford et al., 2005, Stafford et al., 2006a, O'Brien et al., 2007). The higher hospital costs per 1000 population for opioid- and cocaine-related separations in NSW reflects the historical availability of these drugs in NSW (Stafford et al., 2006a). The cost for amphetamine-related separations was highest in QLD and WA, and is consistent with amphetamines being reported as the drug most often injected in the month prior to interview among a group of regular injecting drug users in WA. There has also been an increase in the number of clandestine methamphetamine laboratories detected in QLD, particularly between 1997/98 and 2001/02 (McKetin et al., 2005).

The focus of this study was on the hospital costs of four drug classes. However, the total costs for opioids, amphetamine, cannabis and cocaine presented each year accounts for only a proportion (35% in 2003/04 and 2004/05) of the total costs of all cases in these DRGs (total costs for all separations in all DRGs are shown in the Appendix). While the burden

related to these four classes of drugs is significant, much of the difference in these total costs is related to other diagnoses such as poisonings related to licit drugs (benzodiazepines) or other substances (pesticides, carbon dioxide gas). Further research should investigate other high-frequency drugs. Additionally, differences in average length of stay by drug type within a DRG suggest scope for further work assessing the resource implications of these differences in ALOS.

There are a number of effective harm-reduction and early intervention strategies which could reduce the frequency of drug-caused care and therefore the cost. For example, infective endocarditis could be minimised through further strategies aimed at increasing clean injecting practice among intravenous drug users (Moss and Munt, 2003, Bassetti and Battegay, 2004). Early peer intervention should also be encouraged for IDU, for example, calling an ambulance immediately when an overdose occurs (Darke and Hall, 2003) may not only save lives but also decrease the costs of care. Other examples of harm-reduction measures to reduce the frequency of separations include the implementation of up-to-date training for clinicians in the management and referral of drug-using pregnant women (Burns et al., 2006, Wallace et al., 2007) may reduce drug-related pregnancy/neonatal hospital costs. Among sufferers of psychosis, early intervention and treatment has been shown to increase the prospects of an improved future prognosis and possibly a reduction in future presentations (Marshall et al., 2005). Education strategies on the risks associated with drug use and management of these risks need further development. Continued training of frontline health workers (e.g. NSP staff) on the management of drug-related morbidity is also required in an attempt to reduce the number of cases that present to hospital and thus the associated cost.

There were a number of limitations of this study. The costs included are significant; however, as the data was limited to four drug classes, the costs are an underestimate. The costs of other illicit and licit drug use are excluded, as are the costs of HIV/AIDS. In addition, the data analysed is limited to what is reported in medical records and depends primarily on the accurate recording by clinicians (Roxburgh and Degenhardt, 2006).

There were other separations that were directly drug-related which were not included, as the principal diagnosis was not drug-related. Some of these include admissions relating to injecting-site problems, burns from explosions of clandestine laboratories, motor vehicle accidents resulting in admission, and other trauma where drugs may have been involved. Furthermore, analysis of hospital separations results in the exclusion of acute illicit drug-related presentations (e.g. Emergency Department presentations), and is likely to under-estimate all hospital costs associated with illicit drugs.

Another limitation of the study is the lack of identification of poly-drug use among each separation. Poly-drug use is common among drug users (Darke and Ross, 1997, McKetin and Kelly, 2007); however, the ICD-10-AM classification system allows for only one drug to be classified as the principal diagnosis and so may not give a complete indication of the reason for the separation.

This study did not include separations where alcohol misuse is listed as the principal diagnosis. Previous work has investigated the impact of alcohol on the hospital system using established AFs (Chikritzhs et al., 2000). Previous alcohol-related AFs are currently being

recalculated and updated at Curtin University, and so to avoid unnecessary overlap in these calculations, separations involving alcohol were excluded from this study.

There are also limitations as a result of case weights and their costs, as these costs are based on averages of all cases for that particular DRG and may not necessarily reflect the true costs.

There has also been some variation, by jurisdiction, in data that has been provided to the NHMD. For instance, in the NT, private hospital data was not provided until 2002/03, and in TAS, for the same year, additional detoxification facilities commenced participation in the NHMD collection.

Future research should use the same framework to produce long-term trends in hospital costs for these drugs. Furthermore, with increasing Australian data which has investigated the effects of drugs on newborns (Burns et al., 2006, Oei and Lui, 2007), there is therefore the possibility of developing risk ratios to calculate revised aetiological fractions. Further research could also be conducted to evaluate whether there is sufficient evidence to develop a number of different DRGs, for instance "drug-induced psychosis", which are more refined for each drug class.

5. CONCLUSION

The results of this study show that estimating hospital costs by drug type, with the use of DRGs, is both doable and can be replicated for further cost evaluation of drug-related hospital costs. This study also demonstrates that changes in hospital costs are identifiable over time, with increasing costs being evident from 2002/03 to 2004/05. In addition, identification of the costs associated with a particular drug class highlight the cost burden related to opioid use as being much higher than the other drug classes. Furthermore, the cost estimates for opioids reflect the considerably greater harms associated with its use as a reflection of current estimates of prevalence of use. The results also demonstrate that much of the drug-related hospital resource use is associated with the 20–29 year age groups. However, of note are the high costs within the 10–19 year age group for cannabis-related separations. Finally, there is evidence which indicates that many of these costs are avoidable (even if drug use continues) through established harm-reduction techniques.

The National Hospital Morbidity Database, in conjunction with data published by the Commonwealth Department of Health and Ageing in relation to cost, is a useful monitoring system for drug-related hospital costs in Australia. On-going analysis of the NHMD with the DRG cost weights, using similar techniques, would provide valuable information about cost trends and patterns over time in relation to drug-related harms in Australia. Continued analysis would also provide a reliable structure within which the costs of policy decisions can be assessed in relation to decreasing or increasing drug-related hospital costs.

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7. APPENDIX

Table A1: Cost weights per drug-related DRGs 1999/00–2002/03

Cost weights per drug-related DRG					
DRG	Name	1999/00	2000/01	2001/02	2002/03
V61A	Drug intoxication and withdrawal with complications	1.27	1.36	1.94	1.41
V61B	Drug intoxication and withdrawal without complications	0.88	0.91	1.13	1.17
V63Z	Opioid use disorder and dependence	0.72	0.56	0.76	0.81
V64Z	Other Drug use disorder and dependence	0.90	0.71	0.76	0.65
X62A	Poisoning/Toxic effects of drugs & other substances with complications	0.97	0.93	0.92	0.94
X62B	Poisoning/Toxic effects of drugs & other substances without complications	0.41	0.39	0.37	0.40

Table A2: Costs weights per drug-related DRGs 2003/04–2004/05

Cost weights per DRG			
DRG	Name	2003/04	2004/05
V61Z	Drug intoxication and withdrawal	1.16	1.14
V63A	Opioid use disorder and dependence	0.61	0.82
V63B	Opioid use disorder and dependence (left against medical advice)	0.57	0.53
V64Z	Other Drug use disorder and dependence	0.61	0.61
X62A	Poisoning/Toxic effects of drugs & other substances with complications	0.93	0.92
X62B	Poisoning/Toxic effects of drugs & other substances without complications	0.39	0.37

Table A3: Costs weights per non-drug-related DRGs

DRG	Name	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
960Z	Ungroupable	2.18	3.47		3.97		0.96
902Z	Non-Ext operating room procedure Unrelated to principal diagnosis	1.91					
A06Z	Tracheostomy Or Ventilation>95 hours	20.80	21.31	22.23	22.79	22.59	24.02
A41A	Intubation Age<16 with Complications	4.80			5.08	6.56	6.33
B60A	Established Paraplegic/Quadriplegic+/- Operating Room Procedure with complications	3.54		7.39	6.81	7.99	8.32
B60B	Established Paraplegic/Quadriplegic+/- Operating Room Procedure without complications	2.16	1.91	2.12	1.96	2.40	2.35

Table A3 continued

B63Z	Dementia & Chronic Disturburbance of Cerebral Function						2.84
B64B	Delirium without complications						1.36
P66D	Neonate, admission weight 2000-2499G with significant operating room procedure without problems	1.20					
P67A	Neonate, admission weight 2499G without significant operating room procedure with multiple major problems						3.80
P67B	Neonate, admission weight >2499G without significant operating room procedure with a major problem	2.34	1.23	2.08	2.34		
P67D	Neonate, admission weight >2499G without significant operating room procedure without problems	0.73	2.92	0.55		0.50	

Table A3 continued

P67C	Neonate, admission weight >2499G without significant operating room procedure with other problems						1.07
X03Z	Microvascular tissue transfer/Skin Grafts Other Injuries	3.04	3.48	3.08	2.90		
X04A	Other procedure for injury to lower limb Age>59 years with complications	3.60			4.03		2.69
X05Z	Other procedure for injuries to the hand	0.89				0.88	0.92

Table A3 continued

X06A	Other procedures for other injuries with catastrophic or severe complications	1.20	3.42	3.33	3.37	3.43	3.37
X06B	Other procedures for other injuries without catastrophic or severe complications	0.57				1.04	1.05
X07A	Skin graft injury excluding the hand with microvascular tissue transfer with catastrophic or severe complications					5.58	5.67

Table A4: Frequency of all cases in selected DRGs

DRG	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*1100*	*946*	*931*	*862*	*5679*	*5547*
Drug Intoxication 2	*4105*	*4380*	*4369*	*4179*	*n/a*	*n/a*
Drug Intoxication Total	**5205**	**5326**	**5300**	**5041**	**5679**	**5547**
Opioid Use 1	*6398*	*5755*	*3090*	*3275*	*2883*	*2780*
Opioid Use 2	*n/a*	*n/a*	*n/a*	*n/a*	*550*	*473*
Opioid Use Total	**6398**	**5755**	**3090**	**3275**	**3433**	**3253**
Other Drug Use	**4026**	**4416**	**5234**	**4604**	**5072**	**4994**
Poisoning 1	*8579*	*8286*	*7691*	*7576*	*8189*	*9002*
Poisoning 2	*25,463*	*27,566*	*26,523*	*26,618*	*25,834*	*25,218*
Poisoning	**34,042**	**35,852**	**34,214**	**34,194**	**34,023**	**34,220**
Other	**72**	**64**	**39**	**39**	**42**	**98**
Total Cases	**49,743**	**51,413**	**47,877**	**47,153**	**48,249**	**48,112**

Table A5: Frequency of drug-related principal diagnoses per DRG (0 to 59 year olds)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*685*	*651*	*606*	*522*	*3909*	*3852*
Drug Intoxication 2	*2704*	*2939*	*2895*	*2810*	*n/a*	*n/a*
Drug Intoxication Total	**3389**	**3590**	**3501**	**3332**	**3909**	**3852**
Opioid Use 1	*6398*	*5755*	*3090*	*3275*	*2883*	*2780*
Opioid Use 2	*n/a*	*n/a*	*n/a*	*n/a*	*550*	*473*
Opioid Use Total	**6398**	**5755**	**3090**	**3275**	**3433**	**3253**
Other Drug Use	**1836**	**2149**	**2694**	**2345**	**2718**	**2717**
Poisoning 1	*1223*	*974*	*675*	*715*	*889*	*834*
Poisoning 2	*2323*	*2359*	*1803*	*1798*	*1916*	*1730*
Poisoning Total	**3546**	**3333**	**2478**	**2513**	**2805**	**2564**
Total Cases	**15,169**	**14,827**	**11,763**	**11,465**	**12,865**	**12,386**

Table A6: Current costs for all separations in selected DRGs ($AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*3,558,159*	*3,482,718*	*5,142,081*	*3,587,920*	*20,546,849*	*21,070,169*
Drug Intoxication 2	*9,200,783*	*10,789,561*	*14,055,554*	*14,433,597*	*n/a*	*n/a*
Drug Intoxication Total	**12,758,942**	**14,272,279**	**19,197,634**	**18,021,517**	**20,546,849**	**21,070,169**
Opioid use 1	*11,732,908*	*8,724,120*	*6,685,895*	*7,830,918*	*5,485,167*	*7,595,627*
Opioid use 2	*n/a*	*n/a*	*n/a*	*n/a*	*977,807*	*835,299*
Opioid Use Total	**11,732,908**	**8,724,120**	**6,685,895**	**7,830,918**	**6,462,973**	**8,430,926**
Other Drug Use	**9,228,800**	**8,487,420**	**11,324,910**	**8,834,155**	**9,649,936**	**10,150,405**
Poisoning 1	*21,195,192*	*20,860,088*	*20,144,575*	*21,022,491*	*23,753,587*	*27,595,091*
Poisoning 2	*26,590,247*	*29,102,253*	*27,939,063*	*31,430,534*	*31,424,736*	*31,089,759*
Poisoning Total	**47,785,439**	**49,962,341**	**48,083,638**	**52,453,025**	**55,178,323**	**58,684,850**
Other	***1,843,034***	***2,144,919***	***1,557,394***	***1,926,630***	***1,896,352***	***2,403,172***
Total ($)	**83,349,123**	**83,591,078**	**86,849,471**	**89,066,246**	**93,734,434**	**100,739,522**

Table A7: Constant costs for all separations in selected DRGs (standardised to 2005 costs, $AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*4,667,740*	*4,420,775*	*6,185,698*	*4,014,827*	*21,566,038*	*21,070,169*
Drug Intoxication 2	*12,069,967*	*13,695,687*	*16,908,216*	*16,150,974*	n/a	n/a
Drug Intoxication Total	**16,737,707**	**18,116,462**	**23,093,914**	**20,165,801**	**21,566,038**	**21,070,169**
Opioid use 1	*15,391,714*	*11,073,927*	*8,042,839*	*8,762,677*	*5,757,249*	*7,595,627*
Opioid use 2	n/a	n/a	n/a	n/a	*1,026,309*	*835,299*
Opioid Use Total	**15,391,714**	**11,073,927**	**8,042,839**	**8,762,677**	**6,783,557**	**8,430,926**
Other Drug Use	**12,106,721**	**10,773,473**	**13,623,372**	**9,885,284**	**10,128,604**	**10,150,405**
Poisoning 1	*27,804,727*	*26,478,672*	*24,233,042*	*23,523,845*	*24,931,840*	*27,595,091*
Poisoning 2	*34,882,184*	*36,940,832*	*33,609,470*	*35,170,286*	*32,983,503*	*31,089,759*
Poisoning Total	**62,686,911**	**63,419,504**	**57,842,511**	**58,694,131**	**57,915,343**	**58,684,850**
Other	***2,417,769***	***2,722,644***	***1,873,477***	***1,851,897***	***1,989,809***	***2,403,172***
Total ($)	**109,340,821**	**106,106,010**	**104,476,112**	**99,359,791**	**98,383,351**	**100,739,522**

Table A8: Current costs per DRG for drug-related separations only ($AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*2,215,763*	*2,396,670*	*3,347,047*	*2,172,731*	*14,142,918*	*14,631,745*
Drug Intoxication 2	*6,060,637*	*7,239,844*	*9,313,533*	*9,705,290*	*n/a*	*n/a*
Drug Intoxication Total	**8,276,400**	**9,636,514**	**12,660,581**	**11,878,021**	**14,142,918**	**14,631,745**
Opioid use 1	*11,732,908*	*8,724,120*	*6,685,895*	*7,830,918*	*5,485,167*	*7,595,627*
Opioid use 2	*n/a*	*n/a*	*n/a*	*n/a*	*977,807*	*835,299*
Opioid Use Total	**11,732,908**	**8,724,120**	**6,685,895**	**7,830,918**	**5,485,167**	**8,430,926**
Other Drug Use	**4,208,663**	**4,130,314**	**5,829,062**	**4,499,586**	**5,171,240**	**5,522,357**
Poisoning 1	*3,021,532*	*2,452,055*	*1,767,987*	*1,984,039*	*2,578,696*	*2,556,577*
Poisoning 2	*2,425,839*	*2,490,467*	*1,899,262*	*2,123,078*	*2,330,642*	*2,172,664*
Poisoning Total	**5,447,371**	**4,942,522**	**3,667,249**	**4,107,118**	**4,909,337**	**4,689,390**
Other	**569,917**	**2,144,917**	**1,557,394**	**1,654,979**	**1,896,353**	**2,403,171**
Total ($)	**30,235,259**	**29,578,386**	**30,400,180**	**29,970,622**	**31,605,015**	**35,677,589**

Table A9: Constant costs per DRG for drug-related separations only (standardised to 2005 costs, $AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*2,906,729*	*3,042,203*	*4,026,351*	*2,431,253*	*14,844,452*	*14,631,745*
Drug Intoxication 2	*7,950,594*	*9,189,869*	*11,203,773*	*10,860,071*	*n/a*	*n/a*
Drug Intoxication Total	**10,857,323**	**12,232,072**	**15,230,124**	**13,291,324**	**14,844,452**	**14,631,745**
Opioid use 1	*15,391,714*	*11,073,927*	*8,042,839*	*8,762,677*	*5,757,249*	*7,595,627*
Opioid use 2	*n/a*	*n/a*	*n/a*	*n/a*	*1,026,309*	*835,299*
Opioid Use Total	**15,391,714**	**11,073,927**	**8,042,839**	**8,762,677**	**6,783,557**	**8,430,926**
Other Drug Use	**5,521,098**	**5,242,797**	**7,012,106**	**5,034,968**	**5,427,750**	**5,522,357**
Poisoning 1	*3,963,770*	*3,112,506*	*2,126,811*	*2,220,109*	*2,706,607*	*2,556,577*
Poisoning 2	*3,214,726*	*3,206,003*	*2,328,841*	*2,397,428*	*2,467,561*	*2,172,664*
Poisoning Total	**7,146,086**	**6,273,771**	**4,411,540**	**4,595,802**	**5,152,856**	**4,689,390**
Other	**2,417,769**	**2,722,644**	**1,873,478**	**1,875,666**	**1,989,810**	**2,403,171**
Total ($)	**41,333,989**	**37,545,212**	**36,570,087**	**33,560,436**	**34,198,425**	**35,677,589**

Table A10: Constant costs per 1000 population of all drug-related separations by 10 year age group (standardised to 2005 costs, $AUS)

Age (Years)	0–9	10–19	20–29	30–39	40–49	50–59
1999/00	3,342	6,135	13,130	8,787	5,557	3,136
2000/01	2,993	5,370	12,626	8,867	5,597	3,188
2001/02	3,041	5,276	11,653	8,561	6,064	3,182
2002/03	2,898	5,057	10,466	8,177	5,802	3,244
2003/04	2,517	5,131	10,371	8,120	5,630	3,194
2004/05	2,280	5,355	10,424	8,232	5,889	3,359

Table A11: Constant costs per 1000 population of drug-related separations by jurisdiction (standardised to 2005 costs, $AUS)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
1999/00	7,088	6,254	8,265	7,181	7,130	3,880	3,882	4,257
2000/01	6,944	5,856	7,828	6,330	7,393	4,391	4,133	2,976
2001/02	6,504	5,873	7,975	6,702	6,772	3,814	4,738	3,325
2002/03	6,345	5,613	6,867	6,731	5,987	5,347	4,457	2,929
2003/04	6,517	5,376	6,604	6,540	5,575	5,667	3,729	3,211
2004/05	6,729	5,231	6,763	6,829	5,608	5,530	3,921	3,870

Table A12: Frequency of opioid-related separations by DRG

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*253*	*180*	*104*	*93*	*719*	*737*
Drug Intoxication 2	*805*	*842*	*516*	*511*	*n/a*	*n/a*
Drug Intoxication Total	**1058**	**1022**	**620**	**604**	**719**	**737**
Opioid use 1	*6398*	*5755*	*3090*	*3275*	*2883*	*2780*
Opioid use 2	*n/a*	*n/a*	*n/a*	*n/a*	*550*	*473*
Opioid Use Total	**6398**	**5755**	**3090**	**3275**	**3433**	**3253**
Poisoning 1	*1022*	*775*	*484*	*536*	*663*	*614*
Poisoning 2	*1704*	*1671*	*1149*	*1123*	*1180*	*1091*
Poisoning Total	**2726**	**2446**	**1633**	**1659**	**1843**	**1705**
Other	**63**	**52**	**30**	**34**	**36**	**61**
Total principal diagnosis	**10245**	**9275**	**5373**	**5572**	**6031**	**5756**

Table A13: Current costs for opioid-related separations by DRG ($AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*818,377*	*662,674*	*574,411*	*387,096*	*2,601,371*	*2,799,480*
Drug Intoxication 2	*1,804,295*	*2,074,158*	*1,660,029*	*1,764,912*	*n/a*	*n/a*
Drug Intoxication Total	**2,622,671**	**2,736,831**	**2,234,439**	**2,152,008**	**2,601,371**	**2,799,480**
Opioid use 1	*11,732,908*	*8,724,120*	*6,685,895*	*7,830,918*	*5,485,167*	*7,595,627*
Opioid use 2	*n/a*	*n/a*	*n/a*	*n/a*	*977,807*	*835,299*
Opioid Use Total	**11,732,908**	**8,724,120**	**6,685,895**	**7,830,918**	**6,462,973**	**8,430,926**
Poisoning 1	2,524,943	1,951,070	1,267,712	1,487,336	1,923,144	1,882,180
Poisoning 2	1,779,436	1,764,125	1,210,345	1,326,038	1,435,364	1,345,028
Poisoning Total	**4,304,379**	**3,715,195**	**2,478,057**	**2,813,374**	**3,358,508**	**3,227,209**
Other	***491,775***	***1,765,099***	***1,196,309***	***1,318,599***	***1,658,622***	***1,929,361***
Total ($)	**19,151,734**	**16,941,245**	**12,594,701**	**14,114,899**	**14,081,474**	**16,386,976**

Table A14: Constant costs for opioid-related separations by DRGs (standardised to 2005 costs, $AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*1,073,580*	*841,162*	*690,991*	*433,154*	*2,730,407*	*2,799,480*
Drug Intoxication 2	*2,366,948*	*2,632,824*	*1,996,942*	*1,974,910*	n/a	n/a
Drug Intoxication Total	**3,440,529**	**3,473,986**	**2,687,933**	**2,408,064**	**2,730,407**	**2,799,480**
Opioid use 1	*15,391,714*	*11,073,927*	*8,042,839*	*8,762,677*	*5,757,249*	*7,595,627*
Opioid use 2	n/a	n/a	n/a	n/a	*1,026,309*	*835,299*
Opioid Use Total	**15,391,714**	**11,073,927**	**8,042,839**	**8,762,677**	**6,783,557**	**8,430,926**
Poisoning 1	*3,312,324*	*2,476,583*	*1,525,002*	*1,664,306*	*2,018,538*	*1,882,180*
Poisoning 2	*2,334,338*	*2,239,285*	*1,455,992*	*1,483,817*	*1,506,562*	*1,345,028*
Poisoning Total	**5,646,662**	**4,715,868**	**2,980,994**	**3,148,122**	**3,525,101**	**3,227,209**
Other	***2,164,000***	***2,240,522***	***1,439,108***	***1,475,493***	***1,740,363***	***1,929,361***
Total ($)	**26,642,904**	**21,504,304**	**15,150,874**	**15,794,357**	**14,779,428**	**16,386,976**

Table A15: Constant costs per 1000 population for opioid-related separations by 10 year age group (standardised to 2005 costs, $AUS)

Age (years)	0–9	10–19	20–29	30–39	40–49	50–59
1999/00	77	1314	4524	2383	1041	294
2000/01	72	736	3638	1991	995	325
2001/02	76	329	2191	1454	1013	365
2002/03	62	288	2174	1595	1083	397
2003/04	62	250	1874	1587	998	417
2004/05	56	254	1881	1809	1174	533

Table A16: Constant costs per 1000 population for opioid-related separations by jurisdiction (standardised to 2005 costs, $AUS)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
1999/00	2403	1550	1483	865	1361	310	254	346
2000/01	2043	1053	1197	667	1110	349	188	198
2001/02	1438	655	919	543	670	397	213	300
2002/03	1547	660	818	503	669	1041	323	221
2003/04	1425	657	768	544	546	781	66	340
2004/05	1499	679	1006	710	631	592	244	315

Table A17: Frequency of amphetamine-related separations by DRG

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*206*	*251*	*281*	*225*	*1810*	*1664*
Drug Intoxication 2	*960*	*1145*	*1197*	*1271*	*n/a*	*n/a*
Drug Intoxication Total	**1166**	**1396**	**1478**	**1496**	**1810**	**1664**
Other Drug Use	**869**	**973**	**1229**	**1145**	**1369**	**1172**
Poisoning 1	*174*	*167*	*162*	*151*	*206*	*182*
Poisoning 2	*522*	*589*	*547*	*564*	*633*	*523*
Poisoning Total	**696**	**756**	**709**	**715**	**839**	**705**
Other	**7**	**9**	**6**	**5**	**14**	**16**
Total DRGs	**2731**	**3125**	**3416**	**3356**	**4018**	**3541**
Total principal diagnosis	**2738**	**3134**	**3422**	**3361**	**4032**	**3557**

Table A18: Current costs for amphetamine-related separations by DRG ($AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*666,346*	*924,062*	*1,552,014*	*936,522*	*6,548,652*	*6,320,671*
Drug Intoxication 2	*2,151,706*	*2,820,559*	*3,850,881*	*4,389,831*	n/a	n/a
Drug Intoxication Total	**2,818,052**	**3,744,620**	**5,402,894**	**5,326,353**	**6,548,652**	**6,320,671**
Other Drug Use	**1,992,009**	**1,870,077**	**2,659,212**	**2,197,026**	**2,604,646**	**2,382,113**
Poisoning 1	*429,883*	*420,424*	*424,317*	*419,007*	*597,538*	*557,910*
Poisoning 2	*545,109*	*621,825*	*576,204*	*665,971*	*769,988*	*644,775*
Poisoning Total	**974,992**	**1,042,249**	**1,000,521**	**1,084,978**	**1,367,526**	**1,202,685**
Other	***47,374***	***259,276***	***327,974***	***336,380***	***230,245***	***319,839***
Total ($)	**5,832,426**	**6,916,222**	**9,390,601**	**8,944,737**	**10,751,069**	**10,225,309**

Table A19: Constant costs for amphetamine-related separations by DRG (standardised to 2005 costs, $AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*874,140*	*1,172,954*	*1,867,004*	*1,047,954*	*6,873,486*	*6,320,671*
Drug Intoxication 2	*2,822,696*	*3,580,265*	*4,632,441*	*4,912,153*	n/a	n/a
Drug Intoxication Total	**3,696,837**	**4,753,219**	**6,499,445**	**5,960,107**	**6,873,486**	**6,320,671**
Other Drug Use	**2,613,199**	**2,373,775**	**3,198,915**	**2,458,438**	**2,733,844**	**2,382,113**
Poisoning 1	*563,938*	*533,664*	*510,435*	*468,862*	*627,178*	*557,910*
Poisoning 2	*715,096*	*789,311*	*693,149*	*745,212*	*808,181*	*644,775*
Poisoning Total	**1,279,034**	**1,322,975**	**1,203,583**	**1,214,074**	**1,435,359**	**1,202,685**
Other	***234,724***	***329,112***	***394,539***	***400,173***	***241,592***	***319,839***
Total ($)	**7,823,794**	**8,779,081**	**11,296,483**	**10,032,792**	**11,284,282**	**10,225,309**

Table A20: Constant costs per 1000 population for amphetamine-related separations by 10 year age group (standardised to 2005 costs, $AUS)

Age (years)	0–9	10–19	20–29	30–39	40–49	50–59
1999/00	58	520	1507	598	131	18
2000/01	65	523	1629	780	153	16
2001/02	77	633	2013	1076	224	30
2002/03	63	507	1781	980	198	48
2003/04	62	513	1950	1056	317	89
2004/05	54	464	1735	996	284	50

Table A21: Constant costs per 1000 population for amphetamine-related separations by jurisdiction (standardised to 2005 costs, $AUS)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
1999/00	522	196	855	508	630	237	217	359
2000/01	552	226	824	570	1032	269	91	249
2001/02	644	338	1035	894	1301	396	178	211
2002/03	679	274	796	889	915	479	81	296
2003/04	799	380	772	856	1016	512	137	339
2004/05	700	284	678	999	907	568	215	512

Table A22: Frequency of cannabis-related separations by DRG

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*226*	*208*	*210*	*196*	*1353*	*1410*
Drug Intoxication 2	*916*	*912*	*1137*	*1012*	*n/a*	*n/a*
Drug Intoxication Total	**1142**	**1120**	**1347**	**1208**	**1353**	**1410**
Other Drug Use	**901**	**1066**	**1311**	**1169**	**1215**	**1334**
Poisoning 1	*17*	*18*	*15*	*21*	*13*	*25*
Poisoning 2	*73*	*63*	*65*	*93*	*83*	*80*
Poisoning	**90**	**81**	**80**	**114**	**96**	**105**
Other	**2**	**1**	**1**	**n/a**	**1**	**18**
Total principal diagnosis	**2135**	**2268**	**2739**	**2491**	**2665**	**2867**

Table A23: Current costs for cannabis-related separations by DRG ($AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*731,040*	*765,756*	*1,159,868*	*815,815*	*4,895,208*	*5,355,857*
Drug Intoxication 2	*2,053,086*	*2,246,593*	*3,657,854*	*3,495,286*	n/a	n/a
Drug Intoxication Total	**2,784,126**	**3,012,350**	**4,817,722**	**4,311,101**	**4,895,208**	**5,355,857**
Other Drug Use	**2,065,362**	**2,048,820**	**2,836,637**	**2,243,077**	**2,311,647**	**2,711,382**
Poisoning 1	*42,000*	*45,315*	*39,289*	*58,272*	*37,709*	*76,636*
Poisoning 2	*76,232*	*66,511*	*68,470*	*109,814*	*100,962*	*98,627*
Poisoning Total	**118,232**	**111,826**	**107,759**	**168,087**	**138,671**	**175,263**
Other	***30,768***	***5,170***	***6,036***	n/a	***7,486***	***131,014***
Total ($)	**4,998,488**	**5,178,166**	**7,768,154**	**6,722,265**	**7,353,012**	**8,373,516**

Table A24: Constant costs for cannabis-related separations by DRG (standardised to 2005 costs, $AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*959,008*	*972,010*	*1,395,270*	*912,884*	*5,138,026*	*5,355,857*
Drug Intoxication 2	*2,693,323*	*2,851,705*	*4,400,238*	*3,911,172*	n/a	n/a
Drug Intoxication Total	**3,652,331**	**3,823,714**	**5,795,509**	**4,824,056**	**5,138,026**	**5,355,857**
Other Drug Use	**2,709,428**	**2,600,662**	**3,412,350**	**2,509,969**	**2,426,312**	**2,711,382**
Poisoning 1	*55,097*	*57,521*	*47,262*	*65,206*	*39,579*	*76,636*
Poisoning 2	*100,004*	*84,425*	*82,367*	*122,881*	*105,970*	*98,627*
Poisoning Total	**155,101**	**141,946**	**129,629**	**188,087**	**145,549**	**175,263**
Other	***19,045***	***6,563***	***7,261***	n/a	***7,855***	***131,014***
Total ($)	**6,535,905**	**6,572,885**	**9,344,749**	**7,522,111**	**7,717,742**	**8,373,516**

Table A25: Constant costs per 1000 population for cannabis-related separations by 10 year age group (standardised to 2005 costs, $AUS)

Age (years)	0–9	10–19	20–29	30–39	40–49	50–59
1999/00	13	642	1129	420	139	34
2000/01	10	544	1172	524	102	25
2001/02	12	731	1581	738	262	37
2002/03	13	594	1165	609	250	54
2003/04	10	498	1231	691	237	59
2004/05	10	506	1378	715	283	43

Table A26: Constant costs per 1000 population for cannabis-related separations by jurisdiction (standardised to 2005 costs, $AUS)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
1999/00	484	348	440	293	469	198	466	231
2000/01	506	339	433	251	422	444	375	93
2001/02	734	505	538	362	501	764	811	230
2002/03	619	357	455	295	365	547	737	171
2003/04	657	311	406	370	406	722	846	237
2004/05	671	352	470	346	465	750	1125	364

Table A27: Frequency of cocaine-related separations by DRG

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*n/a*	*12*	*11*	*8*	*27*	*41*
Drug Intoxication 2	*23*	*40*	*45*	*16*	*n/a*	*n/a*
Drug Intoxication Total	**23**	**52**	**56**	**24**	**27**	**41**
Other Drug Use	**66**	**110**	**154**	**31**	**134**	**211**
Poisoning 1	*10*	*14*	*14*	*7*	*7*	*13*
Poisoning 2	*24*	*36*	*42*	*18*	*20*	*36*
Poisoning	**34**	**50**	**56**	**25**	**27**	**49**
Other	**n/a**	**2**	**2**	**n/a**	**n/a**	**3**
Total principal diagnosis	**123**	**214**	**268**	**80**	**188**	**304**

Table A28: Current costs for cocaine-related separations by DRG ($AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*n/a*	*44,178*	*60,755*	*33,299*	*97,687*	*155,738*
Drug Intoxication 2	*51,551*	*98,535*	*144,770*	*55,261*	*n/a*	*n/a*
Drug Intoxication Total	**51,551**	**142,713**	**205,525**	**88,560**	**97,687**	**155,738**
Other Drug use	**151,292**	**211,417**	**333,213**	**59,483**	**254,947**	**428,862**
Poisoning 1	*24,706*	*35,245*	*36,669*	*19,424*	*20,305*	*39,851*
Poisoning 2	*25,062*	*38,006*	*44,242*	*21,254*	*24,328*	*44,382*
Poisoning Total	**49,768**	**73,251**	**80,912**	**40,679**	**44,633**	**84,233**
Other	**n/a**	***115,372***	***27,075***	**n/a**	**n/a**	***22,957***
Total ($)	**252,611**	**542,753**	**646,725**	**188,721**	**397,267**	**691,789**

Table A29: Constant costs for cocaine-related separations by DRG (standardised to 2005 costs, $AUS)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Drug Intoxication 1	*n/a*	*56,077*	*73,086*	*37,261*	*102,533*	*155,738*
Drug Intoxication 2	*67,627*	*125,075*	*174,152*	*61,837*	*n/a*	*n/a*
Drug Intoxication Total	**67,627**	**181,152**	**247,237**	**99,097**	**102,533**	**155,738**
Other Drug Use	**198,471**	**268,361**	**400,841**	**66,560**	**267,593**	**428,862**
Poisoning 1	*32,410*	*44,738*	*44,112*	*21,735*	*21,312*	*39,851*
Poisoning 2	*32,878*	*48,243*	*53,222*	*23,783*	*25,535*	*44,382*
Poisoning	**65,288**	**92,981**	**97,333**	**45,519**	**46,847**	**84,233**
Other	**n/a**	***146,447***	***32,570***	**n/a**	**n/a**	***22,957***
Total ($)	**331,386**	**688,942**	**777,981**	**211,176**	**416,973**	**691,789**

Table A30: Constant costs per 1000 population for cocaine-related separations by 10 year age group (standardised to 2005 costs, $AUS)

Age (years)	0–9	10–19	20–29	30–39	40–49	50–59
1999/00	13	16	54	35	9	0
2000/01	4	25	120	64	32	3
2001/02	2	23	120	97	31	2
2002/03	0	12	26	27	5	4
2003/04	0	10	63	66	5	3
2004/05	0	5	84	131	13	5

Table A31: Constant costs per 1000 population for cocaine-related separations by jurisdiction (standardised to 2005 costs, $AUS)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
1999/00	45	7	15	11	5	0	0	0
2000/01	95	19	16	32	10	0	0	0
2001/02	120	12	15	12	4	8	0	10
2002/03	27	8	6	2	3	0	0	0
2003/04	46	24	14	5	8	6	0	0
2004/05	91	36	9	2	7	0	0	0

Table A32: Current costs for "drug caused" separations ($AUS)

	Neonatal		*IDU*			
	Ante partum Haemorrhage	*Low Birth-weight*	*Hepatitis B*	*Hepatitis non-A, non-B*	*Infective Endocarditis*	*Total*
1999/00	315,996	3,571,218	437,439	2,305,493	1,073,181	7,703,327
2000/01	347,972	3,902,854	469,982	2,101,679	1,090,227	7,912,714
2001/02	347,981	4,486,642	494,602	2,584,377	1,293,731	9,207,333
2002/03	408,440	4,880,030	391,186	2,630,705	1,292,835	9,603,196
2003/04	492,164	4,781,903	406,758	2,956,546	1,369,654	10,007,025
2004/05	544,731	5,529,997	585,566	3,524,294	1,386,962	11,571,550

Table A33: Constant costs for "drug caused" separations (standardised to 2005 costs, $AUS)

	Neonatal		*IDU*			
	Ante partum Haemorrhage	*Low Birthweight*	*Hepatitis B*	*Hepatitis non-A, non-B*	*Infective Endocarditis*	*Total*
1999/00	414,542	4,684,928	573,857	3,024,477	1,407,860	10,105,664
2000/01	441,694	4,954,044	596,566	2,667,743	1,383,867	10,043,914
2001/02	418,605	5,397,208	594,982	3,108,877	1,556,294	11,075,966
2002/03	457,033	5,460,608	437,725	2,943,680	1,446,644	10,745,690
2003/04	516,417	5,715,133	426,803	3,102,241	1,437,149	11,197,743
2004/05	544,731	5,529,997	585,566	3,523,268	1,386,962	11,570,524

Table A34: Total current costs for drug-related and "drug caused" separations ($AUS)

	Opioids	*Amphetamine*	*Cannabis*	*Cocaine*	*Preg/Neo*	*IDU*	*Total*
1999/00	19,151,734	5,832,426	4,998,488	252,611	3,887,214	3,816,113	37,938,587
2000/01	16,941,245	6,916,222	5,178,166	542,753	4,250,826	3,661,888	37,491,100
2001/02	12,594,701	9,390,601	7,768,154	646,725	4,834,623	4,372,710	39,607,514
2002/03	14,114,899	8,944,737	6,722,265	188,721	5,288,470	4,314,726	39,573,818
2003/04	14,081,474	10,751,069	7,353,012	397,267	5,274,067	4,732,958	42,589,847
2004/05	16,386,976	10,225,309	8,373,516	691,789	6,074,728	5,496,822	47,248,113

Table A35: Total constant costs for drug-related and "drug caused" separations (standardised to 2005 costs, $AUS)

	Opioids	*Amphetamine*	*Cannabis*	*Cocaine*	*Preg/Neo*	*IDU*	*Total*
1999/00	26,642,904	7,823,794	6,535,905	331,386	5,099,470	5,006,194	51,439,653
2000/01	21,504,304	8,779,081	6,572,885	688,942	5,395,738	4,648,176	47,589,126
2001/02	15,150,874	11,296,483	9,344,749	777,981	5,815,813	5,260,153	47,646,053
2002/03	15,794,357	10,032,792	7,522,111	211,176	5,917,641	4,828,049	44,306,126
2003/04	14,779,428	11,284,282	7,717,742	416,973	6,231,550	4,966,193	45,396,168
2004/05	16,386,976	10,225,309	8,373,516	691,789	6,074,728	5,495,796	47,248,114

Table A36: Average length of stay by DRG (comparing analysed NHMD data with Department of Health and Ageing cost weight data)

		Drug Intox 1	Drug Intox 2	Opioid disorder 1	Opioid Disorder 2	Other drug use	Poisoning 1	Poisoning 2	'Other'
1999/00	ALOS - all separations*	6.54	4.4	3.41	N/A	4.3	3.1	1.37	
	ALOS - this study**	6.76	5.04	4.03	N/A	5.17	2.46	1.24	19.36
2000/01	ALOS - all separations*	6.73	4.1	3.38	N/A	3.36	2.96	1.35	
	ALOS - this study**	7.61	5.11	4.30	N/A	4.93	2.50	1.28	26.83
2001/02	ALOS - all separations*	8.23	5.19	4.12	N/A	3.48	3.09	1.36	
	ALOS - this study**	8.14	5.78	5.13	N/A	4.66	2.68	1.33	45.15
2002/03	ALOS - all separations*	6.39	5.37	3.77	N/A	3.16	3.18	1.39	
	ALOS - this study**	6.62	5.07	5.83	N/A	4.98	3.09	1.32	33.13
2003/04	ALOS - all separations*	5.1	N/A	3.72	2.87	3.23	3.15	1.36	
	ALOS - this study**	5.78	N/A	5.70	3.54	4.59	2.57	1.34	17.12
2004/05	ALOS - all separations*	5.12	N/A	4.46	2.71	2.95	3.15	1.36	
	ALOS - this study**	5.96	N/A	5.66	3.23	4.29	3.14	1.27	8.88

** National average length of stay for all separations as per the Department of Health and Ageing, ** National average length of stay for drug-related separations (this study)*

Note: 1999/00–2002/03: Drug Intoxication 1 - Drug intoxication and withdrawal with complications, Drug Intoxication 2 - Drug intoxication and withdrawal without complications, Opioid 1 - Opioid use disorder and dependence. 2003/04–2004/05: Drug Intoxication 1 - Drug intoxication and withdrawal, Opioid 1 - Opioid use disorder and dependence, Opioid 2 - Opioid use disorder and dependence (left against medical advice). All years: Other drug use - Other Drug use disorder and dependence, Poisoning 1 - Poisoning/Toxic effects of drugs & other substances with complications, Poisoning 2 - Poisoning/Toxic effects of drugs & other substances without complications. No comparison provided for 'Other' as this a mix of DRGs..

Table A37: Average length of stay for opioid-related separations by DRG

	Drug Intoxication 1	Drug Intoxication 2	Opioid use 1	Opioid use 2	Poisoning 1	Poisoning 2	Other
1999/00	4.69 (0.72)	3.01 (0.68)	4.03 (1.18)	n/a	2.58 (0.83)	1.26 (0.92)	19.7
2000/01	6.10 (0.91)	3.51 (0.86)	4.30 (1.27)	n/a	2.61 (0.88)	1.33 (0.99)	24.56
2001/02	7.51 (0.91)	6.95 (1.34)	5.13 (1.25)	n/a	3.09 (1.00)	1.36 (1.00)	53.97
2002/03	3.86 (0.60)	2.98 (0.56)	5.83 (1.55)	n/a	3.41 (1.07)	1.36 (0.98)	16.59
2003/04	3.71 (0.73)	n/a	5.70 (1.53)	3.54 (1.23)	2.82 (0.90)	1.38 (1.02)	17.47
2004/05	3.70 (0.72)	n/a	5.66 (1.27)	3.23 (1.19)	3.54 (1.12)	1.35 (0.99)	10.61

(The numbers in brackets are a ratio of the ALOS for opioid-related separations to that of the national average for each DRG in each year)

Table A38: Average length of stay for amphetamine-related separations by DRG

	Drug Intoxication 1	Drug Intoxication 2	Other Drug use	Poisoning 1	Poisoning 2	Other
1999/00	7.02	4.81	4.10	1.87	1.16	19
	(1.07)	(1.09)	(0.95)	(0.60)	(0.85)	
2000/01	7.03	5.02	4.45	1.95	1.15	45.6
	(1.04)	(1.22)	(1.32)	(0.66)	(0.85)	
2001/02	7.74	4.96	4.18	1.60	1.28	21.3
	(0.94)	(0.96)	(1.20)	(0.52)	(0.94)	
2002/03	6.21	4.74	4.54	2.27	1.26	145.6
	(0.97)	(0.88)	(1.44)	(0.71)	(0.91)	
2003/04	4.85	n/a	3.89	1.89	1.27	17.2
	(0.95)		(1.20)	(0.60)	(0.93)	
2004/05	5.72	n/a	3.72	2.04	1.16	7.1
	(1.12)		(1.26)	(0.65)	(0.85)	

(The numbers in brackets represent a ratio of the ALOS for amphetamine-related separations to that of the national average for each DRG in each year)

Table A39: Average length of stay for cannabis-related separations by DRG

	Drug Intoxication 1	Drug Intoxication 2	Other Drug use	Poisoning 1	Poisoning 2	Other
1999/00	8.85	7.19	6.11	1.41	1.05	10
	(1.35)	(1.63)	(1.42)	(0.45)	(0.77)	
2000/01	9.85	6.74	5.29	1.94	1.03	1
	(1.46)	(1.64)	(1.57)	(0.66)	(0.76)	
2001/02	9.11	6.36	4.92	1.93	1.12	11
	(1.11)	(1.23)	(1.41)	(0.62)	(0.82)	
2002/03	8.42	6.68	5.30	1.14	1.19	n/a
	(1.32)	(1.24)	(1.68)	(0.36)	(0.86)	
2003/04	8.18	n/a	5.56	1.54	1.33	4
	(1.60)		(1.72)	(0.49)	(0.98)	
2004/05	7.47	n/a	5.04	2.04	1.10	4.94
	(1.46)		(1.71)	(0.65)	(0.81)	

(The numbers in brackets represent a ratio of the ALOS for cannabis-related separations to that of the national average for each DRG in each year)

Table A40: Average length of stay for cocaine-related separations by DRG

	Drug Intoxication 1	Drug Intoxication 2	Other Drug use	Poisoning 1	Poisoning 2	Other
1999/00	n/a	2.81 (0.64)	6.29 (1.46)	2.7 (0.87)	1.42 (1.04)	n/a
2000/01	3.58 (0.53)	2.5 (0.61)	5.71 (1.70)	3.64 (1.23)	1.33 (0.99)	14.5
2001/02	5.73 (0.70)	3.68 (0.71)	6.35 (1.82)	1.57 (0.51)	1.26 (0.93)	1.5
2002/03	6.38 (1.00)	2.88 (0.54)	9.06 (2.87)	1.57 (0.49)	1.06 (0.76)	n/a
2003/04	3.70 (0.73)	n/a	2.99 (0.93)	1.57 (0.50)	1.15 (0.85)	n/a
2004/05	4.56 (0.89)	n/a	2.89 (0.98)	1.38 (0.44)	1.03 (0.76)	7

(The numbers in brackets represent a ratio of the ALOS for cocaine-related separations to that of the national average for each DRG in each year)

Casemix and DRGs

Diagnostic Related Groups (DRGs) are a method of categorising and classifying all episodes of care into a limited number of distinct and medically meaningful diagnostic categories. This results in a number of manageable diagnosis-based classes which are differentiated on the basis of clinical content and resource consumption.

DRGs were first used in the United States in the 1980s. Following allocation of funding by the Australian federal government, The Casemix Development Program was established and the first release of an Australian DRGs classification system was in July 1992. Since that time, the Australian DRGs have been revised on 10 occasions. There are currently 665 DRGs which are used by federal and all jurisdiction governments to measure and/or fund health services.

The DRG is firstly characterised by Major Diagnostic Categories (there are 23 of these) which are defined by a body system or disease. For instance, in this study the two main MDCs of interest are: alcohol/drug use and alcohol/drug induced organic mental disorders; and injuries poisonings and toxic effects of drugs. MDCs are partitioned into medical, surgical and other. These partitions are based on whether there have been any operating room (OR) procedures or non-OR procedures. Further partitioning occurs, using the principal diagnosis (from the ICD-10-AM).

Each DRG is also ranked to the level of cost associated with the separation (e.g. a – highest, b – second highest, c – third highest, d – four highest, z – split for the adjacent DRG), although there are some DRGs which have just the one level of cost. Before being separated by levels of cost, DRGs are grouped together as adjacent DRGs. Following this, additional diagnoses or complications and comorbidities are taken into consideration. When a patient has more than one additional diagnosis, the code for patient complications or comorbidities can be elevated, resulting in higher costs.

Each acute inpatient episode of care is allocated to only one DRG. The DRG and respective cost weight for each separation is determined based on specific inpatient data collected. These data items include:

- principal diagnosis
- additional diagnoses
- complications and/or comorbidities
- significant procedures
- age
- separation status
- gender
- length Of Stay (LOS)
- newborn's admission weight
- length of mechanical ventilation
- same day status and
- mental health legal status.

To determine the final DRG, the above information is 'run' through the DRG hierarchy and the DRG is then assigned using a 'grouper' which takes into account all of these data items to assign the DRG.

Each DRG has a cost weight, where the cost weight of 'one' is the average case cost of all hospital separations and varies from year to year. If the cost weight is greater than one, the cost is greater than the overall average cost for one episode of care; if it is below one, the cost is therefore less. The National Hospital Cost Data Collection (NHCDC) is used to estimate the DRG cost weights.