

The Relationship Between  
Suicide and Overdose Among  
Methadone Maintenance Patients

Shane Darke & Joanne Ross

**NDARC Technical Report No. 100**

**Technical Report No. 100**

**THE RELATIONSHIP BETWEEN  
SUICIDE AND OVERDOSE  
AMONG  
METHADONE MAINTENANCE PATIENTS**

Shane Darke & Joanne Ross

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

ISBN 07334 0798 6

© NDARC 2000

## TABLE OF CONTENTS

<b>ACKNOWLEDGMENTS</b> .....	<b>vi</b>
<b>EXECUTIVE SUMMARY</b> .....	<b>vii</b>
<b>1.0 INTRODUCTION</b> .....	<b>1</b>
1.1 Study Aims.....	2
<b>2.0 METHOD</b> .....	<b>3</b>
2.1 Procedure .....	3
2.2 Structured Interview ..	3
2.2.1 Demographic characteristics.....	3
2.2.2 Drug use history .....	3
2.2.3 Needle risk behaviours .....	4
2.2.4 Family history .....	4
2.2.5 Antisocial personality disorder .....	4
2.2.6 Social functioning.....	4
2.2.7 Heroin overdose .....	4
2.2.8 Depression .....	5
2.2.9 Suicide .....	5
2.3 Statistical Analyses ....	5
<b>3.0 RESULTS</b> .....	<b>6</b>
3.1 Sample Characteristics.....	6
3.2 Drug Use History .....	7
3.3 Needle Risk Behaviours.....	9
3.4 Family History and Social Functioning .....	9
3.5 Antisocial Personality Disorder .....	10
3.6 Heroin Overdose .....	11
3.7 Depression .....	11
3.8 Suicide .....	12
3.8.1 History of suicide attempts .....	12
3.8.2 Methods of attempted suicide.....	14
3.8.3 Most recent suicide attempt.....	14
3.8.4 Suicide attempts and overdose .....	17
3.8.5 Factors associated with attempted suicide.....	18

<b>4.0</b>	<b>DISCUSSION .....</b>	<b>22</b>
4.1	Major Findings.....	22
4.2	History of Attempted Suicide .....	22
4.3	Factors Associated with Attempted Suicide .....	23
4.4	Circumstances of Attempted Suicide.....	24
4.5	Methods of Attempted Suicide .....	25
4.6	Attempted Suicide and Overdose .....	26
4.7	Summary .....	27
<b>5.0</b>	<b>REFERENCES.....</b>	<b>29</b>

## LOCATION OF TABLES

<b>Table 1:</b>	Demographic characteristics of the sample .....	7
<b>Table 2:</b>	Drug use history .....	9
<b>Table 3:</b>	Antisocial personality disorder .....	10
<b>Table 4:</b>	Heroin overdose history .....	11
<b>Table 5:</b>	History of attempted suicide .....	13
<b>Table 6:</b>	Methods employed in suicide attempts .....	14
<b>Table 7:</b>	Methods employed in most recent suicide attempt .....	15
<b>Table 8:</b>	Circumstances of most recent suicide attempt .....	16
<b>Table 9:</b>	Suicide and overdose history .....	18
<b>Table 10:</b>	Comparison of those with history of attempted suicide and others.....	19
<b>Table 11:</b>	Multiple logistic regression predicting history of attempted suicide..	20
<b>Table 12:</b>	Current functioning of those with history of attempted suicide and others .....	20

## **ACKNOWLEDGMENTS**

This research was funded by the Department of Health and Aged Care. The authors wish to thank the staff at Coopers Cottage, Jacaranda House, Kullaroo Clinic, Long Jetty methadone maintenance unit, Tower Clinic and Wyong methadone maintenance unit.

A sample of 223 methadone maintenance patients were interviewed about attempted suicide and heroin overdose histories. Forty percent of participants reported a history of at least one suicide attempt. Females were significantly more likely than males to have attempted suicide (50% v 31%), and to have done so on more than one occasion (28% v 15%). Ten percent of participants had attempted suicide since enrolment in their current treatment, and 8% of participants had attempted suicide in the preceding 12 months. There was a large and significant difference between males and females in the onset of attempted suicide with females reporting an initial attempt, on average, six years before males (18.3 v 24.7 yrs). Amongst those who had attempted suicide the initiation of heroin use preceded the first suicide attempt in 55% of cases. Females were significantly more likely than males to have attempted suicide prior to the onset of heroin use (69% v 11%).

While heroin overdose was common among the sample (66%), the most common methods employed for suicide attempts were overdose of a non-opioid drug (21%) and slitting of wrists (20%). A deliberate heroin overdose as a means of attempted suicide was reported by 10% of participants. Thus, while 40% of participants had attempted suicide, only 10% of participants had done so by means of a deliberate heroin overdose. Those participants who had experienced an overdose were significantly more likely to have attempted suicide than other participants (46% v 28%). However, this is not surprising given that 10% of participants had employed heroin overdose as a means of suicide. When these were excluded from the analyses, those participants who had experienced a heroin overdose were no more likely to have attempted suicide than other participants. Overdoses appeared overwhelmingly to be accidental. Ninety two percent of those who had overdosed reported that their most recent overdose was accidental.

Attempted suicide presents a major clinical problem to staff at drug treatment programmes, which is distinct from the issue of heroin overdose. Most heroin overdoses appear to be accidental, and most suicide attempts employ other methods. While both overdose and suicide present increasing clinical problems, they are separate problems, and require different responses.

## 1.0 INTRODUCTION

The rates of fatal heroin overdose and of completed suicide have risen steeply in recent years<sup>1-7</sup>. Fatal opioid overdoses in Australia increased from 1.3 per million in 1964 to 71.5 per million in 1997<sup>3</sup>, with similarly large increases reported in other countries<sup>2,6,7</sup>. Similarly, over the same period, the rate of completed suicide among young males in Australia increased from 8.7 per 100,000 to 30.9 per 100,000<sup>7</sup>. The extent to which a link exists between these phenomena has been a topic of recent research<sup>8-16</sup>.

The risk factors for suicide have been extensively researched<sup>4,17-23</sup>. There is a large gender imbalance in suicide attempts, with males more likely to complete suicide and females more likely to attempt suicide<sup>4,17-22</sup>. Other factors include: parental separation, parental suicide, parental psychopathology, childhood abuse, unemployment, homelessness, mood disorders, hopelessness, a diagnosis of antisocial personality disorder (ASPD) and, of particular interest here, substance dependence<sup>4,17-23</sup>.

A strong association exists between opiate dependence and suicide<sup>8,13-18,22-28</sup>. A recent meta-analysis reported that opioid dependence individuals are 14 times more likely than their non-heroin using peers to die by suicide<sup>22</sup>. Fifteen percent of deaths among drug users entering treatment in Norway over a thirty year period were attributed to suicide<sup>28</sup>. Several recent studies have also shown the proportion of drug users with a history of attempted suicide to range between a third and a half, e.g. 35%<sup>16</sup>, 45%<sup>10</sup>, 46%<sup>15</sup>. It has been noted that heroin users share many characteristics in common with suicide fatalities, such as high rates of mood disorders, poor family relations and unemployment<sup>13,27</sup>, so an association between heroin use and suicide is not unexpected.

The link between opiate dependence and suicide, however, raises the question as to what extent heroin overdoses are *de facto* suicide attempts<sup>8-16</sup>. Several authors have noted an association between heroin overdose and suicide<sup>13,15,16</sup>. Like attempted suicide, non-fatal overdose is common among heroin users<sup>29-31</sup>. Rossow & Lauritzen<sup>15</sup> reported the odds of having attempted suicide among treatment entrants as six times greater if a non-fatal overdose had been experienced, and a 0.39 correlation between the number of overdoses and suicide attempts was reported. Among a London treatment sample, 50% of those with a history of overdose had



attempted suicide compared to 18% of those with no history of overdose<sup>16</sup>. In a recent study of 77 overdose survivors admitted to accident and emergency, 49% reported suicidal thoughts or feelings immediately prior to overdose<sup>13</sup>.

Other authors, however, have disputed the view that there is a strong component of suicidal intent among heroin overdoses<sup>1,10-12,29,32</sup>. Only 5% of fatal heroin overdoses that occurred in New South Wales over a five year period were classified as suicides<sup>1</sup>. Kosten et al<sup>12</sup> found no association between suicide attempts and overdose. While Vingoe et al<sup>15</sup> reported an association between suicide attempt and overdose histories, only 15% of those who had attempted suicide had done so by deliberate overdose. An Australian study of non-fatal heroin overdose reported that only 1% of heroin users reported that their most recent overdose was deliberate<sup>29</sup>. Kjelsberg et al<sup>11</sup> reported that the characteristics and histories of young overdose survivors were no different from overdose fatalities, but significantly different from completed suicides. They argued that overdoses are predominantly accidental, and unlikely to be suicides.

Clearly, the relationship between overdose and suicide remains unclear and controversial. The current study was designed to examine the frequency, circumstances and predictors of attempted suicide among a sample of male and female heroin users enrolled in methadone maintenance (MM). In particular, the study aimed to examine the relationship between non-fatal overdose and attempted suicide among this population.

### **1.1 Study Aims**

1. To determine the histories of attempted suicide among male and female MM patients; and
2. To determine the relationship between non-fatal heroin overdose and attempted suicide among MM patients.

## **2.0 METHOD**

### **2.1 Procedure**

All respondents were volunteers who were paid A\$20 for their participation in the study. Recruitment took place from February to July of 2000. To be eligible for the study participants must have been currently enrolled in the methadone maintenance unit from which data was being collected. Advertisements for the research project were placed in six methadone unit waiting rooms in the Sydney region. So as to avoid response bias the advertisements made no mention of attempted suicide.

Approximately equal numbers of males and females were recruited for the study. Females constitute a minority of the NSW methadone maintenance programme (30%)<sup>33</sup>. As general population research on suicide indicates that attempted suicide is more prevalent among females, females were deliberately oversampled for the study.

All respondents were guaranteed, both at the time of screening and interview, that any information they provided would be kept strictly confidential and anonymous, and were assured that their participation would not in any way affect their current or future treatment. Interviews were conducted only after participants had provided informed consent. All interviews were conducted by one of the research team and took between 30 and 45 minutes to complete.

### **2.2 Structured Interview**

#### **2.2.1 Demographic characteristics**

Demographic details obtained included: gender, age, marital status, level of school and tertiary education, employment status, length of time enrolled in current treatment, current methadone dose, 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 drug class during the 6 months preceding interview was also sought. Further questions were asked about their main drug of choice, age at first intoxication with any drug, the first drug ever injected and age at first

injection. Current heroin dependence was measured using the Severity of Dependence Scale (SDS)<sup>34</sup>.

### **2.2.3 Needle risk behaviours**

The needle risk component of the Opiate Treatment Index (OTI)<sup>35</sup> was used in assessing injecting behaviours in the month preceding interview that placed respondents at risk of either contracting or transmitting blood borne viruses.

### **2.2.4 Family history**

Participants were asked about their psychiatric treatment history, their parents' psychiatric treatment history, parental drug and alcohol problems, and the presence or absence of parents during their childhood.

### **2.2.5 Antisocial personality disorder**

DSM-IV diagnoses of antisocial personality disorder (ASPD) were obtained from the Diagnostic Interview Schedule (DIS), modified to obtain DSM-IV diagnoses<sup>36</sup>. A lifetime diagnosis is defined by DSM-IV as requiring evidence of a Conduct Disorder of Childhood, and evidence of at least three of seven adult symptoms. A current ASPD diagnosis was defined as satisfying the conditions for a lifetime diagnosis of ASPD, and the occurrence of three adult symptoms in the preceding 12 months.

### **2.2.6 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. Higher scores indicate poorer social functioning.

### **2.2.7 Heroin overdose**

Participants were asked how many times they had overdosed, how long since they had last overdosed, whether they had ever been administered naloxone, how long since they were administered naloxone, and whether their most recent overdose was deliberate or accidental.

### **2.2.8 Depression**

Current depression was measured using the Beck Depression Inventory (BDI)<sup>37</sup>. Cut-off scores for the BDI are: 10-18 (mild-moderate depression), 19-29 (moderate-severe depression) and severe-extreme depression (>29).

### **2.2.9 Suicide**

A specialised section on suicide was developed. Attempted suicide was defined as deliberate self-harm with the intent of causing death. Participants were asked if they had ever attempted suicide, how many times they had attempted suicide, age of first and most recent attempts, medical treatment after attempts and methods employed. Detailed data on the most recent attempt were also collected. These included: why the attempt was made, method employed and reason for using this method, social and drug use circumstances, major life events, perceived seriousness of attempt, medical interventions, and whether the attempt was planned or a "spur of the moment" decision.

### **2.3 *Statistical Analyses***

T-tests were used for continuous data. Where distributions were highly skewed, medians were reported. For dichotomous categorical variables, Odds Ratios (OR) and 95% Confidence Intervals (95% CI) were reported. Logistic regressions using backwards elimination were performed in order to determine which factors were associated with a history of attempted suicide. All analyses were conducted using SPSS for Windows (release 9.0)<sup>38</sup>.

### **3.0 RESULTS**

#### **3.1 *Sample Characteristics***

The sample consisted of 223 methadone maintenance patients, recruited from six methadone maintenance units located in the western, inner and northern Sydney regions. The mean age of participants was 33.1 yrs (SD 8.6, range 17-54), with 52% being male (Table 1). Males were significantly older than females ( $t_{221}=2.8$ ,  $p<.05$ ). Forty percent of participants were married or in a defacto relationship at the time of interview.

The mean years of formal school education was 9.4 (SD 1.7, range 1-12). Forty percent of participants had completed a trade or technical course, and 1% had completed a university course. The majority of participants (77%) were currently unemployed, with 3% in full-time employment, 5% in part-time/casual employment and 14% engaged in home duties. While more males were currently unemployed than females (89% v 64%), this difference was attributable to the fact that 27% of females were engaged in home duties compared to 1% of males.

The median length of enrolment in the current methadone treatment was 24 months (range 0.25-228 mths). The mean methadone dose was 65.5 mg (SD 33.1, range 2.5-200 mgs).

Forty six percent of participants reported a history of imprisonment, with males significantly more likely than females to report a history of imprisonment (OR 6.18, 95% CI 3.44-11.09).

**Table 1: Demographic characteristics of the sample**

<b>Variable</b>	<b>Males (N=117)</b>	<b>Females (N=106 )</b>	<b>Total (N=223)</b>
Age (mean yrs)	34.7	31.5	33.1
School education (mean yrs)	9.3	9.5	9.4
<i>Marital status</i>			
Single	63	56	60
Married/defacto	37	44	40
<i>Tertiary education:</i>			
None	59	59	59
Trade/technical	40	40	40
University	1	2	1
<i>Employment (%):</i>			
Unemployed	89	64	77
Full time	5	1	3
Part time	4	7	5
Student	1	1	1
Home duties	1	27	14
Current dose (mean mg)	66.7	64.2	65.5
Prison record (%)	76	34	56

### **3.2 Drug Use History**

The mean age of first intoxication with alcohol or any other drug was 13.4 yrs (SD 2.9, range 6-30 yrs). The mean age of first injection was 19.2 yrs (SD 5.4, range 9-45 yrs). There was a negative correlation between age and age of first injection ( $r=-0.33$ ,  $p<.001$ ). Heroin was the first drug injected by 59% of participants, with 34% having first injected amphetamines, 3% other opiates, 2% cocaine, and 1% methadone, hallucinogens and barbiturates respectively. The mean

age of first heroin use was 20.0 yrs (SD 5.7, range 9-45 yrs), with a mean age of 21.3 yrs (SD 5.9, 9-45 yrs) for the commencement of regular (at least monthly) heroin use.

The sample engaged in a wide variety of polydrug use (Table 2). The mean number of drug classes ever used was 8.9 (SD 1.8, range 4-11), with 4.3 (SD 1.7, range 0-9) classes having been used in the last six months. A mean of 3.4 (SD 1.4, range 0-6) classes had ever been injected, 1.3 (SD 1.0, range 0-5) classes in the preceding six months. Eighty one percent of participants had injected a drug in the preceding six months. The most commonly used drug classes over the preceding six months were tobacco (94%), heroin (71%), cannabis (71%), benzodiazepines (57%) and alcohol (51%).

The mean SDS score for current heroin dependence was 6.1 (SD 4.5, range 0-15). there was a negative correlation between current methadone dose and number of heroin use days in the preceding six months ( $r_s = -.15$ ,  $p < .05$ ).

**Table 2: Drug use history**

<b>Class</b>	<b>Ever used</b>	<b>Drug Ever Injected</b>	<b>Used lst 6 mths</b>	<b>Injected lst 6 mths</b>	<b>Days used lst 6 mths*</b>
Heroin	100	99	71	70	48
Other opiates	64	53	22	14	12
Amphetamines	93	85	28	27	6
Cocaine	66	57	14	14	2
Hallucinogens	78	19	2	1	1
Benzodiazepines	89	24	57	7	30
Antidepressants	56	1	22	0	180
Alcohol	98		51		6
Cannabis	99		71		96
Inhalants	51		1		3
Tobacco	99		94		180
Mean no. drug classes	8.9	3.4	4.3	1.3	N/A

\* Median number of days used in last 6 mths by those who had used the drug class in that period

### **3.3 Needle Risk Behaviours**

Needle risk behaviours were low among the sample. In the month preceding interview, 7% of participants had injected with a borrowed used syringe, all of whom borrowed from only one person. Nine percent reported having lent their used syringe to another to inject with in the preceding month.

### **3.4 Family History and Social Functioning**

Both parents were present whilst participants were growing up in 56% of cases, one parent being absent in 37% of cases, and both parents in 7% of cases. The major reasons for parental absence were divorce/family break-up (69% of cases in which a parent was absent) and death of a parent (17%).



Sixty percent of participants had received psychiatric or psychological treatment for problems other than drug or alcohol dependence, as had 22% of participants' parents. Fifty seven percent of participants reported that they had a parent with a drug or alcohol problems (one parent 42%, both parents 15%). Forty seven percent of participants had a father with a substance dependence problem (86% alcohol) and 25% reported a mother with a dependence problem (71% alcohol).

The mean age that participants reported leaving home was 16.5 years (SD 3.4, range 9-33). Thirty eight percent of participants left home before they were 16 years old and 4% had never left home. Sixty four percent of participants reported having at least one period of homelessness, with no difference in the proportion of males and females (64% v 64%). The median length of time for the longest period of homelessness experienced was 4 mths (range 0.25-84 mths).

The mean OTI social functioning score was 19.0 (SD 8.0, range 1-39), with no significant difference between males and females (19.8 v 18.1).

### 3.5 *Antisocial Personality Disorder*

Over a half of participants (56%) met the criteria for a lifetime diagnosis of ASPD and 26% met criteria for a current diagnosis (Table 3). Males were more likely than females to receive diagnoses of conduct disorder (OR 1.72, 95% CI 1.01-2.94), lifetime ASPD (OR 2.08, 95% CI 1.21-3.55) and current ASPD (OR 2.29, 95% CI 1.22-4.29).

**Table 3: Antisocial personality disorder**

	<b>Males (N=117) %</b>	<b>Females (N=106) %</b>	<b>Persons (N=223) %</b>
Conduct disorder of childhood diagnosis	64	51	58
ASPD diagnosis (lifetime)	64	46	56
ASPD diagnosis (current)	33	18	26

### 3.6 Heroin Overdose

Two thirds (66%) of participants reported having experienced at least one heroin overdose, with males more likely to have overdosed (OR 2.13, 95% CI 1.21-3.73) (Table 4). Among those who had overdosed, the median number of overdoses was 2 (range 1-40). Forty four percent of participants had been administered the opioid antagonist naloxone at an overdose. The median time since last overdose was 36 mths (range 1-300 mths). Nineteen percent of participants reported having overdosed whilst enrolled on their current treatment program, 47% had most recently overdosed prior to treatment enrolment and 34% had never overdosed. When asked whether their most recent overdose was accidental or deliberate, 92% responded it was accidental, 7% that it was deliberate and 1% were unsure.

**Table 4: Heroin overdose history**

	<b>Males (N=117)</b>	<b>Females (N=106)</b>	<b>Persons (N=223)</b>
Ever overdosed (%)	74	58	66
No. overdoses (mdn)*	2	2	2
Overdosed last 12 mths (%)	19	14	17
Time since last overdose (mdn mths)*	36	30	36
Ever administered naloxone (%)	52	37	45
Overdosed in current treatment (%)	21	18	19
Most recent overdose accidental (%)*	92	92	92

*\*Those with overdose history only*

### 3.7 Depression

Fifty three percent of participants reported having received treatment for depression. Significantly more females than males reported having a treatment history for depression (63% v 44%, OR 2.15, 95% CI 1.25-3.68). The mean age at which treatment first occurred was 25.1 yrs (SD 8.1, range 12-43), with females first receiving treatment for depression at a significantly younger age than males (23.4 v 27.3yrs,  $t_{117}=2.6$ ,  $p<.01$ ). Fifty six percent of participants had used antidepressants, and 22% had done so in the preceding six months.

The mean BDI score for the sample was 20.9 (SD 11.1, range 0-47), with no significant difference between the scores of males and females (19.6 v 22.2). Using the standardised cut-offs for the BDI, 84% of participants had some degree of current depression: 32% mild-moderate, 29% moderate-severe, and 23% severe-extreme. On the specific BDI questions dealing with hopelessness and suicidal ideation, 61% reported discouragement about the future, and 46% reported current suicidal ideation.

### **3.8 *Suicide***

#### **3.8.1 History of suicide attempts**

Forty percent of participants reported a history of at least one suicide attempt, with a median of two attempts (Table 5). Females were significantly more likely than males to have attempted suicide (OR 2.25, 95% CI 1.30-3.89), and to have done so on more than one occasion (28% v 15%, OR 2.32, 95% CI 1.19-4.52). The median time elapsed since last suicide attempt was 54 mths, with 8% of participants having attempted suicide in the preceding 12 months. Ten percent of participants had attempted suicide since enrolment in their current treatment (males 12%, females 9%). The mean age at first suicide attempt was 20.9 yrs, but there was a large and significant difference between males and females in the onset of attempted suicide with females reporting an initial attempt, on average, six years before males (24.7 v 18.3 yrs,  $t_{87}=4.3$ ,  $p<.001$ ).

**Table 5: History of attempted suicide**

	<b>Males (N=117)</b>	<b>Females (N=106)</b>	<b>Persons (N=223)</b>
Suicide attempt (%)	31	50	40
No of attempts (mdn)*	1	2	2
Time since last attempt (mdn mths)*	42	84	54
<i>Age*</i>			
Mean age at first attempt (yrs)	24.7	18.3	20.9
Mean age at last attempt (yrs)	27.9	24.1	25.6
Treated by doctor after attempt (%)	20	40	29
Hospitalised after an attempt (%)	20	33	26
Treated by psychiatrist or psychologist after an attempt (%)	20	34	26
Attempted suicide prior to initiation of heroin use (%)*	11	69	55

\* *Those with a history of suicide attempts only (N=89)*

Over a quarter of participants had been treated by a doctor for a suicide attempt (29%) (73% of suicides attempters), had been hospitalised after an attempt (26%) (65% of suicides attempters), and had received psychiatric treatment after an attempt (26%) (66% of suicides attempters). Females were significantly more likely than males to have treated by a doctor for a suicide attempt (OR 1.47, 95% CI 1.47-4.88), been hospitalised after an attempt (OR 2.01, 95% CI 1.09-3.71) and to have received psychiatric treatment after an attempt (OR 2.10, 95% CI 1.14-3.86).

Amongst those who had attempted suicide, in 55% of cases initiation of heroin use preceded a suicide attempt and in 45% of cases a suicide attempt had been made prior to the initiation of heroin use. Females were 18 times more likely than males to have attempted suicide prior to the onset of heroin use (OR 18.00, 95% CI 5.45-59.45).

### 3.8.2 Methods of attempted suicide

The most common method employed for suicide attempts was overdose of a non-opioid drug, with 21% of all participants having attempted suicide in this manner (Table 6). Almost all such cases were overdoses of benzodiazepines (35/41). Females were significantly more likely than males to report attempting suicide by a non-opioid drug overdose (OR 3.78, 95% CI 1.86-7.66). Slitting of wrists was the next most common method employed (20% of all participants). While more females than males reported a history of this means (28% v 13%), the difference narrowly missed out on statistical significance ( $p=.08$ ). A deliberate heroin overdose as a means of attempted suicide was reported by 10% of participants. Methods included in the other category included electrocution, swallowing iron crosses (in prison) and drowning.

**Table 6: Methods employed in suicide attempts**

<b>Method</b>	<b>Males (N=117) %</b>	<b>Females (N=106) %</b>	<b>Persons (N=223) %</b>
Non-opioid drug overdose	11	32	21
Slitting wrists	13	28	20
Heroin overdose	9	12	10
Hanging	9	2	6
Poisoning	2	3	2
Gunshot	1	1	1
Jumping from height	1	1	1
Other	2	3	2

### 3.8.3 Most recent suicide attempt

The methods employed in the most recent suicide attempt are presented in Table 7. As can be seen, the order of methods reflects those of lifetime histories presented above. Nearly a half (44%) of most recent suicide attempts were by means of a non-opioid drug overdose, predominantly benzodiazepines. Slitting of wrists was the second most common method (28%), with heroin overdose constituting 20% of most recent suicide attempts.

**Table 7: Methods employed in most recent suicide attempt**

<b>Method</b>	<b>Males (N=36) %</b>	<b>Females (N=53) %</b>	<b>Persons (N=89) %</b>
Non-opioid drug overdose	31	53	44
Slitting wrists	22	32	28
Heroin overdose	22	19	20
Hanging	19	2	9
Poisoning	6	2	3
Jumping from height	3	0	1
Other	6	2	3

Participants were asked why they had chosen the particular method employed on this occasion. By far the most common response was that the means were immediately available (49%). The next most common reasons were that the method involved little or no pain (12%), the subject was in gaol so their means were restricted (9%), and to minimise the effect it would have on others (8%).

The three most common reasons given for having attempted suicide on this occasion were: depression (30%), a relationship split (18%), and imminent incarceration/incarcerated (10%).

Eighty two percent of suicide attempters reported a major life event that preceded their most recent suicide attempt (Table 8). These were most commonly: a relationship split (25% of suicide attempters), impending/current incarceration (11%), a family or friend's death (8%), domestic violence (7%), and losing custody of children (6%).

**Table 8: Circumstances of most recent suicide attempt**

	<b>Males (N=36) %</b>	<b>Females (N=53) %</b>	<b>Persons (N=89) %</b>
Major life event	86	79	82
Medical intervention required	53	66	61
<i>Intent</i>			
Spur of the moment	69	74	72
Informed others of intent*	14	17	15
<i>Social circumstances</i>			
No close friends	50	32	39
Living alone	22	15	18
Incarceration/pending incarceration	25	2	11
<i>Drug use/Treatment</i>			
Using heroin at time	69	40	52
In drug treatment at time	36	23	28
Psychiatric treatment at time	6	9	8
<i>Seriousness of attempt</i>			
Serious/very serious	94	81	87
Not very serious	6	19	13

\* *Suicide note or informed someone of intent*

Medical intervention was required in the majority of cases (61%). The majority (72%) of most recent attempts were unplanned, spur of the moment decisions, and in only 15% of cases was any note or indication of intent given.

A substantial minority (39%), including a half of the males, reported that they had no close friends that they could trust or rely upon at the time of their most recent attempt. Only 18%, however, were living alone at the time of the last attempt. A substantial proportion of participants (11%) were incarcerated at the time of their most recent suicide attempt, with 9 of these 10 participants being males (OR 17.33, 95%CI 2.09-144.07).

Approximately a half of participants were active heroin users at the time of their last attempt, and 28% were enrolled in drug dependence treatment. Males were significantly more likely to have been using heroin at the time (OR 8.75, 95% CI 1.54-9.49). Only 8% were receiving any psychiatric or psychological treatment at the time.

The overwhelming majority (87%) regarded their most recent suicide attempt as either serious or very serious. When asked how likely it would be that they would attempt suicide again, 16% thought it likely or very likely (males 21%, females 14%), 78% thought it unlikely (males 73%, females 80%) and 6% were unsure (males 6%, females 6%).

#### **3.8.4 Suicide attempts and overdose**

The interactions between suicide attempts and overdose are presented in Table 9. Only 24% of participants had never experienced either an overdose or a suicide attempt. Thirty one percent of participants had histories of both overdose and suicide attempts. These 31%, however, include participants who had deliberately overdosed and those who had only ever overdosed by accident. When these are separated, 20% of participants had experienced an accidental overdose and attempted suicide by other means.

Overall, those participants who had experienced an overdose were significantly more likely to have attempted suicide than other participants (46% v 28%, OR 2.19, 95% CI 1.20-3.98). However, it must be borne in mind that 10% of participants had employed overdose as a means of suicide. When those who have attempted suicide by overdose were excluded from the analyses, those participants who had experienced an overdose were no more likely to have attempted suicide than other participants (36% v 28%, OR 1.45, 95% CI 0.78-2.70).



**Table 9: Suicide and overdose history**

	<b>Males (N=117) %</b>	<b>Females (N=106) %</b>	<b>Persons (N=223) %</b>
No overdose or suicide	21	28	24
<i>Overdose plus suicide attempt</i>	26	36	31
Deliberate overdose history	9	12	10
No deliberate overdose history	17	24	20
Accidental overdose, no suicide history	49	22	36
Suicide attempt, no overdose history	5	14	9

**3.8.5 Factors associated with attempted suicide**

Those patients with a history of attempted suicide were more likely to be female (OR 2.25, 95% CI 1.30-3.89), to have had at least one parent with a drug substance dependence problem (OR 2.03, 95% CI 1.16-3.53) and to have had one or both parents absent during their childhood (OR 4.72, 95% CI 1.06-3.13) (Table 10). They had also first become intoxicated at a younger age ( $t_{221}=3.8$ ,  $p<.001$ ) to have initiated injecting at an earlier age ( $t_{219}=2.3$ ,  $p<.05$ ), and had used more different drug classes during their lives ( $t_{221}=4.4$ ,  $p<.001$ ).

**Table 10: Comparison of those with history of attempted suicide and others**

	<b>Attempted suicide (N=89)</b>	<b>Others (N=134)</b>
<i>Demographics</i>		
Age	33.1	33.2
Sex (% females)*	60	40
Education (yrs)	9.1	9.5
<i>Social factors</i>		
Parental drug problem (%)*	66	51
Parental psychiatric history (%)	27	19
Absence of parent(s) (%)*	53	38
History of homelessness (%)	71	60
<i>Drug use history</i>		
Age first intoxicated*	12.6	14.0
Age first injected*	18.1	19.9
Age first heroin use	19.2	20.6
Polydrug use*	9.5	8.5
ASPD (%)	63	51

\* *Significant difference between groups*

In order to determine the independent factors associated with a history of attempted suicide, multiple logistic regressions were conducted. Variables entered into the model were: age, sex, education, parental drug use problem, parental psychiatric history, parental absence, homelessness, ASPD diagnosis, age of first intoxication, age of first injection, age of first heroin use and number of drug classes ever used. After controlling for the effects of other variables, being female, parental absence during childhood, earlier age of first intoxication and higher levels of polydrug use were associated with a history of attempted suicide (Table 11). Specifically, being female increased the odds of having a history of overdose three times, each additional parent absent during childhood increased the odds 1.43 times, each year younger that initial intoxication occurred increased the odds 1.18 times, and each additional drug class ever used increased the odds 1.44 times.

**Table 11: Multiple logistic regression predicting history of attempted suicide**

<b>Variable</b>	<b>OR</b>	<b>95% CI</b>
Sex (female)	3.03	1.67-5.56
Parental absence	1.43	1.01-2.01
Earlier age of first intoxication	1.18	1.04-1.33
Polydrug use	1.44	1.18-1.77

The current functioning of suicide attempters and other participants is presented in Table 12. Those with a history of attempted suicide had significantly higher BDI scores ( $t_{221}=5.9$ ,  $p<.001$ ) and OTI social functioning scores ( $t_{221}=2.4$ ,  $p<.05$ ) than other participants. They were also significantly more likely to also report current suicidal ideation (OR 4.04, 95% CI 2.29-7.13) and to express discouragement and hopelessness about the future (OR 2.14, 95% CI 1.21-3.80). There were no significant differences between the two groups in frequency of recent heroin use, polydrug use or SDS scores.

**Table 12: Current functioning of those with history of attempted suicide and others**

	<b>Attempted suicide (N=89)</b>	<b>Others (N=134)</b>
<i>Depression</i>		
BDI (mean)*	25.9	17.6
Suicidal ideation (%)*	64	31
Hopelessness (%)*	72	54
OTI social functioning (mean)*	20.6	18.0
<i>Drug use</i>		
Heroin use (mdn days last 6 mths)	15	12
Polydrug use (no. drug classes last 6 mths)	4.6	4.2
SDS	6.5	5.9

\* Significant difference between groups

In order to determine the current factors associated with a history of attempted suicide, multiple logistic regressions were conducted. Variables entered into the model were: age, sex, BDI scores, OTI social functioning scores, days of heroin use in the last 6 months, number of drug classes used in the last 6 months, and SDS scores. After taking into account other variables, the only significant current factors associated with a history of attempted suicide were being female (OR 2.08, 95% CI 1.15-3.70) and higher BDI scores (OR 1.07, 95% CI 1.05-1.11).

## **4.0 DISCUSSION**

### **4.1 *Major Findings***

The first major finding of the current study was that histories of attempted suicide and of heroin overdose were common among MM patients, with only a quarter of participants never having overdosed or attempted suicide. The second major finding concerned the means employed to attempt suicide. The most common methods were non-opioid drug overdose and slitting of wrists. While 40% of participants had attempted suicide, only 10% of participants had ever done so by means of a deliberate heroin overdose. Among those who had ever overdosed, 92% reported that their most recent overdose was accidental. While both overdose and attempted suicide were common, the data are not consistent with the view that suicidal intent is a major factor in heroin overdose.

### **4.2 *History of Attempted Suicide***

Consistent with previous studies<sup>10,15,16,27</sup>, a history of attempted suicide was common among MM patients. The finding that 40% of subjects had a history of attempted suicide is similar to the findings from recent studies of attempted suicide cited above<sup>10,15,16</sup>. A quarter of participants had been hospitalised after a suicide attempt. The clinical significance of these findings is illustrated by the fact that one in ten of the MM patients interviewed had attempted suicide since enrolment in their current treatment programme, and 8% had done so in the 12 months preceding interview. Recent and potential suicide attempts constitute a major clinical issue among MM patients.

As is the case in the general population, female MM patients were significantly more likely than males to have a history of attempted suicide, and to have had repeated suicide attempts. There were large differences between males and females in the age at which a suicide attempt first occurred. Females, on average, had first attempted suicide six years earlier than males with a history of attempted suicide. It is particularly worthy of note that the majority of female suicide attempts occurred *prior* to the initiation of heroin use, while almost all attempts by males occurred *after* the initiation of heroin use. The suicide attempts of females would appear to be related to long-standing problems that predate heroin use, and may contribute to the use of the drug itself. One possible factor contributing to the earlier onset of suicidal behaviours among females may be childhood abuse. The prevalence of childhood sexual and physical abuse among female drug users is high<sup>39, 40</sup>. It is possible that females are reacting to long-standing

psychological problems and trauma, while males are reacting to the stresses of the heroin using lifestyle such as incarceration.

The clinical significance of these findings is further emphasised by the high levels of depression and current suicidal ideation among participants. Over 80% of participants had some degree of current depression, and a quarter of participants had depression in the severe to extreme range of the BDI. Of particular clinical relevance was the finding that those with a history of suicide exhibited higher levels of current depression than other participants.

Nearly a half of patients interviewed reported current suicidal ideation, and 61% reported some degree of hopelessness about the future. The latter is particularly relevant, as it is a strong predictor of future suicidal behaviours<sup>41</sup>. This is reinforced by the finding that 16% of those who had attempted suicide believed it likely they would do so again. Overall, methadone clinics are not only dealing with a population in which a history of attempted suicide is common, but with a group that has high levels of current suicidal ideation and depression.

#### **4.3 *Factors Associated with Attempted Suicide***

The factors associated with a history of attempted suicide among this group were similar to those associated with suicide in the broader population<sup>4,17-23</sup>. As studies of suicide and parasuicide amongst the broader population have found, suicide attempters in this study were more likely to be female, to have parents with drug or alcohol problems, to have parents with psychiatric histories, and to have parents absent during childhood. Multiple regressions indicated that being female and the loss of parents during childhood were independent predictors of later suicidal behaviours.

There were, however, factors specific to the drug using population that were associated with a history of attempted suicide. Participants who had attempted suicide had first been intoxicated at an average age of 12 years, significantly earlier than other patients. They had also had a lifetime history of wider polydrug use than other patients. It is possible that these factors represent attempts at self-medication of psychological distress.

A diagnosis of ASPD in this study was not significantly associated with attempted suicide. There are reasons, however, why this might be the case amongst this group. The rate of ASPD is

consistently high among this population, and there are particular problems in making the diagnosis among heroin users<sup>42</sup>. The criminal behaviours engendered by drug dependence means that the odds of receiving a diagnosis that is based primarily upon criminal behaviours is high. The diagnosis thus includes both "true" psychopaths and "secondary" psychopaths, whose criminality is related to drug use rather than personality disorder *per se*<sup>41</sup>.

Despite the fact that the median length of time since most recent suicide attempt was 45 months, the psychosocial functioning of those with a history of such attempts continues to be poorer than those without such a history. Suicide attempters recorded higher levels of current depression, suicidal ideation and poorer social functioning than other patients, findings similar to those reported elsewhere<sup>25,27</sup>. In contrast, the current drug use patterns of the two groups did not significantly differ. The drug use patterns of suicide attempters were thus responding to their treatment programme as well as those of other patients. It is in the realm of psychosocial factors that elevated levels of problems continued. Screening, and more clinical attention to these factors may mitigate the distress these people continue to experience.

#### **4.4 *Circumstances of Attempted Suicide***

Suicide attempts were predominantly unplanned, spur of moment decisions among both males and females. Only a small minority left suicide notes or informed others of the intention to attempt suicide.

Not surprisingly, the most common reason given for attempting suicide on the most recent occasion was depression. Over 80% of those who had a history of attempted suicide reported that a major life event had occurred prior to the attempt. The events reported by participants were similar to those reported by the broader population<sup>4,17-23</sup>, with relationship split-ups being the most common. Of particular relevance to this population however, was the role of incarceration in suicide attempts. One in ten most recent attempts occurred either in prison, or when a prison sentence was imminent. Consistent with the more extensive prison histories of the male participants, almost all these participants were males. Imminent or actual imprisonment clearly represents a period of increased risk for male MM patients.

In common with the broader population<sup>4,17-23</sup>, social isolation at the time of the most recent suicide was common. At the time of their most recent suicide attempt, approximately 40% of suicide attempters reported having no close friends at all. This was particularly pronounced among males.

There was a large gender imbalance in the use of heroin at the time of the most recent suicide attempt. The majority of males were using heroin at the time of the most recent attempt, while the majority of females were not. This is consistent with the earlier onset of suicidal behaviours amongst females, and the view, hypothesised above, that male suicide attempts amongst this group are likely to be related to the use of heroin, with the majority of first suicide attempts occurring after the onset of heroin use. In contrast, suicidal behaviours amongst females typically predates the use of heroin, and would appear to be related to problems of longer-standing than the use of heroin.

The problems clinics face in relation to attempted suicide amongst their clients is further emphasised by the fact that in over a quarter of the most recent attempts by participants the person was enrolled in a drug treatment programme at the time. In contrast, however, no psychiatric or psychological treatment was being received by the vast majority of participants at the time of their most recent suicide attempt. Given the high levels of depression and suicidal behaviours amongst this group, screening for appropriate interventions appears warranted.

#### **4.5 *Methods of Attempted Suicide***

The most common method of attempting suicide, particularly amongst females, was by non-opioid drug overdose. Nearly a half (44%) of the most recent suicide attempts employed this method. The drugs involved were overwhelmingly benzodiazepines. Hassan<sup>4</sup> and others<sup>14</sup> have commented on the reduction in the number of suicide deaths by tranquilliser overdose, particularly among females, since the decline of barbiturate prescribing and the substitution of benzodiazepines. It is highly likely that a large number of these participants would have died if barbiturates were still in common use.

The use of pharmaceuticals as the most common means of attempted suicide among heroin users has been noted in several other studies<sup>10,14,16</sup>. Johnsson & Fridell<sup>10</sup> reported that a half of suicide



attempts among a cohort of heroin users were by benzodiazepines and antidepressants, with deliberate heroin overdose being rare. Vingoe et al<sup>16</sup> also reported non-opioid overdose as the most common means of attempted suicide among a treatment sample of heroin users.

Deliberate slitting of wrists was the next most commonly reported method amongst the MM patients interviewed for this study. Over a quarter of most recent suicide attempts were by this means. It should be noted that in the interviews, self-harm by slashing of arms without deliberate suicidal intention was not counted as a suicide attempt. The attempts reported here all involved an intention to die. It is of particular interest that more females than males reported using this means, as more violent means of suicide are associated with males in the broader community.

Overall, approximately three quarters of the most recent suicide attempts were by the two means described above. Deliberate heroin overdose accounted for only a fifth of most recent attempts, and only 10% of patients interviewed had ever employed this method.

Consistent with the reports that the most recent attempts were predominantly spur of the moment decisions, immediate availability was overwhelmingly the most common reason given for the choice of method employed. Participants typically described situations in which they suddenly wished to kill themselves, and reached for the most available method. In many cases this involved taking large numbers of prescription medications. In others the participants simply reached for a kitchen knife. These were not decisions that were typically planned or given a great deal of forethought.

#### **4.6 *Attempted Suicide and Overdose***

Lifetime histories of both attempted suicide (40%) and heroin overdose (66%) were common among participants. Despite these high levels, however, only 10% of participants had ever attempted suicide by means of a deliberate heroin overdose. As noted above, and as has been reported in several other studies<sup>10,14,16</sup>, suicide attempts among this group were primarily by means other than deliberate heroin overdose. Drug overdose was the most common methods of attempted suicide, but by means of non-opioid pharmaceutical preparations.

Conversely, heroin overdose among participants overwhelmingly appeared to be accidental. Ninety two percent of those who had ever overdosed reported that their most recent overdose was accidental. This finding is consistent with the results of earlier studies of both fatal and non-fatal overdose in that the overwhelming majority of heroin overdoses are not intentional<sup>11,29,31</sup>. Taken together with the methods employed to attempt suicide, the data do not support the proposition that most heroin overdoses involve suicidal intention.

As was reported by Rossow & Lauritzen<sup>15</sup>, the current study found a statistical association between a history of heroin overdose and attempted suicide. However, this association would appear to be an artefact of the fact that 10% of participants had attempted suicide by means of a heroin overdose. As such, they are represented on both sides of the analysis, and artificially inflate the association between these two risk behaviours. When those who have attempted suicide by heroin overdose were excluded from the analyses, those who had attempted suicide were no more likely to have experienced a heroin overdose than other participants.

#### **4.7 Summary**

In summary, a history of attempted suicide was common among participants, and among female MM patients in particular. Attempted suicide presents a major clinical problem independent of drug use to staff at drug treatment programmes. Those with a history of attempted suicide present with higher levels of current depression and with poorer social functioning than other patients, and a significant minority of patients in this study reported a suicide attempt since enrolment in their current treatment programme. While the current drug use of these suicide attempters was indistinguishable from that of other patients, the poorer psychosocial functioning of this group presents a significant clinical problem. The current data indicate, however, that heroin overdoses and suicide appear to present different clinical problems. Most heroin overdoses appear to be accidental, and most suicide attempts employ other methods. While both overdose and suicide present increasing clinical problems, they are separate problems, and require different responses to reduce their associated harm.

## 5.0 REFERENCES

1. Darke, S., Ross, J., Zador, D. & Sunjic, S. (2000) Heroin-related deaths in New South Wales, Australia, 1992-1996. *Drug and Alcohol Dependence*, 60, 141-150.
2. Davoli, M., Perucci, C.A., Rapiti, E., Bargagli, A.M., Dippoliti, D., Forastiere, F. & Abeni, D. (1997) A persistent rise in mortality among injection drug users in Rome, 1980 through 1992. *American Journal of Public Health*, 87, 851-853.
3. Hall, W., Degenhardt, L. & Lynskey, M. (1999) Opioid overdose mortality in Australia, 1964-1997: birth-cohort trends. *Medical Journal of Australia*, 171, 34-37.
4. Hassan, R. (1995) *Suicide Explained. The Australian Experience* (Melbourne, Melbourne University Press).
5. Lynskey, M., Degenhardt, L. & Hall, W. (2000) Cohort trends in youth suicide in Australia. *Australian and New Zealand Journal of Psychiatry*, 34, 408-412.
6. Neeleman, J. & Farrell, M. (1997) Fatal methadone and heroin overdoses: time trends in England and Wales. *Journal of Epidemiology and Community Medicine*, 51, 435-437.
7. Risser, D., Uhl, A., Stichenwirth, M., Honigschnabl, S., Hirz, W., Schneider, B., Stellwag-Carion, C., Klupp, N., Vycudilik, W. & Bauer, G. (2000) Quality of heroin and heroin-related deaths from 1987 to 1995 in Vienna, Austria. *Addiction*, 95, 375-382.
8. Appleby, L. (2000) Drug misuse and suicide: a tale of two services. *Addiction*, 95, 175-177.
9. Farrell, M., Neeleman, J., Griffiths, P. & Strang, J. (1996) Suicide and overdose among opiate addicts. *Addiction*, 91, 321-333.

10. Johnsson, E. & Fridell, M. (1997) Suicide attempts in a cohort of drug abusers: a five year follow-up study. *Acta Psychiatrica Scandinavia*, 96, 362-366.
11. Kjelsberg, E., Winther, M. & Dahl, A.A. (1995) Overdose deaths in young substance abusers: accidents or hidden suicides. *Acta Psychiatrica Scandinavia*, 91, 236-242.
12. Kosten, T.R. & Rounsaville, B.J. (1988) Suicidality among opioid addicts: a 2.5 year follow-up. *American Journal of Drug and Alcohol Abuse*, 14, 357-369.
13. Neale, J. (2000) Suicidal intent in non-fatal illicit drug overdose. *Addiction*, 95, 85-93.
14. Oyefeso, A., Ghodse, H., Clancy, C. & Corkery, J.M. (1999) Suicide among drug addicts in the UK. *British Journal of Psychiatry*, 175, 277-282.
15. Rossow, I. & Lauritzen, G. (1999) Balancing on the edge of death: suicide attempts and life-threatening overdoses among drug addicts. *Addiction*, 94, 209-219.
16. Vingoe, L., Welch, S., Farrell, M. & Strang, J. (1999) Heroin overdose among a treatment sample of injecting drug misusers: accident or suicidal behaviour? *Journal of Substance Use*, 4, 88-91.
17. Appleby, L., Cooper, J., Amos, T. & Faragher, B. (1999) Psychological autopsy study of suicides by people under 35. *British Journal of Psychiatry*, 175, 168-174.
18. Buckstein, O.G., Brent, D.A., Perper, J.A., Moritz, G., Baugher, M., Schweers, J., Roth, C. & Balach, L. (1993) Risk factors for suicide among adolescents with a history of substance use; a case-control study. *Acta Psychiatrica Scandinavia*, 88, 403-408.
19. Casey, P.R. (1989) Personality disorder and suicide intent. *Acta Psychiatrica Scandinavia*, 79, 290-295.
20. Foster, T., Gillepsie, K., McClelland, R. & Patterson, C. (1999) Risk factors for suicide independent of DSM-III-R Axis I disorder. *British Journal of Psychiatry*, 175, 175-179.

21. Frederick, C.J., Resnik, H.L.P. & Wittlin, B.J. (1973) Self-destructive aspects of hard core addiction. *Archives of General Psychiatry*, 28, 579-585.
22. Harris, E.C. & Barraclough, B. (1997) Suicide as an outcome for mental disorders. *British Journal of Psychiatry*, 170, 205-228.
23. Miles, C.P. (1977) Conditions predisposing to suicide: a review. *Journal of Nervous and Mental Disease*, 164, 231-246.
24. Bentley, A.J. & Busuttil, A. (1996) Deaths among drug abusers in south-east Scotland (1989-1994). *Medicine, Science and the Law*, 36, 231-236.
25. Chatham, L.R., Knight, K., Joe, G.W. & Simpson, D.D. (1995) Suicidality in a sample of methadone maintenance patients. *American Journal of Drug and Alcohol Abuse*, 21, 345-361.
26. Deykin, E.Y. & Buka, S.L. (1994) Suicidal ideation and attempts among chemically dependent adolescents. *American Journal of Public Health*, 84, 634-639.
27. Murphy, S.L., Rounsaville, B.J., Eyre, S. & Kleber, H.D. (1983) Suicide attempts in treated opiate addicts. *Comprehensive Psychiatry*, 24, 79-89.
28. Rossow, I. (1994) Suicide among drug addicts in Norway. *Addiction*, 89, 1667-1673.
29. Darke, S., Ross, J. & Hall, W. (1996) Overdose among heroin users in Sydney, Australia I. Prevalence and correlates of non-fatal overdose. *Addiction*, 91, 405-411.
30. Gossop, M., Griffiths, P., Powis, B., Williamson, S. & Strang, J. (1996) Frequency of non-fatal heroin overdose: survey of heroin users recruited in non-clinical settings. *British Medical Journal*, 313, 402.

31. McGregor, C., Darke, S., Christie, P. & Ali, R. (1998) Experience of non-fatal overdose among heroin users in Adelaide: circumstances and risk perception. *Addiction*, **93**, 701-711.
32. Ravndal, E. & Vaglum, P. (1999) Overdoses and suicide attempts: different relations to psychopathology and substance abuse? A 5-year prospective study of drug abusers. *European Addiction Research*, **5**, 63-70.
33. Drug and Alcohol Directorate (1996) *NSW Methadone Programme 1994/95. Annual Statistical Report*. NSW Health Department In-house Report Series A96/1 (Sydney, NSW Health Department).
34. 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.
35. 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.
36. Robins, L.N., Helzer, J.E., Croughan, J. & Ratcliff, K.S. (1981) National Institute of Mental Health Diagnostic Interview Schedule: Its history, characteristics, and validity. *Archives of General Psychiatry*, **38**, 381-389.
37. Beck, A.T., Ward, C.H., Mendelson, M., Mock, J. & Erbaugh, J. (1961) An inventory for measuring depression. *Archives of General Psychiatry*, **4**, 561-571.
38. SPSS inc. (1999) *SPSS for Windows, 9.0* (Chicago, SPSS inc).
39. Dansky, B.S., Saladin, M.E., Brady, K.T., Kilpatrick, D.G. & Resnick, H.S. (1995) Prevalence of victimization and posttraumatic stress disorder among women with

substance use disorders: comparison of telephone and in-person assessment samples. *International Journal of the Addictions*, 30, 1079-1099.

40. Medrano, M.A., Zule, W.A., Hatch, J. & Desmond, D.P. (1999) Prevalence of childhood trauma in a community sample of substance-abusing women. *American Journal of Drug and Alcohol Abuse*, 25, 449-462.
41. Beck, A.T., Steer, R.A., Kovacs, M. & Garrison, B. (1985) Hopelessness and eventual suicide: a 10-year prospective study of patients hospitalized with suicidal ideation. *American Journal of Psychiatry*, 142, 559-563.
42. Darke, S., Kaye, S. & Finlay-Jones, R. (1998) Antisocial personality disorder, psychopathy and injecting drug use. *Drug and Alcohol Dependence*, 52, 63-69.