

THE BECKLEY FOUNDATION  
DRUG POLICY PROGRAMME

# THE AUSTRALIAN “HEROIN SHORTAGE” SIX YEARS ON: WHAT, IF ANY, ARE THE IMPLICATIONS FOR DRUG POLICY?

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The Beckley Foundation Drug Policy Programme (BFDPP, [www.internationaldrugpolicy.net](http://www.internationaldrugpolicy.net)) is a non-governmental initiative dedicated to providing a rigorous independent review of the effectiveness of national and international drug policies. The aim of this programme of research and analysis is to assemble and disseminate material that supports the rational consideration of complex drug policy issues, and leads to more effective management of the widespread use of psychoactive substances in the future. The Beckley Foundation Drug Policy Programme is a member of the International Drug Policy Consortium (IDPC, [www.idpc.info](http://www.idpc.info)), which is a global network of NGOs specialising in issues related to illegal drug use and government responses to the related problems. The Consortium aims to promote objective debate on the effectiveness, direction and content of drug policies at national and international level.

## SUMMARY

During the mid to late 1990s in Australia heroin and heroin related deaths increased steeply, peaking at over 1000 deaths in 1999. In January 2001, there was an abrupt, unpredicted and unprecedented reduction in heroin supply with nearly simultaneous onset in all Australian jurisdictions. The shortage was most marked in New South Wales, the State with the largest heroin market. There were large increases in price, dramatic decreases in purity at the street level, and marked reductions in the ease with which injecting drug users reported that they could obtain heroin. The abrupt onset of the shortage and an immediate and dramatic reduction in fatal and nonfatal overdoses prompted national (and later international) debate about the causes and policy significance of the shortage. This briefing paper summarises the results of research into the consequences of the “heroin shortage” and reviews the continuing debate about its causes and policy significance. As such, in light of an increased understanding of the “heroin shortage”, it revisits some of the issues discussed in BFDPP briefing paper number 4, *Upheavals in the Australian drug market: heroin drought, stimulant flood*, released in 2004.

### *Background to the Australian heroin market*

Heroin use has been arguably the most harmful type of illicit drug use in Australia for four decades (Hall, 2004). It has caused considerable harm to users through the development of dependence, high rates of fatal and nonfatal overdose, associated mental health problems, and increased rates of blood borne virus infection (Hall *et al.*, 1999b, Darke *et al.*, 2002, Hall *et al.*, 1999a, Hall *et al.*, 2000a). It has also adversely affected the broader Australian community through highly visible drug dealing, property crime and reduced public amenity.

Australia experienced a particularly steep increase in heroin overdose deaths between the mid and late 1990s (Hall *et al.*, 1999a). Deaths peaked in 1999 when there were 1116 opioid overdose deaths among those aged 15 to 54 years, accounting for one in eight deaths among Australians aged 15-24 years (Degenhardt *et al.*, 2004c). There were also substantial rises in the number of people who were treated for heroin dependence, arrested for heroin offences, and diagnosed with hepatitis C infections (Hall *et al.*, 1999a, Hall *et al.*, 2000a, Law *et al.*, 2003). It was predicted in 2003 that injection drug-related hepatitis C would become the largest cause of liver transplants in Australia (Law *et al.*, 2003).

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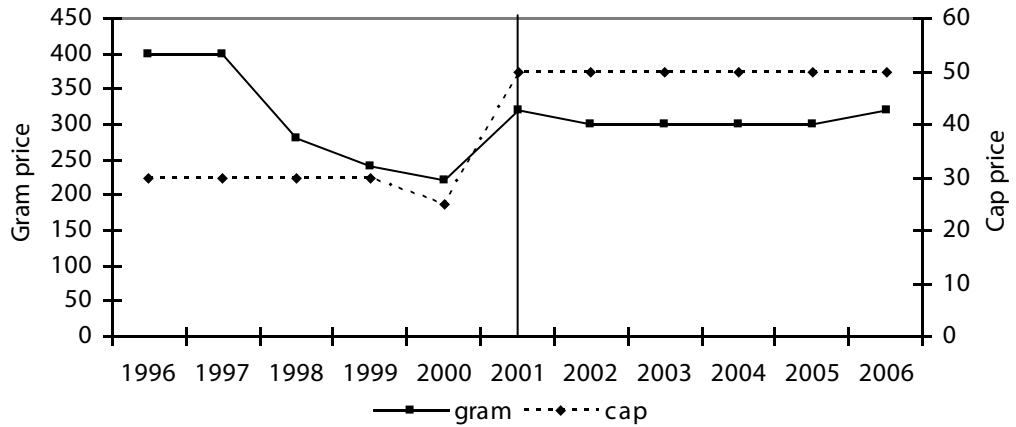
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**What was the “heroin shortage”?**

In January 2001, there was an unexpected and abrupt reduction in heroin supply that affected all Australian jurisdictions within a period of weeks. The shortage was most marked in New South Wales, the State with the largest heroin market (Day *et al.*, 2006, Degenhardt *et al.*, 2005e),

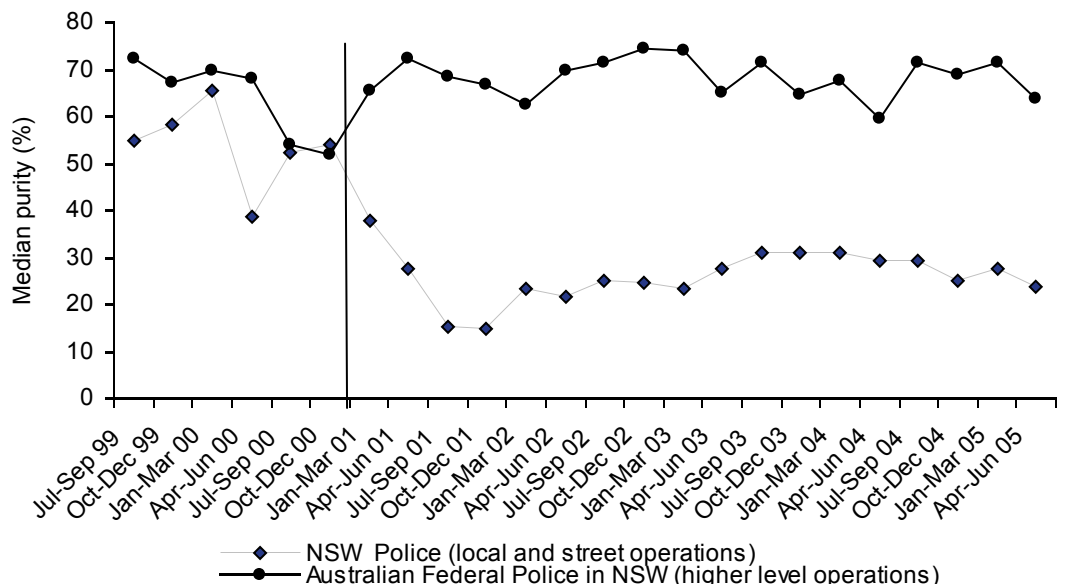
where there were increases in price, dramatic decreases in purity at the street level, and reductions in the ease with which injecting drug users (IDU) reported being able to obtain the drug (see Figures 1–3).

**Figure 1:** IDU reports of heroin gram and “cap” (street deal) prices, 1996-2006



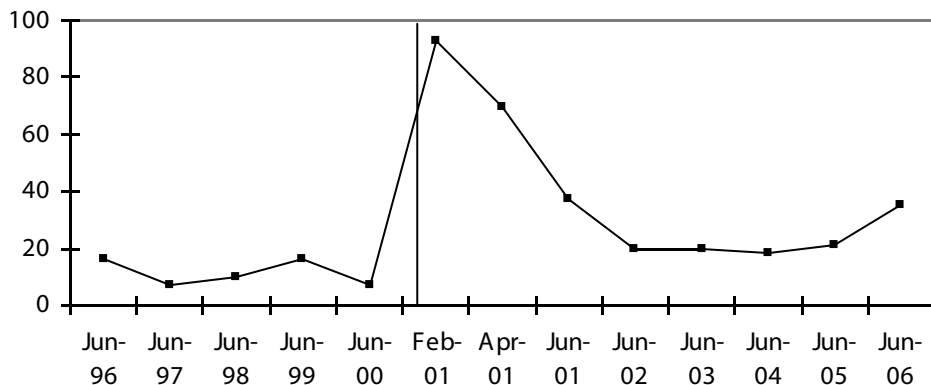
Source: NSW IDRS IDU interviews (Black *et al.*, 2007)

**Figure 2:** Purity of heroin seizures in NSW, 1999-2005



Source: ABCI 2001, 2002; ACC, 2003, 2004; 2005 (Black *et al.*, 2007)

**Figure 3:** Proportion of IDU reporting heroin had recently become more difficult to obtain, 1996-2006



Source: June estimates IDRS(Black *et al.*, 2007), February 2001 estimate from (Day *et al.*, 2006), April 2001 estimate from (Weatherburn *et al.*, 2003)

The abrupt onset of the reduction in supply and the dramatic reduction in overdose deaths prompted first a national, and later an international, debate about the causes and policy significance of what came to be called the “Australian heroin shortage” (e.g. (United Nations Office on Drugs and Crime, 2003, Tyndall, 2005, Reuter, 2005, Hao, 2005, Weatherburn, 2005). In this briefing paper<sup>4</sup> we reflect on the insights provided by research into the causes, consequences and policy implications of the reduction in heroin supply six years after it first began. We also consider some of the proposed explanations for the changes that were canvassed in the original Beckley briefing paper on the heroin shortage (Bush *et al.*, 2004), within the context of the data that we now have before us.

### Was the heroin shortage really a “shortage”?

The 1990s was a period of strong growth in heroin use in Australia. This was driven by increases in the availability of cheap and pure heroin, the creation and expansion of street drug markets in the major cities, and reflected in substantial rises in heroin related harms, such as fatal and nonfatal overdose. Some have argued that this period reflected a heroin “glut” (Dietze and Fitzgerald, 2002), and that the term “drought” implied a less than “normal” level of supply, when in fact the levels of supply in the 1990s were actually what had been unusual supply levels. They also wondered whether the improved monitoring of illicit drug markets from the mid 1990s may have increased public perceptions of increased heroin availability, and thereby heightened awareness of the subsequent reduction in 2001. Finally, they argued that it was premature to draw conclusions about the reasons for the change in the market before establishing whether it was better seen as a return to pre-“glut” conditions (Dietze and Fitzgerald, 2002).

Dietze and Fitzgerald did not dispute the fact that there was a large reduction in heroin supply; they simply suggested that the apparent extent of the change may have been amplified because it was better researched than earlier drug market events. Research has now clearly documented a very abrupt and substantial reduction in heroin supply, signalled by a sharp reduction in availability, decreased purity and

increased price (Day *et al.*, 2006, Topp *et al.*, 2002) that occurred within a month in all Australian states. We statistically investigated indicators reflecting the heroin market in NSW across time (such as overdose and heroin purity), and found that one “component” - the timing of the onset of the heroin shortage - could explain 47% of the variance across time in these indicators, while the period of the “glut” explained 8% (Gilmour *et al.*, 2006). This suggested to us that: a) the onset of the heroin shortage explained more about the heroin market than the glut and b) that the shortage and the glut were independent events (since the components are completely independent of each other).

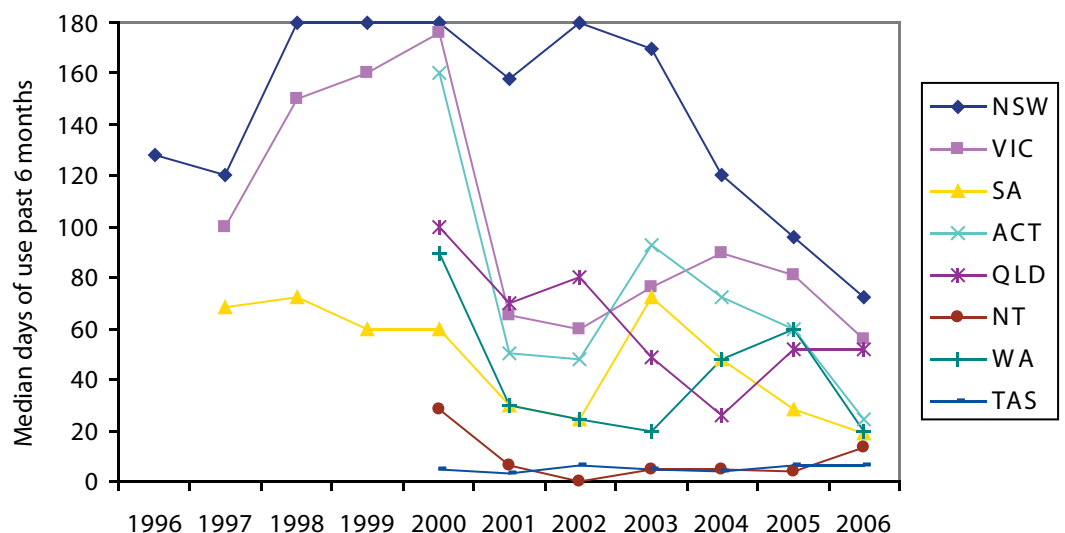
The heroin “glut” in the mid 1990s (if that is what it was) also provided important information about the heroin market, and potential explanations of why and how the shortage occurred. Specifically, the glut suggested that a relatively small number of high level trafficking groups in South East Asia might have targeted Australia as a destination country for heroin, using large-scale (and sophisticated) methods of importation to deliver unprecedented amounts of heroin to Australian cities. This was the most probable reason for the *increase* in heroin supply during this period (Degenhardt *et al.*, 2005g, Degenhardt *et al.*, 2004a). As will become clear during this briefing paper, to this date the nature and scale of the Australian heroin market appear to have been fundamentally altered – there has not been a return to the level of availability, street purity or prices that had been seen during the “glut”.

### What was the impact of the shortage on heroin use?

Heroin use markedly decreased across the country after reduction in heroin supply. In the largest heroin market of Sydney, the impact on heroin use among regular injecting drug users use was less marked in the short term than in jurisdictions where heroin supply had historically been more limited (Figure 4). In more recent years, the reduction in the frequency of heroin use among regular IDU has been sustained, and heroin use among regular IDU in Sydney has continued to drop (Figure 4).

**Figure 4:** Median days of heroin use among regular IDU who had used it, 1996-2006

Source: IDRS IDU interviews (O'Brien *et al.*, 2007)



<sup>4</sup> Some of the ideas contained within this briefing were first published in DEGENHARDT, L., DAY, C., GILMOUR, S. & HALL, W. (2006c) The “lessons” of the Australian “heroin shortage”. Substance Abuse Treatment, Prevention and Policy.

### What happened to the use of other drugs?

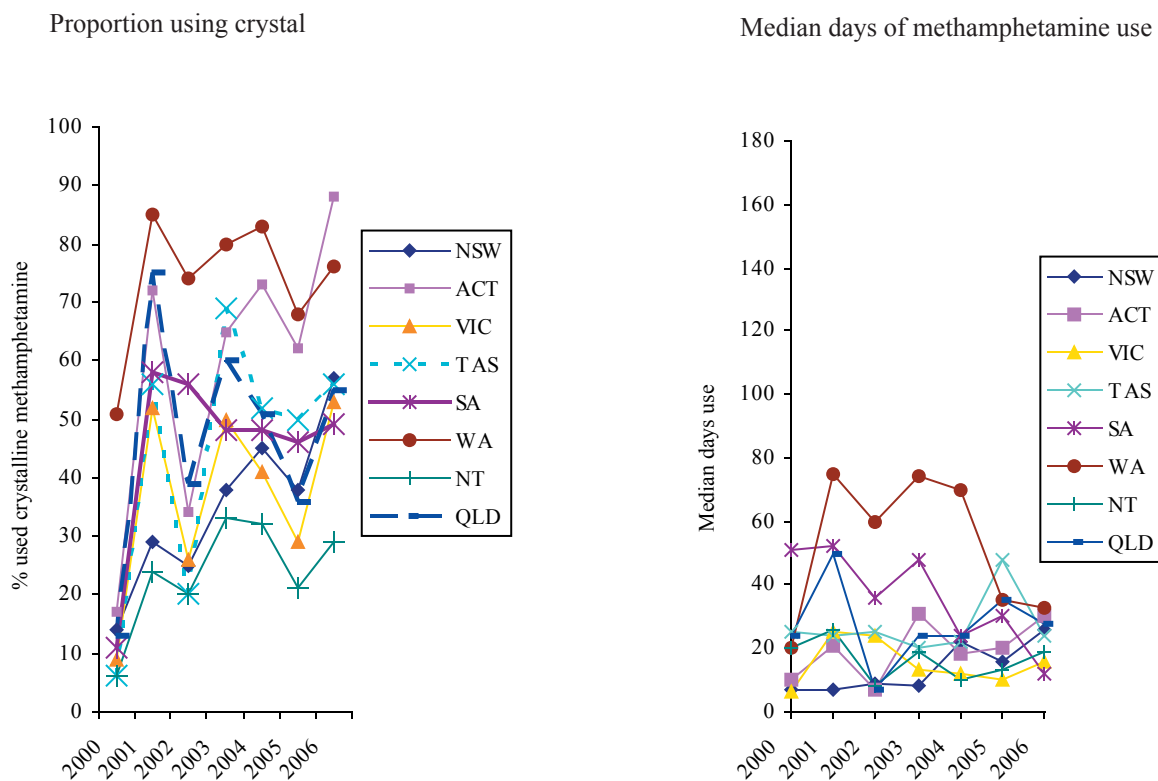
In the original BFDPP briefing paper on the heroin shortage, the authors commented upon the “flood” of stimulants (cocaine and crystal methamphetamine) that had been coming into Australia, and that this may have explained some of the changes being observed in the heroin market (Bush *et al.*, 2004). It is important to consider these possibilities.

Australia has never had a very large cocaine market – in terms of use among IDU – with the exception of some central Sydney areas (O’Brien *et al.*, 2007, Shearer *et al.*, 2005). Cocaine is available, but it is not of high purity (compared to that seen in other countries) and it is a relatively expensive drug. Use appears to be more common among those with higher socioeconomic status and those in the “dance party” scenes (Dunn *et al.*, 2007, Shearer *et al.*, 2005). Levels of cocaine injection among regular IDU in Sydney have always been higher than among those in the rest of the country, and it was certainly the case that cocaine use among this group increased in 2001 when heroin supply reduced (Roxburgh *et al.*, 2004). It appeared that this was related to the switch by street level dealers to dealing cocaine when they could not source heroin (Degenhardt *et al.*, 2005b).

An increase in methamphetamine related harms had been gradually occurring since the mid 1990s (see below). There was also evidence to suggest that crystal methamphetamine importations had been increasing in the late 1990s (as reflected in border-level seizures). It is important to note, however, that the population prevalence of methamphetamine use in Australia is far higher than that for either injecting drug use or heroin use (Australian Institute of Health and Welfare, 2005) - most methamphetamine users in Australia are therefore *not* heroin users and do *not* inject this drug. Among regular IDU, the shift to crystal methamphetamine use had not occurred before heroin supply reduced (Figure 5).

Given the continued strong demand for heroin, it is unclear why any local drug distributor would shift to distributing another drug in place of (rather than in addition to) heroin. *Local* level dealers commonly supply multiple drug types (Dunn *et al.*, 2007). During interviews with Australian Federal Police and international law enforcement personnel in South East Asia, researchers investigated a possible shift at the *international* level. The high level trafficking networks importing heroin into Australia were reportedly distinct from those importing crystal methamphetamine during this time (Degenhardt *et al.*, 2005g).

**Figure 5:** Proportion using crystal methamphetamine, and median days of methamphetamine use among regular IDU who had used it, 2000-2006



Source: IDRS IDU interviews (O’Brien *et al.*, 2007)

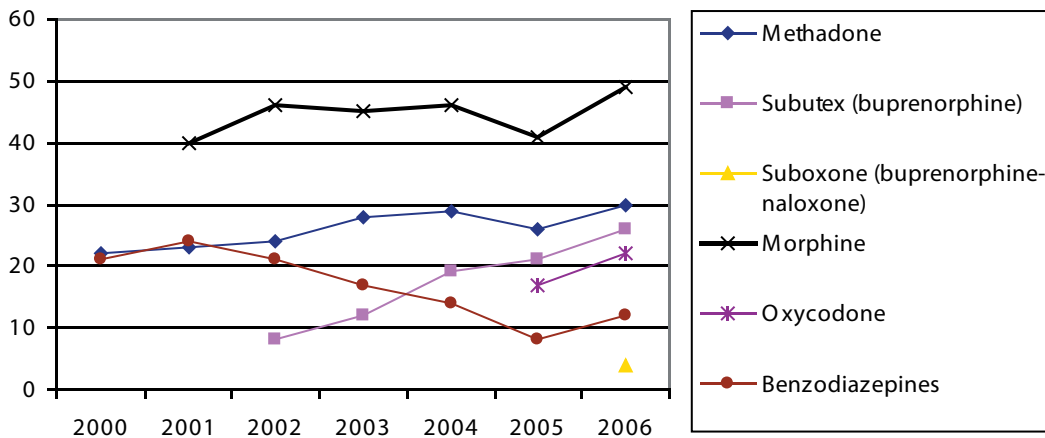
Since 2001, Australian drug monitoring systems have suggested increased injection of prescription opioids, such as morphine and oxycodone (Figure 6) (O'Brien *et al.*, 2007, Degenhardt *et al.*, 2006a). This has been more notable in jurisdictions where heroin supply has been severely affected, but has also been increasing in the Sydney (NSW) sites. There is some evidence to suggest that this is related to the limited availability and poor quality of what remains many IDUs' primary drug of choice – heroin.

**What was the impact on heroin-related harm?**

The most notable and the most important effect was an abrupt 67% reduction in fatal and nonfatal opioid overdoses (in NSW in 2001) (Degenhardt *et al.*, 2005c). Deaths in Australia due to opioids among those aged 15-54 years declined from 1116 in 1999, to 386 in 2001, and have remained at this reduced level since (Degenhardt and Roxburgh, 2007a).

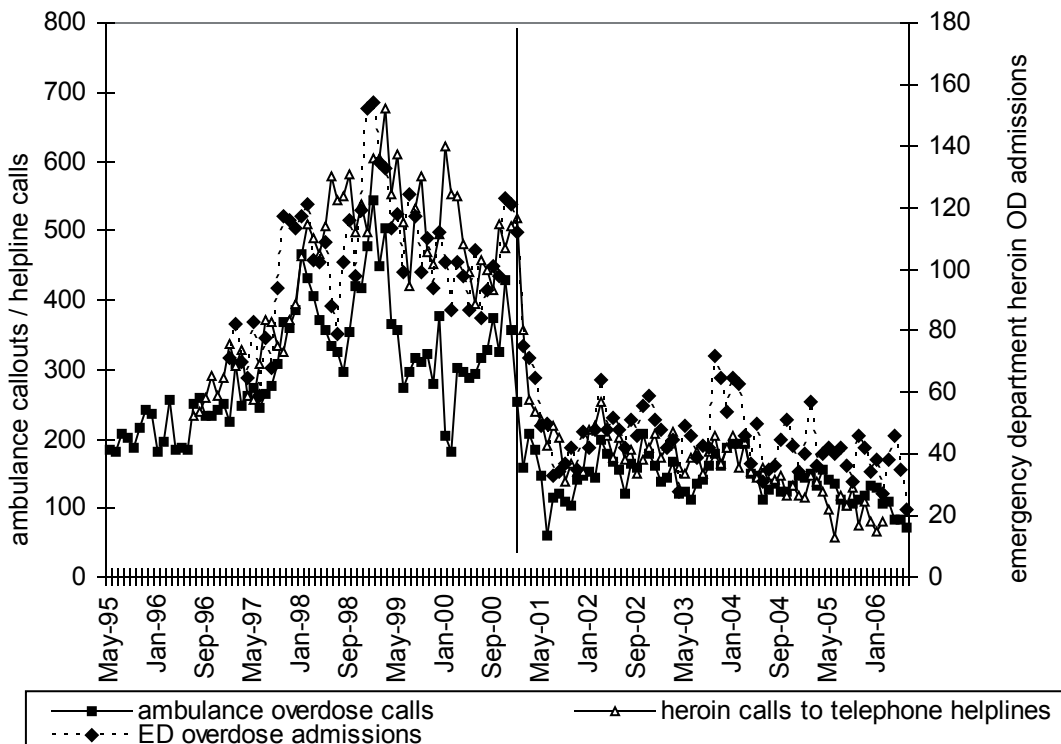
The onset of the heroin shortage led to substantial reductions in other indicators of heroin related problems in the larger Australian heroin markets in NSW and Victoria (see Figure 7 for data from NSW). Reduced heroin-related harms were the clearest, most pronounced, and least controversial changes in drug related harm following the reduction in heroin supply.

**Figure 6:** Proportion of regular IDU injecting pharmaceuticals in the past six months, 2000-2006



Source: IDRS IDU interviews (O'Brien *et al.*, 2007)

**Figure 7:** Indicators of heroin related harm in NSW, 1995-2006



Source: Forensic Toxicology Laboratory database, Division of Analytical Laboratories; NSW Health; NSW Ambulance Service; NSW Alcohol and Drug Information Service (Black *et al.*, 2007).

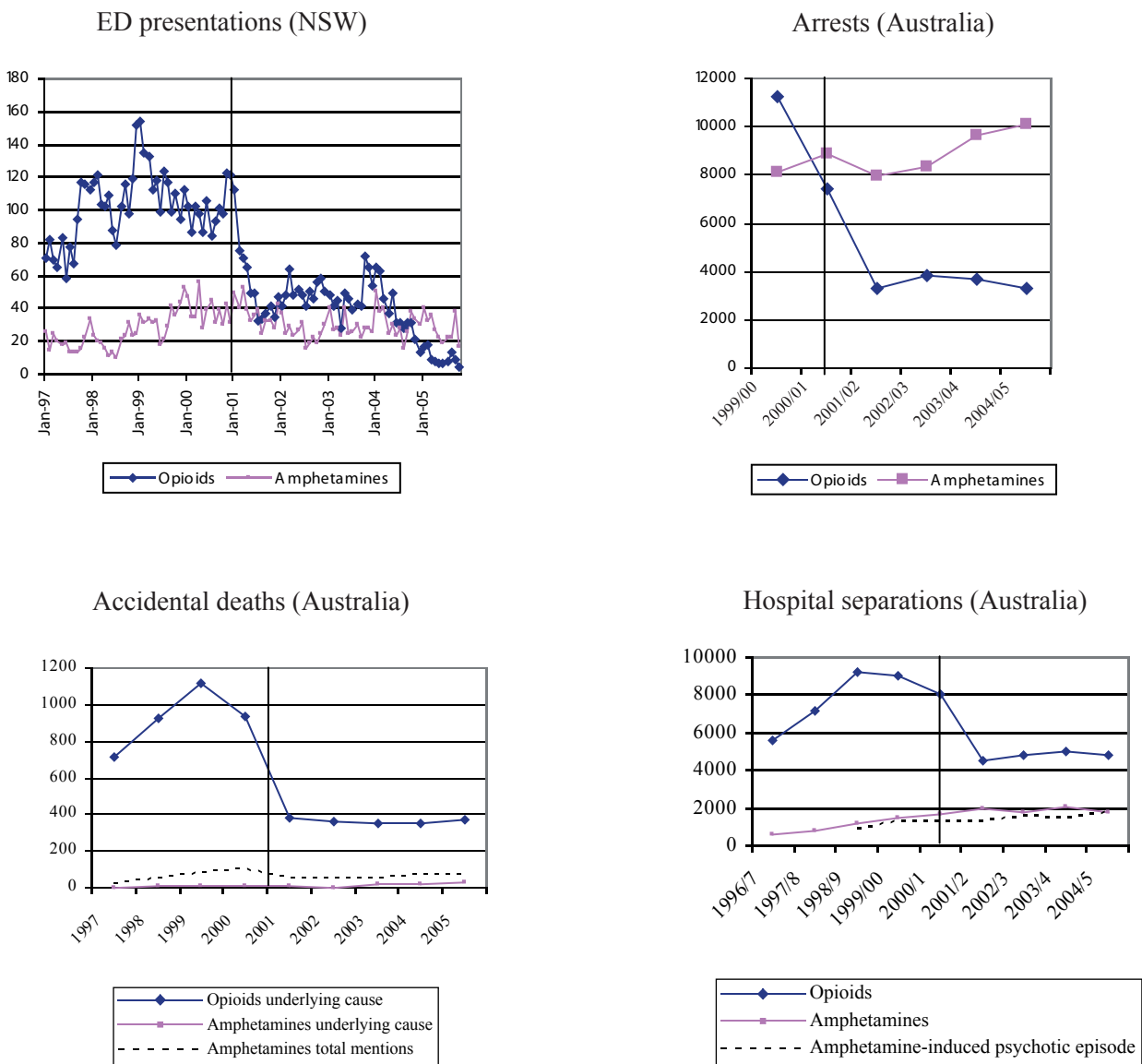
**What was the impact on other forms of drug-related harm?**

Some IDU engaged in riskier forms of injecting and reported more drug-related harms as a consequence of changes in their drug use. This was documented in earlier research on this event (Degenhardt and Day, 2004, Dietze *et al.*, 2004, Harrison *et al.*, 2004) and recent work on the incidence of hepatitis C in cohorts of at-risk IDU (Maher *et al.*, 2007).

We are less confident about ascertaining population level effects of the heroin shortage on other drug harms, because health consequences of psychostimulant drugs are poorly captured in existing data collection systems, but we were unable to detect significant *changes* associated with the heroin shortage *at the population level*.

There were no increases detected in deaths related to amphetamines, cocaine or benzodiazepines following the reduction in heroin supply (Degenhardt *et al.*, 2004a, Dietze *et al.*, 2004, Harrison *et al.*, 2004, Longo *et al.*, 2004, Smithson *et al.*, 2004). There still have not been large increases in deaths *primarily* due to psychostimulants (Degenhardt and Roxburgh, 2007b) (Figure 8), although these collections underestimate the number of deaths to which these drugs may have *contributed* (Kinner *et al.*, 2005, Darke *et al.*, 2005). There were no detectable changes in arrests, emergency presentations or hospital separations at the time of the heroin shortage (Figure 8).

**Figure 8:** Comparison of opioid and amphetamine indicators



Source: (Roxburgh and Degenhardt, 2006, Degenhardt and Roxburgh, 2007b, Degenhardt and Roxburgh, 2007a)

After 2001, hepatitis C notifications decreased (Day *et al.*, 2005). Mathematical models of the epidemic completed in the preceding year, however, had actually predicted an increase (Law *et al.*, 2003). We argued that this was probably due to a reduction in the extent of injecting drug use in major drug markets (Day *et al.*, 2004). The incidence of hepatitis C infection also did not change across time in a cohort of IDU who continued to inject, and who had been hepatitis C negative in 1999 (Maher *et al.*, 2007).

Risk and harm did occur. There was increased risk of hepatitis C infection documented among Sydney IDU who injected cocaine regularly (Maher *et al.*, 2007), and health workers, IDU and local level police in Sydney noted that there was rapid physical and psychological deterioration for IDU injecting cocaine (Degenhardt *et al.*, 2006b). Those injecting temazepam gel capsule formulations (benzodiazepines) were at high risk of serious injection related problems. More recently, the consequences of dependent methamphetamine use are becoming more evident, with drug-induced psychosis presenting a major challenge particularly to inner city emergency departments, and a very real problem especially for dependent users (McKetin *et al.*, 2006).

#### ***What was the impact on drug markets and crime?***

Street drug markets across the country shrank in size and drug sales in these markets became much more covert. There was evidence that low and mid level drug dealers shifted to distributing other drugs when heroin was less available (Dietze *et al.*, 2004, Degenhardt *et al.*, 2005b).

There were no changes in rates of property crime in Victoria and other jurisdictions (Degenhardt *et al.*, 2005e). In NSW, by contrast, there was a short-lived spike in property crimes involving violence, perhaps related to increased cocaine use among IDU (Degenhardt *et al.*, 2005f), followed by a steady fall (which had begun prior to the onset of the shortage) (Degenhardt *et al.*, 2005b). Property crime in NSW has not returned to the levels of 1999-2000 in the years since 2001 (Goh *et al.*, 2007).

#### ***What was the impact upon health and law enforcement at the local level?***

The increases in methamphetamine and cocaine use had significant impacts on health services and local law enforcement. Key experts in both areas reported dealing with increased numbers of people exhibiting the behavioural effects of heavy psychostimulant use. Specialist health services increasingly reported that their clients had significant polydrug use problems (Gibson *et al.*, 2005).

The number of people entering opioid pharmacotherapy (methadone or buprenorphine) for heroin dependence for the first time was significantly reduced (Degenhardt *et al.*, 2005a); the total number of persons in methadone or buprenorphine, however, has continued to increase since that time (O'Brien *et al.*, 2007).

#### ***What caused the reduction in supply?***

The explanations for the heroin shortage have been hotly debated (Wood *et al.*, 2006, Tyndall, 2005, Reuter, 2005, Hao, 2005, Weatherburn, 2005, Wodak, 2002, Bush *et al.*, 2004). In 2002-2003, we evaluated all hypotheses proposed to explain the shortage using all the data available to us, with the aim of ruling out the most implausible. We used data from dozens of interviews with State, national and international informants, and detailed data on the Australian and international heroin and other drug markets collected from published reports, law enforcement briefings and routine data collections (Degenhardt *et al.*, 2005g). Two researchers (Louisa Degenhardt and Linette Collins) obtained security clearances from the Australian Federal Police, the Australian Customs Service, NSW Police, the (then) National Crime Authority (now part of the Australian Crime Commission), and the (then) Office of Strategic Crime Assessment, in order to view sensitive intelligence documents and to receive briefings from law enforcement personnel in Australia and Thailand.

Despite some claims that it was solely engineered by law enforcement, we concluded that the shortage was probably due to a confluence of factors reflecting the complexity of the heroin market (Degenhardt *et al.*, 2005g). One of these factors was probably an increased success in disrupting large scale heroin importation rings by high-level Australian drug law enforcement operations that were conducted nationally and internationally by the Australian Federal Police and Customs (in cooperation with other agencies internationally). These were multiple operations that involved seizures of over 1000kg of heroin during 2000, but perhaps more importantly, which removed key individuals directing a small number of highly centralised drug trafficking networks that had imported large amounts of heroin into Australia (Degenhardt *et al.*, 2005g).

Changes in source countries (such as reduced heroin production or increased methamphetamine production) probably also played a role, but these did not explain the abrupt onset of the shortage or its near simultaneous onset in all Australian states.

Recently, Canadian researchers have reported reductions in heroin seizures and overdoses in Vancouver in 2001-2002 (Wood *et al.*, 2006). They have used these trends to question whether law enforcement played any role in the Australian heroin shortage in 2001. It is doubtful, however, that Australian heroin shortage can be wholly explained by a reduction in heroin production in source countries, for several reasons.

First, the timing of the onset of the Australian shortage can be specified to within a month and throughout the country, in late December and early January 2001. Time series analysis of monthly data on various indicators reflecting the size of the heroin market strongly pointed to the occurrence of an external "shock" to heroin supply system in January 2001 (Degenhardt and Day, 2004, Degenhardt *et al.*, 2004a, Day *et al.*, 2003, Weatherburn *et al.*, 2003). No comparable event was reported in Vancouver at the time (or since) by key informants

whom we contacted when undertaking our analyses of the reasons for Australian heroin shortage (Degenhardt *et al.*, 2004a).

Second, the size of the decrease in fatal and nonfatal overdose in Australia was much larger and more immediate than the smaller (and more gradual) decline in overdoses that was first observed in Vancouver almost a year later than Australia. The fact that the reduction was larger in Sydney and Melbourne is significant because these cities contained a much larger number of heroin users (an estimated 70,000 regular heroin users in 2000 (Degenhardt *et al.*, 2004b)) than Vancouver where there were around 2,000 heroin injectors (estimated as a multiplier of the number of overdose deaths) and where fewer than half of all injectors report daily heroin use.

Third, if we use the decline in overdose mortality in Vancouver data to estimate the contribution that declining heroin supply from source countries may have made in Australia, then it would explain at most half of the decline in Australian overdose deaths. This still leaves a role for high level law enforcement in the Australian heroin shortage.

Fourth, reduction in source country supply does not explain why a much larger reduction in heroin supply occurred earlier in Australia than in Vancouver, when Australian cities had a much larger heroin market, and were geographically much closer to source countries in the Golden Triangle.

Finally, there was never a proposal that heroin seizures directly reduced heroin supply in Australia. Rather, we argued that large seizures *deterred* a small number of criminal syndicates from importing heroin in large quantities into Australia. The amount of heroin seized in Australia, for example, was much larger than that in Vancouver in absolute size (total kg) and, perhaps more critically, in terms of the proportion of estimated market consumption (Hall *et al.*, 2000b). Such large seizures might be expected to have a larger deterrent effect on heroin importers when supply in source countries was declining.

### ***Was the heroin shortage a victory for supply reduction?***

Some might argue that the findings provide support for superiority of supply reduction over harm reduction. This ignores the fact that the reduction in heroin supply in Australia occurred in a setting in which harm reduction measures (such as increased treatment and needle and syringe programs) were well integrated with supply and demand reduction initiatives. Australia's illicit drug policy also includes both harm and demand reduction measures (Single and Rohl, 1997) such as increasing treatment places for opioid dependence and providing ready access to needle and syringe programs. The benefits of the reduction in heroin supply in Australia therefore occurred against a background of harm and demand reduction initiatives that probably reduced the severity of some of the negative consequences of reduced heroin supply for IDU.

The finding that *high-level* law enforcement operations were a contributory cause of the Australian heroin shortage (Degenhardt

*et al.*, 2005g) does not contradict other research documenting the negative effects that law enforcement activities directed at the *lowest* levels of the drug market may have on IDU (Kerr *et al.*, 2005, Maher and Dixon, 1999). For example, there is good evidence that highly visible and aggressive police activity at the local level may well result in riskier, public, and hurried injecting, and may simply displace the drug market being targeted to a nearby area (Wood *et al.*, 2004).

A contributory role of high level seizures is also not at odds with evidence that *routine* heroin seizures have little or no effect on street heroin prices, heroin use or heroin-related harm (Wood *et al.*, 2003, Weatherburn and Lind, 1997). Thanks to disruption of large scale importation, heroin seizures thought to be destined for Australia during 2000 comprised perhaps 30% of the estimated annual heroin consumption (Hall *et al.*, 2000b). This compares with 10% in studies of the effects of routine seizures on heroin price and availability. In addition, key persons arrested in these operations came from the small number of centralised drug trafficking networks that controlled the heroin market.

These factors probably combined to make Australia a less attractive destination for large scale heroin traffickers. The result seems to have been a return to older methods of importation that were used before the "glut", that is, the multiple importations of small kilogram quantities of heroin by drug couriers (O'Brien *et al.*, 2007, Australian Customs Service, 2006). This is reflected in a number of highly publicised arrests of Australian heroin "mules" in Australia, Indonesia, Hong Kong and Singapore in recent years.

### ***What are the policy implications for other countries?***

If law enforcement played some role in disrupting large scale trafficking networks that supplied Australia's heroin market, what implications does this have for other countries? We suspect that there are limited implications because there was a unique context that characterised heroin supply in Australia in the late 1990s that may not be easily reproduced in most countries. Specifically, the heroin market in Australia was characterised by the following:

- (i) a small number of highly centralised heroin importation networks,
- (ii) that were importing large quantities of heroin into
- (iii) an isolated island continent,
- (iv) that had a relatively small heroin market by world standards,
- (v) and where IDU had comparatively ready access to a range of drug treatment and harm reduction options.

The Australian shortage, and the work examining its consequences, has nonetheless produced important knowledge about the effects of drug supply reductions. A significant reduction in supply (whatever its cause) *can* substantially increase drug price and decrease purity

and availability. In such situations, dependent heroin users change their drug use patterns — they reduce their heroin use and increase



the use of other drugs, albeit (in some instances) for a limited period. This suggests that demand for heroin is price-elastic, i.e. heroin consumption and expenditure are reduced when the average price increases (Weatherburn *et al.*, 2003). The effects of the reduction in heroin use were modified by changes in the availability of other drugs, increased treatment uptake and retention, and drug substitution.

The changes in the Australian heroin market produced public health benefits, most clearly and importantly substantially reduced opioid overdose deaths and, we argue, a reduction in injecting drug use and hepatitis C infections. The public health benefits of the Australian heroin shortage need to be interpreted in the context of harm and demand reduction initiatives that may have ameliorated its impact on heroin users. Deaths attributable to opioid overdose have remained at the same level for four years post-shortage (Degenhardt and Roxburgh, 2007a), but harms related to increased use of amphetamines have increased, and some people engaged in riskier patterns of injecting, resulting in offsetting increases in harms (Maher *et al.*, 2007).

These findings are consistent with what is known about the effects of supply and control of legal drugs such as alcohol. Changing legal controls on the availability and cost (via changes in taxation) can significantly affect alcohol-related harm in communities. For example, limiting alcohol availability through reducing the number of outlets providing it is related to reduced harms; increasing taxation of alcohol is also related to reduced harm presumably through the reduced consumption of a more expensive drug (it is one of the more strongly recommended policy options) (Norstrom and Skog, 2003, Room *et al.*, 2005).

The alcohol literature also suggests that some groups are less affected by changes in alcohol availability than others (Room *et al.*, 2005), and this appears to have been the case with the Australian heroin shortage. In the case of the shortage, there were greater reductions in heroin related harms at the population level among younger age groups (Degenhardt *et al.*, 2005d). As discussed above, there was also clear documentation of *increased* risk and harm among more disadvantaged IDU, some of whom switched to benzodiazepine injection, heavy cocaine injection (and sex risk behaviours among street based sex workers), and the increased problems related to heavy and dependent methamphetamine use.

The Australian experience also suggests that combining initiatives that aim to reduce supply, demand and harm can substantially reduce the harmful effects of injecting heroin use, and minimise the harms that result when some users switch to other drug use. Having said that, there was evidence that the shifts were difficult for treatment and harm reduction services to respond to quickly (Gibson *et al.*, 2005). The flexibility and responsiveness of such services needs to be supported by sufficient and timely funding for alternative interventions, and the development of new methods for dealing with emerging drug problems among existing and new cohorts of drug users.

## ACKNOWLEDGEMENTS

The National Drug and Alcohol Research Centre (NDARC) is funded by the Australian Government Department of Health and Ageing. Much of the work on the heroin shortage by Degenhardt, Day and Hall has been supported by funding from the Australian Government Department of Health and Ageing's National Drug Law Enforcement Research Fund (NDLERF). The design, conduct, analysis, write-up and conclusions are, however, those of the study investigators. Wayne Hall's involvement in research into the topic was funded by start up funding from the University of Queensland's strategic research fund.

Degenhardt, Day and Hall would like to thank the other researchers involved in their original NDLERF study, whose hard work ensured the breadth and depth of data collection upon which they were able to review the events at hand. These included particularly: Ms Linette Collins, Ms Elizabeth Conroy, Associate Professor Paul Dietze, Ms Amy Gibson, Mr Stuart Gilmour, Mr Adam Harrison, Dr Peter Miller, and Dr Sophie Pointer. Thanks also go to the many people who reviewed the NDLERF reports, those who have debated the "heroin shortage" and its interpretation, those who provided anonymous peer review of papers and those who have encouraged the authors to criticise their own work at every step.

Finally, it is important to thank the thousands of participants who have participated in Australian studies of drug use over the past decade, the results of which have provided the basis for some of this work. Their willingness to provide sensitive information about their lives is appreciated.

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