

**Transitions between the injection of
heroin and amphetamines**

Shane Darke, Sharlene Kaye & Joanne Ross

NDARC Technical Report No. 60

Technical Report No. 60

**TRANSITIONS BETWEEN THE INJECTION
OF
HEROIN AND AMPHETAMINES**

Shane Darke, Sharlene Kaye & Joanne Ross

National Drug and Alcohol Research Centre
University of New South Wales
Australia

ISBN 0 947 2229 96 5

©NDARC 1998

TABLE OF CONTENTS

ACKNOWLEDGMENTS	vi
EXECUTIVE SUMMARY	vii
1.0 INTRODUCTION	1
1.1 Study Aims	2
2.0 METHOD	2
2.1 Procedure.... ..	2
2.2 Structured interview.....	3
2.2.1 Demographic characteristics	3
2.2.2 Drug use history	4
2.2.3 Heroin and amphetamine dependence	4
2.2.4 Needle risk behaviours.....	4
2.2.5 Heroin overdose.....	4
2.2.6 Transitions between the injection of heroin and amphetamines	4
2.2.7 Health	5
2.2.8 Social functioning	5
2.2.9 Psychological functioning.....	5
2.2.10 Criminal behaviours	5
2.3 Analyses	6
3.0 RESULTS	6
3.1 Sample characteristics.....	6
3.1.1 All subjects	6
3.1.2 Primary heroin and amphetamine injectors.....	7
3.2 Drug use history.... ..	8
3.2.1 Primary heroin injectors.....	8
3.2.2 Primary amphetamine injectors.....	9
3.3 Transitions between heroin and amphetamine injecting.....	10
3.3.1 Primary heroin injectors.....	10
3.3.2 Primary amphetamine injectors.....	13
3.3.3 Summary of transitions between heroin	

	and amphetamines.....	15
3.3.4	Predictors of transitions between heroin and amphetamine injecting	19
3.4	Comparisons of current primary heroin and amphetamine injectors	20
3.4.1	Needle risk	20
3.4.2	Health.....	20
3.4.3	Social functioning.....	20
3.4.4	Psychological functioning	20
3.4.5	Criminal behaviours	20
4.0	DISCUSSION	23
4.1	Major findings of the study.....	23
4.2	Transitions between heroin and amphetamine injecting.....	23
4.3	Age and transitions.....	24
4.4	Reasons for transitions	25
4.5	Effects of transitions on lifestyle.....	26
4.6	Comparisons of current primary heroin and amphetamine injectors	26
4.7	Summary	26
5.0	REFERENCES	28

LOCATION OF TABLES AND FIGURES

Table 1:	Demographic characteristics of primary heroin and amphetamine injectors	7
Table 2:	Drug use history of primary heroin and amphetamine injectors	9
Table 3:	Transitions between primary heroin and amphetamine injecting	11
Table 4:	Age and sex of subjects by major transition route	18
Table 5:	Comparisons of current primary heroin and amphetamine injectors	22
Figure 1:	Summary of major transition routes between heroin and amphetamines.....	16

ACKNOWLEDGMENTS

This research was funded by the Commonwealth Department of Health and Family Services. We also wish to thank Lisa Maher for her assistance in recruitment in south western Sydney.

In order to examine transitions between heroin and amphetamine injecting, structured interviews were conducted with 151 primary heroin injectors and 145 primary amphetamine injectors. Four major sub-groups were examined: i) current heroin injectors who initially injected heroin (N=91), ii) current heroin injectors who initially injected amphetamines (N=60), iii) current amphetamine users who initially injected amphetamines (N=121) and iv) current amphetamine users who initially injected heroin (N=24).

The major finding of this study was the complexity of transition patterns between primary injection of the two drug classes. Six major transition pathways were detected among these subjects: heroin-amphetamines-heroin (N=30), heroin-heroin (N=61), amphetamines-heroin (N=60), heroin-amphetamines (N=24), amphetamines-amphetamines (N=80) and amphetamines-heroin-amphetamines (N=41). While the transition from amphetamines to heroin injecting was more common than the reverse case, there was substantial movement in both directions. A simple pattern in which the move to heroin injection is viewed as an endpoint in terms of drug use career does not fit the complexity of transitional movement.

The main reasons given by subjects who had moved from injecting amphetamines to heroin related to a dislike of the negative physical and psychological effects of regular amphetamine use. Reasons for moving from heroin to amphetamines were more diverse and included the physical effects of heroin and the associated lifestyle, the positive effects of amphetamines such as energy and euphoria, and the injection of amphetamines for intoxicating effects whilst maintained on methadone. A transition from amphetamine to heroin was associated with more frequent injection, more money spent on drugs and more frequent crime.

Current primary heroin injectors appeared more socially dysfunctional in terms of crime, unemployment and general social adjustment. However, primary amphetamine injectors had higher levels of current polydrug use, were no less likely to have recently shared used injecting equipment, and had the similar levels of general and psychiatric health to primary heroin injectors.

While, overall, there was a small preponderance of movement from primary amphetamine injecting to primary heroin injecting, there was considerable movement in both directions. Contrary to expectation, heroin use is not necessarily a stable endpoint for injecting careers, but is in many cases simply a further transition in primary drug use.

1.0 INTRODUCTION

Injecting drug users (IDU) typically have long histories of polydrug use¹⁻⁵. In a recent study of Australian heroin users, the mean number of drug classes ever used by subjects was 9.0, with 5.3 classes used in the preceding six months³. A similar picture has emerged for primary amphetamine users, who appear to have even wider polydrug use patterns². Recent studies have also indicated that IDU meet the criteria for a large number of dependence diagnoses, both lifetime and current³⁻⁵. Such results are consistent with the model proposed by Kandel⁶, in which illicit drug users are argued to progress through sequential stages of drug use, commencing with the use of the licit drugs alcohol and tobacco, progressing to the use of cannabis and finally to other illicit drugs.

There is evidence that the use of heroin is increasing in Australia. The number of heroin overdose fatalities has increased markedly during the 1990s⁷, and there have been increasing demands for treatment of heroin dependence in recent years^{8,9}. The average age of heroin users has also dropped in recent years, indicating the introduction into heroin use of new, younger users^{8,9}. This apparent increase in heroin use has caused considerable concern.

Amphetamines and heroin are the two most commonly injected drugs in Australia. One possible factor behind the increase in heroin use is increasing numbers of regular injecting amphetamine users making a transition to regular injecting heroin use. This observation has been made by both IDU themselves and drug service personnel^{8,9}. Recent Australian studies of heroin users have also indicated that approximately a half of current heroin users injected amphetamines before they began injecting heroin^{3,9}. Amphetamine injectors are also typically younger than samples of heroin users, indicating that they may possibly be at an earlier stage of an IDU career². Certainly the high purity of Sydney heroin and its relatively low price may make heroin an attractive option⁸⁻¹⁰. Given the large increase in amphetamine use that occurred in Australia during the mid-1980s to mid-1990s¹¹, the route from amphetamine

injecting to heroin injecting may provide a large number of new recruits to heroin use.

Studies of transitions in drug use are a recent phenomenon¹²⁻¹⁵. These studies have examined transitions between routes of administration within a drug class, in particular the transition from oral or intranasal use to injecting the drug. Such studies have examined transitions between routes of administration of heroin^{13,15}, amphetamines¹² and benzodiazepines¹⁴. To date, however, no study has examined transitions *between* the injection of different drug classes. In order to ascertain the degree of movement between the primary injection of amphetamines and of heroin, the current study used the methodologies developed in the earlier studies of routes of administration *within* drug classes. Given the data and observations cited above, it was anticipated that the overwhelmingly predominant transition between drug classes would be from primary amphetamine injecting to primary heroin injecting.

The study also provided an opportunity to directly compare the drug use and psychosocial functioning of current primary heroin and amphetamine injectors.

1.1 Study Aims

The major aims of the study were as follows:

- i) To ascertain the extent of transitions between injecting amphetamine use and injecting heroin use;
- ii) To determine what factors are associated with such transitions;
- iii) To compare the drug use history and psychosocial functioning of current primary heroin and amphetamine users

2.0 METHOD

2.1 Procedure

All subjects were volunteers who were paid A\$30 for their participation in the study. Recruitment took place from April 1997 to January 1998, by means of

advertisements placed in rock magazines, dance party magazines, local papers, needle exchanges, methadone maintenance clinics and by word of mouth.

Subjects contacted the researchers by telephone and were screened for eligibility for the study. To be eligible, subjects had to have injected heroin and/or amphetamines at least once a month during the preceding six months.

Each interview was conducted in a location determined by the subject in an attempt to allay any hesitations they might have about participating in the study. Subjects were guaranteed, both at the time of screening and interview, that any information they provided would be kept strictly confidential. All interviews were conducted by one of the research team and took between 45 and 60 minutes.

2.2 *Structured Interview*

A structured interview was constructed that examined demographics, drug use history, injection related risk-taking, social functioning, criminal behaviour, health and psychological functioning. A specific section was constructed to address heroin and amphetamine use history, and the circumstances and reasons for transitions between heroin and amphetamine use. Subjects were asked whether they thought of themselves as a primary heroin or a primary amphetamine user. The definition of making a transition to another drug as their main drug was that it became their primary drug for a period of a month or longer. This definition is consistent with the definition used in the studies of transitions between routes of heroin administration discussed above^{13,15}.

The areas covered by the interview are outlined in detail below.

2.2.1 Demographic characteristics

The demographic details obtained included: the subject's gender, age, suburb of residence, level of high school and tertiary education, employment status, drug treatment history and prison record.

2.2.2 Drug use history

In order to gain an indication of overall drug use, respondents were asked which drug classes they had ever used, which ones had they ever injected, and which ones had they injected in the last 6 months. An estimation of how many days they had used each of the drug classes during the 6 months preceding interview was also sought. Further questions were asked about the first drug ever injected and how old they were when they first injected.

2.2.3 Heroin and amphetamine dependence

Current dependence on heroin and amphetamines were measured using the Severity of Dependence Scale (SDS)¹⁶. This is a 5-item scale that measures psychological dependence over the preceding 12 months. Scores range from 0-15, with higher scores being indicative of a higher degree of dependence on the particular drug.

2.2.4 Needle risk behaviours

The needle risk component of the Opiate Treatment Index (OTI)¹⁷ was used in assessing injecting behaviours in the month preceding interview that placed respondents at risk of either contracting or transmitting blood borne viruses.

2.2.5 Heroin overdose

Those subjects who had ever used heroin were asked how many times they had overdosed, how long since they had last overdosed, whether they had ever been administered naloxone, whether they had witness another person overdose and how long since they had witnessed an overdose.

2.2.6 Transitions between the injection of heroin and amphetamines

Subjects were asked about their heroin and amphetamine use history, about transitions between primary injection of the two drugs, circumstances and reasons for transitions, consequences of transitions and likelihood of the occurrence of further transitions.

2.2.7 Health

The Health Scale of the OTI was used to gain some indication of the respondent's current state of health. This scale is divided into items addressing signs and symptoms in each of the major organ systems, with one section specifically focusing on injection-related health problems. Scores range from 0-52. The higher the score obtained, the poorer the overall health of the subject.

2.2.8 Social functioning

The Social Functioning scale of the OTI was administered. The scale measures social adjustment, social support and drug culture involvement over the preceding six months. The scale ranges from 0-48. Higher scores indicate poorer social functioning.

2.2.9 Psychological functioning

Psychological adjustment was assessed using the 28 item version of the GHQ¹⁸. This scale gives a global measure of non-psychotic psychopathology and is made up of the following 4 sub-scales: Somatic symptoms, Anxiety, Social dysfunction and Depression. Global scores range from 0-28, with 4/5 being the most commonly used cut-off point in determining the number of 'cases' of psychopathology in a sample.

2.2.10 Criminal behaviours

The Criminality Scale of the OTI was used to measure property crimes, drug dealing, fraud and violent crimes committed during the month preceding interview. The scale has a range of 0-16. Higher scores denote greater criminal involvement.

2.3 Analyses

For continuous variables t-tests were employed. Categorical variables were analysed using χ^2 . Corresponding odds ratios (O.R.) and 95% confidence intervals (95% C.I.) were calculated. Where distributions were highly skewed, medians were reported. Relationships between age and major transition paths were examined by

ANOVA and subsequent planned comparisons. In order to determine which factors were independently associated with transitions between drug classes, multiple logistic regressions were conducted. Backwards elimination of variables was used to select the most appropriate models. All analyses were conducted using SYSTAT¹⁹.

3.0 RESULTS

3.1 *Sample Characteristics*

3.1.1 All subjects

The sample consisted of 296 regular injecting heroin and amphetamine users, recruited from all areas of Sydney. These comprised 151 current primary heroin users and 145 current primary amphetamine users. The mean age of subjects was 27.9 years (SD 7.3, range 16-57), with 60% being male. The mean years of formal school education was 10.4 (SD 1.6, range 5-12). Twenty eight percent of subjects had completed a trade or technical course, and 8% had completed a university course. The majority of subjects (68%) were currently unemployed, with 14% in full-time employment, and a further 15% in part-time/casual employment. Twenty eight percent of subjects reported a history of imprisonment.

Thirty percent of subjects were currently enrolled in a drug treatment program, for a median length of 18 months (range 1-144 months). The overwhelming majority of these (79/90) were enrolled in methadone maintenance programs, and the mean dose was 67.4 mg (SD 36.3, range 7.5-180 mgs).

3.1.2 Primary heroin and amphetamine injectors

The demographic characteristics of the groups of primary heroin and amphetamine injectors are presented in Table 1.

Table 1: Demographic characteristics of primary heroin and amphetamine injectors

Variable	Primary heroin users (N=151)	Primary amphetamine users (N=145)
Age (mean yrs) (SD, range)	29.0 (7.8, 16-57)	26.6 * (6.5, 16-44)
Sex (% male)	57	62
Education (mean yrs) (SD, range)	9.9 (1.7, 5-12)	10.8 * (1.4, 6-12)
Unemployed (%)	82	52 *
In drug treatment (%)	52	12 *
Prison record (%)	44	12 *

* *Statistical difference exists between groups*

Primary heroin injectors were, on average, older than primary amphetamine injectors (29.0 v 26.6, $t_{294}=2.9$, $p<.01$) and had fewer years of education (9.9 v 10.8, $t_{294}=5.0$, $p<.001$). They were also more likely to be unemployed (82% v 52%, OR 4.2, 95% CI 2.5-7.1), to be enrolled in drug treatment (52% v 12%, OR 6.4, 95% CI 3.6-11.6), and to have a prison record (44% v 12%, OR 5.5, 95% CI 3.0-9.9). There was no difference between the proportions of males in each group.

3.2 *Drug use history*

3.2.1 Primary heroin injectors

The mean age at the time of first injection was 18.4 yrs (SD 4.0, range 9-33). The mean age at the time of first heroin use was 19.1 yrs (SD 4.1, range 11-34). The routes of initial heroin use were: injection (72%), smoking (20%), nasal (8%) and oral (1%). Heroin had been used for a median of 111 days (range 6-180) in the six months preceding interview. The mean SDS score for heroin dependence was 8.9

(SD 3.7, range 0-15). Fifty six percent of primary heroin users had experienced an overdose, 28% in the preceding 12 months.

Drug classes ever used and used in the preceding six months are presented in Table 2. Polydrug use was extensive among primary heroin injectors. This group had used a lifetime mean of 8.5 (SD 2.7, range 2-10) drug classes, and 5.9 (SD 1.7, range 2-10) in the preceding six months. The most common drugs used in the preceding six months apart from heroin were tobacco (92%), cannabis (88%) and benzodiazepines (76%). Primary heroin users had injected a mean of 3.5 (SD 1.4, range 1-6) drug classes, and 2.2 (SD 1.2, range 0-6) in the preceding six months. In terms of the current study, it should be noted that 87% of the primary heroin users had used amphetamines, and 49% had done so in the preceding six months.

Table 2: Drug use history of primary heroin and amphetamine injectors

Drug Class	Primary heroin IDU (N=151)		Primary amphetamine IDU (N=145)	
	Ever used %	Used last 6 months %	Ever used %	Used last 6 months %
Heroin	100	100	81	68
Amphetamines	87	49	100	100
Other opiates	66	43	55	23
Cocaine	73	38	83	47
Hallucinogens	85	24	96	59
Benzodiazepines	92	76	86	63
Alcohol	98	73	99	92
Cannabis	98	88	100	85
Inhalants	51	9	79	33
Tobacco	97	92	97	88
Mean no. drug classes	8.5	5.9	8.8	6.5

3.2.2 Primary amphetamine injectors

The mean age of first injection was 18.8 yrs (SD 3.5, range 13-32). The mean age of first amphetamine use was 17.2 yrs (SD 2.8, range 10-28). The routes of initial amphetamine use were: nasal (60%), injection (21%) and oral (19%). Amphetamines had been used for a median of 53 days (range 2-180) in the six months preceding interview. The mean SDS score for amphetamine dependence was 5.6 (SD 3.4, range 0-14).

Polydrug use was extensive among the primary amphetamine injectors (Table 2). Primary amphetamine users had used a mean of 8.8 (SD 1.6, range 3-10) drug classes, and 6.5 (SD 1.6, range 2-10) in the preceding six months. The most common drugs used in the preceding six months apart from amphetamines were alcohol (92%), tobacco (88%) and cannabis (85%). Primary amphetamine users had injected a mean of 3.4 (SD 1.4, range 1-6) drug classes, and 2.2 (SD 1.0, range 1-6) in the preceding six months. Eighty one percent of primary amphetamine injectors had used heroin, and 68% had done so in the preceding six months.

Compared to primary heroin users, primary amphetamine users had used significantly more drug classes in the preceding six months (6.5 v 5.9, $t_{294}=3.2$, $p<.01$). There were no differences between groups in the age of first injection, the number of drug classes ever used, number of drug classes ever injected, or number of drug classes injected in the preceding six months.

3.3 Transitions between heroin and amphetamine injecting

For the purposes of analysis, subjects were divided into four groups: i) current primary heroin users who injected heroin prior to amphetamines, or had never injected amphetamines (N=91); ii) current primary heroin users who had injected amphetamines prior to injecting heroin (n=60); iii) current primary amphetamine users who had injected amphetamines prior to heroin, or had never injected heroin (N=121); iv) current primary amphetamine users who injected heroin prior to injecting amphetamines (N=24).

3.3.1 Primary heroin injectors

i) Heroin first

Ninety one of the 151 primary heroin users (60%) had injected heroin prior to injecting amphetamines (N=67), or had never injected amphetamines (N=24) (Table 3). The mean age of this group was 28.8 yrs (SD 8.9, range 16-57 yrs) and

55% were male.

Table 3: Transitions between primary heroin and amphetamine injecting

Group	Percentage
<p><i>Primary heroin injectors</i> (N=151)</p> <p>i) Injected heroin first (N=91):</p> <p>Ever injected amphetamines 74</p> <p>Amphetamines ever main drug 33</p> <p>ii) Injected amphetamines first (N=60):</p> <p>Ever injected amphetamines 100</p> <p>Amphetamines ever main drug injected 67</p>	
<p><i>Primary amphetamine injectors</i> (N=145)</p> <p>iii) Injected amphetamines first (N=121):</p> <p>Ever injected heroin 70</p> <p>Heroin ever main drug 34</p> <p>iv) Injected heroin first (N=24):</p> <p>Ever injected heroin 100</p> <p>Heroin ever main drug injected 63</p>	

A third (30/90) of this group of current primary heroin users reported that there had been a period after the commencement of regular heroin use when they had made a transition to amphetamines as their main drug. The median length of time in which amphetamines was the main drug of these subjects was 7.5 mths (range 1-144 mths).

Subjects who had made a transition from heroin use to amphetamine use were asked why they had made a further transition back to heroin. The three main reasons were a dislike of the negative psychological effects of amphetamines (15/30), a dislike of the negative physical effects of amphetamines (12/30) and liking the effects of heroin (6/30).

Only 6% of these 91 subjects thought it likely that amphetamines would become their main drug in the future.

ii) *Amphetamines first*

Sixty (40%) of the primary heroin users had injected amphetamine prior to injecting heroin. The mean age of this group was 29.4 yrs (SD 5.9, range 19-47 yrs) and 60% were male. Amphetamines were the main drug used prior to the injection of heroin in two thirds of these subjects (45 cases).

The median time between commencing to inject heroin and it becoming their main drug was 1.5 mths (range 1-120 mths). After heroin become their main drug, only 10% (6/60) of this group reported a period in which amphetamines became their main drug. The median length of time for which amphetamines was the main drug for these six subjects was 7.5 mths (range 1-48).

When asked the reasons why heroin became the main drug of these initial amphetamine injectors, the three most common responses were that they liked the effects of heroin (35/60), that heroin reduced their psychological distress (11/60), and that they did not like the negative psychological effects of

amphetamines (7/60). At the time of their transition to primary heroin use, 45% had a heroin using regular sexual partner, 28% a non-heroin using partner and 27% had no partner.

After heroin became the main drug of this group, the majority reported that they spent more money on drugs than previously (82%) and they injected drugs more frequently (88%). Over half (59%) reported that they either increased the amount of crime that they committed, or started to commit crime, after heroin became their main drug. Only 2% reported they committed less crime.

Only 7% of these primary heroin users thought it likely that they would ever switch to amphetamines as their main drug.

3.3.2 Primary amphetamine injectors

iii) Amphetamines first

One hundred and twenty one (83%) of the 145 primary amphetamine users had injected amphetamines prior to ever injecting heroin (N=85), or had never injected heroin (N=36). The mean age of this group was 26.2 yrs (SD 5.9, range 16-43 yrs) and 60% were male.

After the commencement of regular amphetamine use, 34% (41/121) reported that there had been a period when they had made a transition in which heroin had become their *main* drug. The median length of time for which heroin was the main drug of these subjects was 24 mths (range 1-252 mths).

Those subjects who had made a transition from amphetamine use to heroin use were asked why they had made a further transition back to amphetamines as their main drug. The three main reasons were a dislike of the physical effects of heroin (9/41), being sick of the heroin lifestyle (7/41), and using amphetamines as an intoxicant while being enrolled in methadone maintenance (7/41). The remaining reasons were extremely varied.

Thirteen percent thought it likely that they would use heroin again as their main drug.

iv) *Heroin first*

Twenty four (17%) of the primary amphetamine users had injected heroin prior to injecting amphetamines. The mean age of this group was 28.7 yrs (SD 8.6, range 17-44 yrs) and 71% were male.

In 63% (15/24) of these subjects heroin was the main drug they used prior to the injection of amphetamines. The median time between commencing to inject amphetamines and it becoming their main drug was 6 mths (range 1-336 mths). After amphetamines became their main drug, 29% (7/24) of this group reported a period in which heroin became their main drug. The median length of time for which heroin was the main drug for these six subjects was 12 mths (range 1-48).

When asked the reasons why amphetamines became the main drug of these initial heroin injectors, the most common responses were that it increased their energy levels (9/24), a liking of the euphoric effects of amphetamines (4/24), that they were able to work (3/24) and that they did not like the psychological effects of heroin (3/24).

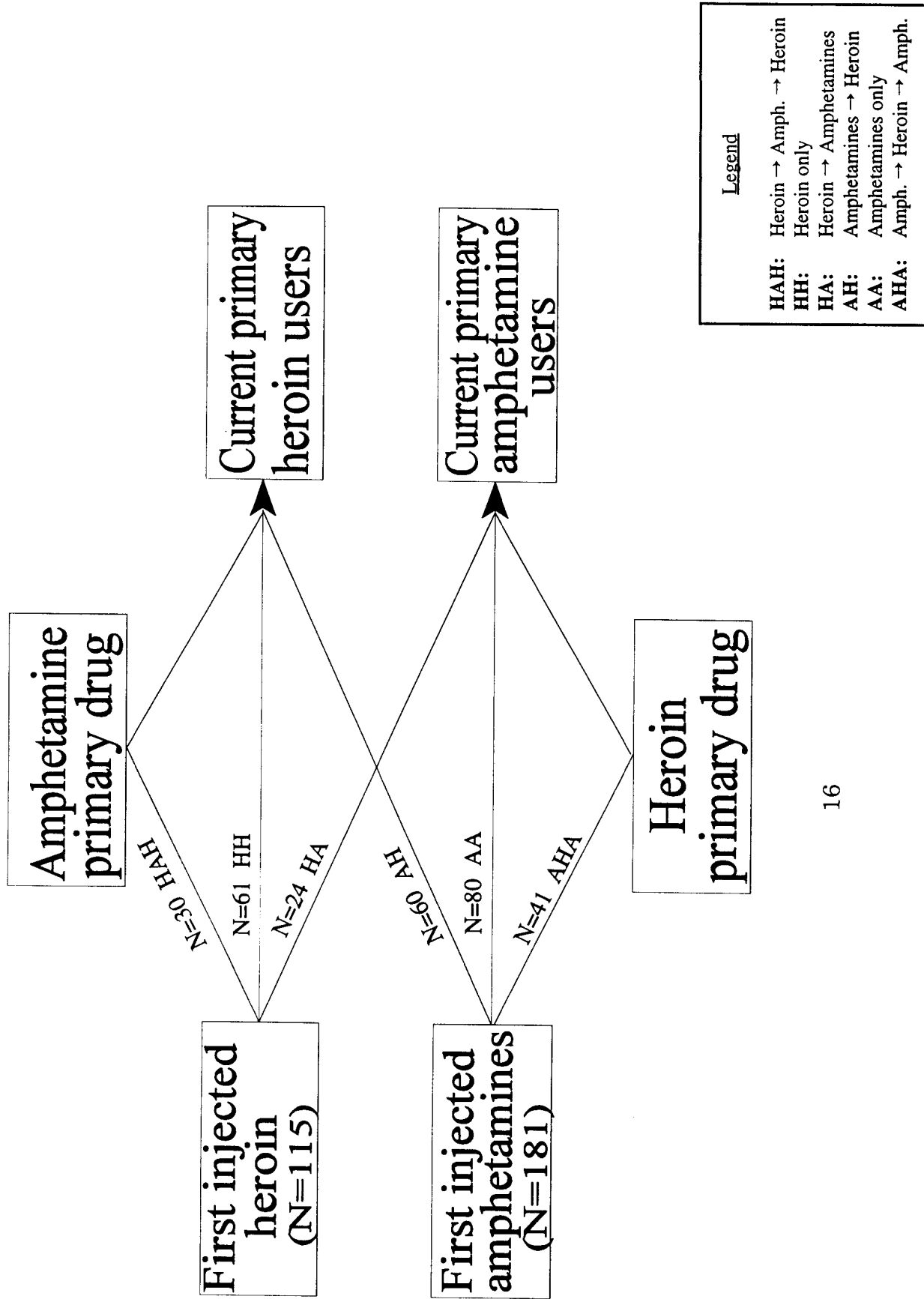
After amphetamines became the main drug of group iv subjects, 42% stated that they spent more money on drugs, and 46% that they spent less money. Three quarters believed that they injected more frequently after amphetamines became their main drug. Only 21% reported that they either increased the amount of crime that they committed or started to commit crime after amphetamines became their main drug. At the time of their transition to primary amphetamine use, 46% had an amphetamine using regular sexual partner, 17% a non-amphetamine using partner and 38% no partner.

Seventeen percent (4/24) of these amphetamine users thought it likely that they would ever switch to heroin as their main drug.

3.3.3 Summary of transitions between heroin and amphetamines

The major transitions between drug classes are depicted in Figure 1. The six major transition routes are labelled as follows: HAH (heroin-amphetamine-heroin, N=30), HH (heroin-heroin, N=61), AH (amphetamines-heroin, N=60), HA (heroin-amphetamines, N=24), AA (amphetamines-amphetamines, N=80) and AHA (amphetamines-heroin-amphetamines, N=41).

Figure 1: Summary of major transition routes between heroin and amphetamines



Among current primary heroin injectors, 40% had injected amphetamines prior to heroin (route AH). Conversely, among current primary amphetamine injectors, only 16% had injected heroin prior to the injection of amphetamines (route HA). Although the majority of subjects (61%, N=181) had injected amphetamines prior to heroin (or had never injected heroin), 51% of subjects were now primary heroin users. While the transition from amphetamines to heroin predominated among these subjects, there had been considerable crossover between drug classes in both directions. Thirty (20%) of the 151 current primary heroin users had first injected heroin and subsequently used amphetamines as their main drug (route HAH). Similarly, 41 (28%) of the 145 current primary amphetamine users had first injected amphetamines, and subsequently used heroin as their primary drug (route AHA).

The picture may alternatively be examined from the starting point, i.e. first injected heroin or amphetamines. Forty seven percent of subjects who first injected heroin were either current primary amphetamine users or had used amphetamines as their primary drug at some point in time (routes HAH and HA). Fifty six percent of those subjects who first injected amphetamines were either current primary heroin users or had used heroin as their primary drug at some time (routes AH and AHA).

The age and sex demographic characteristics of subjects analysed by transition route are presented in Table 4.

Table 4: Age and sex of subjects by major transition route

Route	Age (Yrs)	% Male
<i>Primary heroin users (N=151)</i>		
HAH: heroin-amphetamine-heroin (group i) N=30	33.9	53
HH: heroin-heroin (group i) N=61	26.2	56
AH: amphetamine-heroin (group ii) N=60	29.4	60
<i>Primary amphetamine users (N=145)</i>		
HA: heroin-amphetamine (group iv) N=24	28.7	71
AA: amphetamine-amphetamine (group iii) N=80	24.4	56
AHA: amphetamine-heroin-amphetamine (group iii) N=41	29.9	68

In order to determine whether there were significant age differences among primary heroin users related to the major transition routes (HAH, HH, AH), an ANOVA was conducted. There was a significant main effect of transition route ($F_{2,148}=11.3$, $p<.001$). Contrasts revealed that subjects who became current primary heroin users via route HAH were significantly older than route AH subjects (33.9 v 29.4 yrs, $F_{1,148}=22.4$, $p<.001$) who were, in turn, significantly older than route HH subjects (29.4 v 26.2 yrs, $F_{1,148}=5.8$, $p<.05$). The youngest group of primary heroin users were those who had initially injected heroin and had not used amphetamines as their main drug.

There were also significant differences in age between subjects who had taken different transition routes (HA, AA, AHA) among current primary amphetamine users ($F_{2,142}=13.2$, $p<.001$). Subjects who became current amphetamine users via route AA were significantly younger than either subjects in route HA (24.4 v 28.7 yrs, $F_{1,142}=9.7$, $p<.01$) or route AHA (24.4 v 29.9 yrs, $F_{1,142}=23.1$, $p<.001$). There was no significant difference between the ages of current amphetamine users who progressed by routes HA (29.7 yrs) or AHA (29.9 yrs). Thus, primary amphetamine users who initially injected amphetamines, and had never used heroin as their main drug, were significantly younger than other primary amphetamine users.

There were no significant differences in the proportions of males represented in the major transition routes for either current primary heroin users (routes HAH, HH, AH) or current primary amphetamine users (routes HA, AA, AHA).

While minorities of both current primary heroin and amphetamine users regarded it as likely that would make a transition to the other drug, a significantly higher proportion of amphetamine users said so (14% v 6%, OR 2.5, 95% CI 1.1-5.7).

3.3.4 Predictors of transitions between heroin and amphetamine injecting

In order to determine the independent factors associated with a transition between amphetamine and heroin injecting, logistic regressions were conducted. Variables entered into the model predicting a transition between drug classes were: age, sex (males=1, females=0), drug first injected (heroin=0, amphetamines=1), school education (yrs) and length of time since initial injection of amphetamines/heroin (yrs). The final model indicated drug first injected (OR 1.97, 95% CI 1.14-3.38) and length of time since initial injection of amphetamines/heroin (OR 1.16, 95% CI 1.11-1.21) to be independent predictors of a transition. The results indicate that, after taking other factors into account, the

odds of initial amphetamine injectors making a transition to heroin were approximately twice those of the reverse case, and that the odds of any transition increase by 16% for each year since initial injection. The regression equation was significant (χ^2 , 2df= 65.2, $p < .001$), and had a good fit (Hosmer-Lemeshaw $\chi^2=6.7$, $p < .46$).

3.4 Comparisons of current primary heroin and amphetamine injectors

Comparisons were made between current primary heroin and amphetamine injectors (Table 5). Comparisons of drug use histories were presented in section 3.2.2 (above).

3.4.1 Needle risk

There were no significant differences in the proportions of primary heroin and amphetamine injectors who had borrowed (14% v 10%) or lent (24% v 21%) used injecting equipment during the month preceding interview (Table 5).

3.4.2 Health

There was no significant difference between the OTI health scores of primary heroin and amphetamine injectors (18.8 v 18.0).

3.4.3 Social functioning

Primary heroin injectors had significantly higher OTI social functioning scores than primary amphetamine injectors (21.6 v 17.1), indicating poorer current social functioning (Table 5).

3.4.4 Psychological functioning

There were no significant differences between the GHQ scores of primary heroin and amphetamine injectors (9.9 v 9.3), or in the proportions of each group who exceeded the 4/5 cut-off for "caseness" (71% v 70%).

3.4.5 Criminal behaviours

While there was no significant difference in the proportions of primary heroin and amphetamine injectors who had committed crime in the preceding month (57% v 54%), primary heroin injectors had significantly higher OTI crime total scores (1.9 v 1.3, $t_{294}=2.6$, $p<.01$), indicating higher degrees of criminal involvement (Table 5). Thus, while no more likely to have committed crime, heroin injectors committed crimes more frequently than amphetamine injectors.

Table 5: Comparisons of current primary heroin and amphetamine injectors

Variable	Primary heroin injectors (N=151)	Primary amphetamine injectors (N=145)
<i>Needle risk</i> (% in last month)		
Borrowed needles	14	10
Lent needles	24	21
<i>Health</i>		
OTI Health total	18.8	18.0
OTI Social Functioning*	21.6	17.1
<i>Psychological functioning</i>		
GHQ total	9.9	9.3
"Psychiatric" cases (%)	71	70
<i>Criminal behaviours</i> (Last month)		
OTI crime total*	1.9	1.3
Any crime (%)	57	54

* *Significant difference exist between groups*

4.0 DISCUSSION

4.1 *Major findings of the study*

The major finding of this study was the complexity of transition patterns between primary injection of the two drug classes. While the transition from amphetamines to heroin injecting was more common than the reverse case, there was substantial movement in both directions. A simple pattern in which the move to heroin injection is viewed as an endpoint in terms of a drug use career does not fit the complexity of transitional movement.

4.2 *Transitions between heroin and amphetamine injecting*

It was anticipated on the basis of key informant reports that the results of this study would indicate a predominant transition from primary amphetamine injecting to primary heroin injecting, with many fewer subjects making the reverse transition. Contrary to expectation, transitional movement did not fit this simple pattern. An examination of Figure 1, which is a simplified account of the transitions undergone by these subjects, indicates the complexity of the results. In reality, some subjects had made several transitions between primary amphetamine and heroin injecting. The view that primary heroin use represents some type of end point in injecting drug use careers is not supported by these results. Rather, the flow between the primary use of these two drug classes is considerable.

The overlap between the injection of these two drugs is shown in the drug use histories of the groups. Among current primary heroin users, a half had used amphetamine during the preceding six months, while two thirds of primary amphetamine users had used heroin in that period. Exposure to both classes of drugs is thus highly prevalent among those who show a stated marked preference for one drug class. What is of interest about this cross exposure is the completely different pharmacological effects of these drugs. The use of both stimulants and CNS depressant drugs, and transitions between the primary use of these drugs, indicates a group that does not specialise in one particular type of

drug effect. The previously cited data showing clusters of dependence diagnoses among IDU are consistent with these results³⁻⁵.

Transition routes HA and AHA are illustrative of the complexity of transitions. Subjects who progressed via route HA first injected heroin, and then became primary amphetamine injectors. These represented a fifth of those subjects who initially injected heroin. Similarly, route AHA subjects initially injected amphetamines, and then made the expected transition to heroin. However these subjects, a quarter of all subjects who first injected amphetamines, subsequently made an unexpected transition back to primary amphetamine use. Similarly unexpected were the route HAH subjects, who first injected heroin, but became primary amphetamine injectors prior to a transition back to primary heroin injecting. As noted, the actual transitions back and forth were more complex still, with small proportions of subjects having made several transitions between the drug classes. The regression analyses indicated that the odds of a transition from amphetamine to heroin injecting were twice those of the reverse case, and that any transition was related to the length of time since initial injection. However, while overall there had been more movement towards heroin, movement was substantial in both directions.

4.3 *Age and transitions*

In interpreting the results, particular attention must be paid to the age of subjects in the various groups. As a group, current primary amphetamine injectors were significantly younger than primary heroin users. At first glance this may be taken to indicate that this group will move on to primary heroin injecting. However, these broad figures do not capture the differences between groups of users who have progressed by different transition routes. Among primary amphetamine users, the youngest group (24.4 yrs) were those who had first injected amphetamines (or had never injected heroin). It is possible that this young group may well progress on to primarily injecting heroin. However, the current data do not indicate that this would necessarily be the end point of

their injecting careers. For example, the current primary amphetamine users who had initially injected amphetamines and later became primary heroin injectors (route AHA) were 30 years old.

The youngest group of current primary heroin users were those who initially injected heroin (26.2 yrs). Again, it should not be assumed that this group have reached some stable endpoint. This younger group may reflect the increased availability and popularity of heroin in recent years.

Despite the evidence of extensive transitions between primary amphetamine and heroin injecting, only minorities of all groups regarded it as likely that they would make a transition to primary use of the other drug. They would appear to underestimate the likelihood of transitions occurring. It is of interest that the current primary amphetamine users regarded it as more likely that they would make a transition than heroin users, which is broadly consistent with the data.

4.4 *Reasons for transitions*

The reasons given by subjects for making transitions are of interest. The main reasons given by subjects who had moved from injecting amphetamines to heroin related to a dislike of the negative physical and psychological effects of regular amphetamine use. Reasons for moving from heroin to amphetamines were more diverse. Negative aspects of heroin use, in particular its physical effects and the associated lifestyle were mentioned. So were perceived positive effects of amphetamines such as energy and euphoria, and the injection of amphetamines for intoxicating effects whilst maintained on methadone. It is worthy of note that groups ii (amphetamines-heroin) and iv (heroin-amphetamines) reported that they had a regular sexual partner using the transitional drug at the time of their transitions. Yet this was not perceived by subjects as a likely reason for their change.

4.5 *Effects of transitions on lifestyle*

There appeared to be quite disparate effects on lifestyle of making a transition. Those subjects who made a transition from primarily injecting amphetamine to heroin reported that they injected more frequently, spent more money on drugs and committed more crime than previously. For subjects who moved from primarily injecting heroin to amphetamines, again most believed they injected more frequently, but less than half spent more money on drugs and only a fifth engaged in more crime.

4.6 Comparisons of current primary heroin and amphetamine injectors

Current primary heroin users were older, less educated, more likely to be unemployed, more likely to have been imprisoned, had poorer social functioning and greater criminal involvement. The overall picture is of a higher level of social dysfunction in comparison to the younger primary amphetamine injectors.

Primary amphetamine injectors, however, had higher levels of current polydrug use, and were no less likely to have borrowed or lent used injecting equipment. There were also no differences in the general and psychiatric health of the two groups. In fact, nearly three quarters of each group exceeded the GHQ cut-off for psychiatric morbidity sufficiently severe to warrant clinical attention. Thus, while primary heroin injectors appear more socially dysfunctional, there is little to distinguish the two groups in terms of injection-related risk and both general and psychological health. There are clear harms associated with injecting drug use *per se*, regardless of the primary drug of choice. A transition from heroin to amphetamines should not be viewed as a movement towards safer drug use.

4.7 Summary

In summary, transitions between the primary injection of heroin and amphetamines are common, and occur in both directions. Not only do the current data confirm the view that polydrug use is the norm among IDU, but that the general drug orientation of these groups may change in both the direction of

stimulants and depressants. Injecting heroin use should not be viewed as a permanent endpoint in the polydrug using careers of IDU. In many cases it simply represents one of many transitions in primary drug use and, as such, a return to the primary injection of amphetamines is not unlikely.

5.0 REFERENCES

1. CLAYTON, R.R. (1986) Multiple drug use epidemiology, correlates and consequences. *Recent Developments in Alcoholism*, 4, 7-38.
2. DARKE, S. & HALL, W. (1995) Levels and correlates of polydrug use among heroin users and regular amphetamine users. *Drug and Alcohol Dependence*, 39, 231-235.
3. DARKE, S. & ROSS, J. (1997) Polydrug dependence and psychiatric comorbidity among heroin injectors. *Drug and Alcohol Dependence*, 48, 135-141.
4. DINWIDDIE, S.H., COTTLER, L., COMPTON, W. & ABDALLAH, A.B. (1996) Psychopathology and HIV risk behaviours among injection drug users in and out of treatment. *Drug and Alcohol Dependence*, 43, 1-11.
5. KIDORF, M., BROONER, R.K., KING, V.L., CHUTUAPE, M.A. & STITZER, M.L. (1996) Concurrent validity of cocaine and sedative dependence diagnoses in opioid-dependent outpatients. *Drug and Alcohol Dependence*, 42, 117-123.
6. KANDEL, D.B. (1975) Stages in adolescent involvement in drug use. *Science*, 190, 912-914.
7. HALL, W. & DARKE, S. (in press) Trends in opiate overdose deaths in Australia, 1979-1995. *Drug and Alcohol Dependence*.
8. HANDO, J. & DARKE, S. (1998) *Drug Trends 1997*. A Comparison of

Drug Use and Trends in Three Australian States: Results From a National Trial of the Illicit Drug Reporting System (IDRS). National Drug and Alcohol Research Centre Monograph No. 36.

9. O'BRIEN, S., DARKE, S. & HANDO, J. (1996) *Drug Trends. Findings from the Illicit Drug Reporting System (IDRS)*. National Drug and Alcohol Research Centre Technical Report No. 38.
10. WEATHERBURN, D. & LIND, B. (1997) The impact of law enforcement activity on a heroin market, *Addiction*, 92, 557-569.
11. HALL, W. & HANDO, J. (1993) Patterns of illicit psychostimulant use in Australia. In Burrows, D., Flaherty, B. & MacAvoy, M. (Eds) *Illicit Psychostimulant Use in Australia* (Canberra, Australian Government Printing Service).
12. DARKE, S., COHEN, J., ROSS, J., HANDO, J. & HALL, W. (1994) Transitions between routes of administration of regular amphetamine users. *Addiction*, 89, 1077-1083.
13. GRIFFITHS, P., GOSSIP, M., POWIS, B. & STRANG, J. (1992) Extent and nature of transitions of route of administration among heroin addicts in treatment- preliminary data from the drug transitions study, *British Journal of Addiction*, 87, 485-491.
14. ROSS, J., DARKE, S. & HALL, W. (1997) Transitions between routes of benzodiazepine administration among heroin users in Sydney. *Addiction*, 92, 697-705.
15. SWIFT, W., MAHER, L., SUNJIC, S. & DOAN, V. (1997) *Transitions between routes of administration among Caucasian and Indochinese*

heroin users in South-west Sydney. National Drug and Alcohol Research Centre Technical Report No. 42.

16. GOSSOP, M., DARKE, S., GRIFFITHS, P., HANDO, J., POWIS, B., HALL, W. & STRANG, J. (1995) The Severity of Dependence Scale (SDS) in English and Australian samples of heroin, cocaine and amphetamine users. *Addiction*, 90, 607-614.
17. DARKE, S., HALL, W., HEATHER, N., WODAK, A. & WARD, J. (1992) Development and validation of a multi-dimensional instrument for assessing outcome of treatment among opioid users: The Opiate Treatment Index, *British Journal of Addiction*, 87, 593-602.
18. GOLDBERG, D.P. & HILLIER, V.F. (1979) A scaled version of the General Health Questionnaire, *Psychological Medicine*, 9, 139-145.
19. WILKINSON, L. (1990) *SYSTAT: The System for Statistics*, (Evanston IL: SYSTAT Inc.).