Drug and Alcohol Services Council
South Australia

It's rarely just the 'h': addressing overdose among South Australian heroin users through a process of intersectoral collaboration

Catherine Mc Gregor[1], Katrina Hall[1], Robert Ali[1,2], Paul Christie[1], Robert Braithwaite[1], and Shane Darke[2]

DASC Monograph No. 2
Research Series

[1]Drug and Alcohol Services Council of South Australia
[2]National Drug and Alcohol Research Centre, University of New South Wales, Australia

Drug and Alcohol Services Council Monograph No. 2 (Research Series)

© DASC 1999
161 Greenhill Road
Parkside SA 5063
Australia

ISBN 0-7308-0283-3

CONTENTS

TABLES		vi
FIGURES		ix
ACKNOWLEDGMENTS		x
EXECUTIVE SUMMARY		xi
SUMMARY OF MAJOR FINDINGS		xviii
RECOMMENDATIONS		xx
SECTION 1	**INTRODUCTION**	
	1.1 Background	1
	1.2 Study aims	1
	1.3 South Australian heroin overdose interventions	2
	1.3.1 Information materials	2
	1.3.2 Peer education	2
	1.3.3 Partnerships	2
	1.4 Data collection and evaluation of the heroin overdose intervention	3
	1.4.1 Pre- and Post-intervention surveys of South Australian heroin users	*3*
	1.4.2 Review of institutional sources	*3*
	1.5 Structure of the report	3
SECTION 2	**LITERATURE REVIEW OF OVERDOSE AMONG HEROIN USERS**	
	2.1 Introduction	4
	2.2 Tolerance	4
	2.3 Circumstances of accidental fatalities among heroin users	5

2.4 Non-fatal overdose among heroin users 7

2.5 Pharmacodynamics of multiple psychoactive substance use 8

2.6 Patterns of multiple substance use 9

2.7 Summary 10

SECTION 3 DEVELOPMENT OF THE SOUTH AUSTRALIAN HEROIN OVERDOSE INTERVENTION

3.1	**Development of the information materials**	11
3.1.1	*Review of existing materials*	12
3.1.2	*Identification of messages*	12
3.1.3	*Development of information materials*	14
3.1.4	*Community consultation*	15
3.2	**Dissemination of heroin overdose intervention materials – South Australia**	20
3.2.1	*Aboriginal and Non-English Speaking Background groups*	*21*
3.3	**National dissemination program**	21
3.4	**Peer education: development of the model**	23
3.4.1	*Method*	25
3.5	**Achievement of structural change**	25
3.6	**South Australian heroin overdose intervention launch**	27

SECTION 4 PRE- AND POST-INTERVENTION SURVEYS OF SOUTH AUSTRALIAN HEROIN USERS

4.1	**Method**	28
4.1.1	*Study questionnaire*	28
4.1.2	*Recruitment and training of interviewers*	29
4.1.3	*Subject recruitment*	30
4.1.4	*Interview procedures*	30
4.1.5	*Analyses*	31
4.2	**Results**	31
4.2.1	*Subjects*	31
4.2.2	*Characteristics of the samples*	32
4.2.3	*Lifetime heroin use*	33
4.2.4	*Lifetime psychoactive substance use history*	33
4.2.5	*Psychoactive substance use in the previous six months*	35
4.2.6	*Severity of Dependence Scale*	*37*
4.2.7	*Recognition of opioid overdose signs*	38
4.2.8	*Personal experience of overdose*	39
4.2.9	*Perceived reasons for personal overdose*	40

SECTION 4 CONTINUED

4.2.10 Circumstances of most recent personal overdose 41
4.2.11 Concomitant psychoactive substance use at time of most recent personal overdose 42
4.2.12 Presence at heroin-related overdoses 43
4.2.13 Responses to overdose 43
4.2.14 Perceived obstacles to help-seeking at overdose 44
4.2.15 Overdose risk perceptions 45
4.2.16 Prevention of heroin-related overdose 47
4.2.17 Frequency of risk behaviours and the use of prevention strategies in the previous six months 48
4.2.18 Motivation for concomitant alcohol and heroin use 50
4.2.19 Motivation for concomitant benzodiazepine and heroin use 51
4.2.20 Concomitant 'other opioid' and heroin use among the post-intervention sample 51
4.2.21 Motivation for concomitant 'other opioid' and heroin use among the post-intervention sample 52
4.2.22 Perception of overdose causes 53
4.2.23 Sources of information on safe substance use 53

SECTION 5 EVALUATION OF EXPOSURE TO THE HEROIN OVERDOSE INTERVENTION

5.1 Awareness of overdose signs among those exposed to the heroin overdose intervention 55
5.2 Changes in risk factors associated with heroin overdose 56
5.3 Exposure to heroin overdose intervention materials 57
5.4 Recall of main heroin overdose intervention messages 61

SECTION 6 EXPOSURE TO HEROIN OVERDOSE INTERVENTION: GROUP COMPARISONS

6.1 Exposure group comparisons 62
6.2 Overdose risk perceptions 63
6.3 Responses to overdose in others 63

SECTION 6 CONTINUED

6.4 Prevention strategies 64

6.5 Perceived reasons for overdose in others 65

SECTION 7 REVIEW OF INSTITUTIONAL SOURCES: HOSPITAL, AMBULANCE AND AUSTRALIAN BUREAU OF STATISTICS DATA

7.1 Australian Bureau of Statistics data 66
7.2 Hospital admissions and attendances 67
7.3 Ambulance attendances 68

SECTION 8 REVIEW OF INSTITUTIONAL SOURCES: TOXICOLOGICAL AND CORONIAL DATA

8.1 Method 70
8.1.1 Cause of death 72
8.2 Results 73
8.2.1 Accidental substance-related fatalities among heroin users in South Australia 73
8.2.2 Characteristics of the cases 73
8.2.3 Accidental substance-related deaths among heroin users in South Australia by appearance 74
8.2.4 Presence of other people 75
8.2.5 Initial action 75
8.2.6 History of psychoactive substance use 76
8.2.7 Detection of 6-monoacetylemorphine in the urine 76
8.2.8 Free morphine concentrations 77
8.2.9 Femoral blood alcohol concentration 78
8.2.10 Free blood codeine concentration 79
8.2.11 Benzodiazepine types detected at autopsy 80
8.2.12 Paraphernalia found at the scene of death 81
8.2.13 Injection sites 81
8.2.14 Regional differences 81
8.2.15 Seasonal variations 82
8.2.16 Day of week 83
8.2.17 Estimated time of death 84
8.2.18 Estimated time interval between heroin use and death 84

SECTION 8 CONTINUED

8.2.19 Location of death 85
8.2.20 Heroin purity 85

8.3 **Summary of results** 86

SECTION 9 **DISCUSSION AND RECOMMENDATIONS**

9.1 **South Australian heroin overdose interventions** 93
9.2 **Institutional sources of data** 94
9.3 **Evaluation of the heroin overdose intervention** 99
9.4 **Conclusions** 110
9.5 **Summary of major findings** 112
9.6 **Recommendations** 113

References 116
Appendix A

TABLES

SECTION 4 PRE- AND POST-INTERVENTION SURVEYS OF SOUTH AUSTRALIAN HEROIN USERS

Table 4.2.1	**Sample demographics**	32
Table 4.2.2	**Characteristics of the samples**	32
Table 4.2.3	**Length of heroin-using career**	33
Table 4.2.4	**Psychoactive substance types ever used or injected**	34
Table 4.2.5	**Lifetime psychoactive substance use**	34
Table 4.2.6	**Number of psychoactive substance types used or injected in the previous six months**	35
Table 4.2.7	**Psychoactive substance use in the previous six months**	36
Table 4.2.8	**Recognition of opioid overdose signs**	38
Table 4.2.9	**Personal experience of overdose**	39
Table 4.2.10	**Perceived main reason for most recent personal overdose**	40
Table 4.2.11	**Circumstances of most recent personal overdose**	41
Table 4.2.12	**Concomitant substance use at time of most recent personal overdose**	42
Table 4.2.13	**Initial action taken at most recent witnessed overdose**	44
Table 4.2.14	**Perceived obstacles to help-seeking at overdose**	45
Table 4.2.15	**Overdose risk perceptions**	46
Table 4.2.16	**Concern regarding future personal overdose**	46
Table 4.2.17	**Heroin overdose prevention strategies**	48
Table 4.2.18	**Frequency of risk behaviours and use of prevention strategies in the previous six months**	49
Table 4.2.19	**Concomitant alcohol/ benzodiazepine and heroin use**	49
Table 4.2.20	**Main reason for concomitant alcohol and heroin use**	50

SECTION 4 CONTINUED

Table 4.2.21 **Main reason for concomitant benzodiazepine and heroin use** 51
Table 4.2.22 **Concomitant 'other opioid' and heroin use among the post-intervention sample** 52
Table 4.2.23 **Main reason for concomitant 'other opioid' and heroin use among the post-intervention sample** 52
Table 4.2.24 **Perceived reasons for overdose in others** 53
Table 4.2.25 **Sources of information on the safe use of substances** 54

SECTION 5 **EVALUATION OF EXPOSURE TO THE HEROIN OVERDOSE INTERVENTION**

Table 5.1 **Awareness of overdose signs** 55
Table 5.2 **Likelihood of trial tasting a new batch of heroin** 56
Table 5.3 **Likelihood of using heroin alone or with the door locked** 56
Table 5.4 **Likelihood of using other psychoactive substances with heroin** 57
Table 5.5 **Sources of information regarding heroin overdose** 58
Table 5.6 **Location of exposure to intervention Postcards** 58
Table 5.7 **Location of exposure to intervention fridge magnets** 59
Table 5.8 **Location of exposure to intervention user booklet** 60
Table 5.9 **Location of exposure to intervention posters** 60
Table 5.10 **Unprompted recall of main intervention messages** 61
Table 5.11 **Prompted recall of intervention posters** 61

SECTION 6 EXPOSURE TO HEROIN OVERDOSE INTERVENTION: GROUP COMPARISONS

Table 6.1	**Group characteristics**	62
Table 6.2	**Reported prevention strategies**	64
Table 6.3	**Perceived reasons for overdose in others**	65

SECTION 8 REVIEW OF INSTITUTIONAL SOURCES: TOXICOLOGICAL AND CORONIAL DATA

Table 8.2.1	**Accidental fatalities among heroin users in South Australia**	73
Table 8.2.2	**Characteristics of the cases**	74
Table 8.2.3	**Accidental substance-related deaths among heroin users in South Australia by appearance**	74
Table 8.2.4	**Presence of other people**	75
Table 8.2.5	**Initial action**	75
Table 8.2.6	**Identification of 6-monoacetylemorphine**	76
Table 8.2.7	**Substances detected at autopsy**	77
Table 8.2.8	**Benzodiazepines types identified**	80
Table 8.2.9	**Region of residence/death**	82
Table 8.2.10	**Season of year**	83
Table 8.2.11	**Day of week**	83
Table 8.2.12	**Estimated time of death**	84
Table 8.2.13	**Estimated time interval between heroin use and death**	84
Table 8.2.14	**Location of death**	85
Table 8.2.15	**Heroin purity and accidental fatalities among heroin users in South Australia**	86

FIGURES

SECTION 7 **REVIEW OF INSTITUTIONAL SOURCES: HOSPITAL, AMBULANCE AND AUSTRALIAN BUREAU OF STATISTICS DATA**

Figure 7.3.1 **Naloxone utilisation by SAAS officers from August 1995 to April 1997** 69

SECTION 8 **REVIEW OF INSTITUTIONAL SOURCES: TOXICOLOGICAL AND CORONIAL DATA FROM SOUTH AUSTRALIA**

Figure 8.2.1 **Distribution of free blood morphine concentrations in 85 heroin-related deaths, South Australia, 1.1.94 – 30.6.97** 78

Figure 8.2.2 **Distribution of femoral blood alcohol concentrations in 33 heroin-related deaths, South Australia, 1.1.94 – 30.6.97** 79

Figure 8.2.3 **Distribution of free blood codeine concentrations in 34 heroin-related deaths, South Australia, 1.1.94 – 30.6.97** 79

ACKNOWLEDGMENTS

This research was funded by a Commonwealth Department of Health and Family Services Research into Drug Abuse Grant (RIDAG) and by the Drug and Alcohol Services Council of South Australia (DASC).

A project of this magnitude can only be conducted with the support, collaboration and practical assistance of many people. In particular, the authors would like to thank the following:

Mr Wayne Chivell, State Coroner, South Australia and Mr Tim Goodes, Manager, and staff of the Coroner's Office for their assistance in accessing coronial records. Dr. Robert Lokan, Chief Scientist, Operations; Ms. Marie Sterai, Case Receipt Officer; Mr. D. Noel Simms, Forensic Scientist and Dr. Paul Pigou, Senior Forensic Scientist, Chemistry, Forensic Science, Adelaide, South Australia for their assistance in the interpretation of toxicological data associated with fatalities among heroin users and access to data concerning heroin purity in South Australia.

Dr Hugh Grantham, Medical Director of the South Australian Ambulance Service (SAAS) and staff for their cooperation in providing access to ambulance records relating to opioid overdose in South Australia.

Superintendent Denis Edmonds, Drug Task Force, South Australian Police and Inspector Graham Lough, Drug and Alcohol Policy Coordinator, South Australian Police for their support and advice regarding police practice.

Members and staff of the South Australian Voice for Intravenous Education (SAVIVE), and the AIDS Council of South Australia (ACSA), who generously provided valuable information in addition to the practical assistance necessary for the conduct of this project.

Members of the interview team for their enthusiasm, energy and commitment to this project.

Cecelia Gore, NSW for assistance in developing a peer education model and process for use in this study.

Jason White for advice on pharmacological issues and Rachel Humeniuk for advice on pharmacological issues and for reading and commenting on drafts of this report.

The development of the information resources would not have been possible without the assistance of number of people. Particular thanks must go to Kenton Miller for his role in facilitating the focus groups, Danny Stevens for editing assistance and production management, and Butler Kemp Design for the concept development, design and layout of the materials.

EXECUTIVE SUMMARY

The South Australian heroin overdose intervention arose following a meeting of representatives from a range of agencies in December 1994. The agencies represented were the Drug and Alcohol Services Council (DASC), the Department of Clinical and Experimental Pharmacology of the University of Adelaide, Forensic Science, the Drug Task Force of South Australian Police, the South Australian Ambulance Service (SAAS), the AIDS Council of South Australia (ACSA), the National Drug and Alcohol Research Centre (NDARC), the South Australian Voice for Intravenous Education (SAVIVE), and the Accident and Emergency (A&E) Departments of South Australian hospitals. This preliminary meeting led to the development of a submission for funding of an evaluation of interventions aimed at reducing the incidence of heroin overdose in South Australia. The interventions would address issues raised in earlier research conducted by NDARC, which had found that those most at risk of overdose were long-term users of heroin and those using at home, particularly in an isolated situation (e.g. behind a closed door). The research also showed that those present when someone overdosed were reluctant to call for assistance from emergency services, primarily due to a fear of police intervention.

The interventions had three major strands:

- The development of partnerships among key stakeholders and the achievement of structural change
- The development and implementation of a peer education process
- The development and dissemination of information materials

Members of the reference group identified a number of key messages to address the concerns raised by previous research. These messages included three slogans which were thought to encapsulate the primary themes of the project. The initial form these slogans took were:

‘don't slow it alone’
‘it's rarely just the 'h‘‘
‘watch out for your mates’

An essential component of this project was the facilitation of ongoing collaboration between the key stakeholders to create a climate in which it was possible to reach agreement on the importance of reducing the risk of overdose or death following the use of heroin. The encouragement of collaborative relationships is considered to be crucial in creating an environment in which health promotion activities can be most effective.

The model of peer education to be used in this study was developed by participants in a workshop conducted in September, 1996. During the workshop, various forms of peer education were discussed: peer teaching, peer support, peer counselling, and peer participation. Peer

participation was considered as the desirable option for the national training program, as it recognises the knowledge and expertise which already exists in a community and uses existing networks to disseminate information and teach skills. This approach facilitates a process of community development in which communities identify those issues which are of concern to them and are assisted to find ways to address them.

Three rounds of consultation with the user community were undertaken during the development of the resource materials to be used in the intervention. The intervention materials took the form of three posters, nine postcards, three fridge magnets and one booklet.

The success of the interventions relied on their wide distribution and acceptance among the target community. Needle exchanges were identified as sites which the general public were unlikely to access and as ideal contact points for injecting drug users. Statewide distribution therefore occurred through needle exchanges, with a substantial proportion of the resources distributed in tandem with the peer education strategy undertaken by SAVIVE. The launch of the intervention materials and education program developed as part of the reduction of heroin overdose intervention took place in November 1996 and received favourable media attention.

Following significant national interest in the project from an early stage, a submission was developed for the dissemination of the South Australian interventions on a national level. The national proposal involved production and national dissemination of materials through needle exchange and other outlets (with the materials modified for local use), training of key workers from around Australia; and the encouragement of collaborative relationships.

To identify the experience and circumstances of fatal and non-fatal overdose among heroin users in South Australia and to provide a baseline against which the intervention described above could be evaluated, a total of 218 heroin users (the pre-intervention sample) were interviewed during September/October 1996. The effectiveness of the intervention was evaluated in a second round of interviews (the post-intervention survey) with 211 heroin users conducted six months after the launch, in May/June 1997.

Results from these two samples of South Australian heroin users showed that almost half (48%) of the pre-intervention and 44% of the post-intervention sample had overdosed on heroin during their lifetime, with no gender difference in numbers of reported overdoses. For both samples, the prevalence of overdose was found to increase with the length of heroin-using career, suggesting that overdose risk may be in part a function of cumulative exposure to heroin use. For subjects in both the pre- and post-intervention samples, the majority of their most recent overdose episodes had occurred in a private home and in the presence of other people. In both pre-intervention and

post-intervention samples, over half of those who had ever overdosed had used other psychoactive substances (principally alcohol and benzodiazepines) in addition to heroin on the most recent occasion.

A majority of participants in both pre-intervention and post-intervention surveys had been present at someone else's overdose during their lifetime. Approximately half of the subjects in each sample called an ambulance as either an initial or subsequent response to the last overdose at which they were present.

On the most recent occasion that someone overdosed in their presence, 40% of those who had ever been present at an overdose among the pre-intervention sample, and 36% of the post-intervention sample, were delayed or stopped from getting help on that occasion. Fear of police involvement was the predominant main reason for both samples.

This fear of police involvement was addressed through the ongoing collaboration between key stakeholders (i.e. heroin users, police, accident and emergency services, and alcohol and other drug services) which resulted in negotiations to identify the circumstances in which police presence is essential at overdose events. These negotiations have resulted in the production of an amended police protocol regarding police attendance at overdoses. Negotiations with the SAAS have similarly resulted in revised guidelines on attendance at overdoses. The establishment of these guidelines was an important step in removing the barriers to help-seeking at overdose events.

While there were no differences between the pre-intervention and post-intervention samples in their perceptions of the personal risk of a future overdose, significantly more of the post-intervention sample perceived a greater risk of future overdose for other people. Respondents in both samples regarded the risk of overdose as much higher for others than for themselves. There was a striking contrast between personal perceptions of overdose risk and the perception of other heroin users' chances of overdose. While the majority felt that the chances of a regular heroin user in Adelaide overdosing in the future was high, less than one-fifth in each sample thought their own chances of overdose were comparable.

Based on the identified risks, principal messages of the intervention were: avoid the concomitant use of multiple centrally acting substances; avoid using heroin in situations where help may be delayed, e.g. while alone; be aware of signs of impending narcosis in others, and call an ambulance in cases of suspected overdose. Significantly more of the post-intervention sample reported that they avoided concomitant heroin and other substance use, or using heroin in excess of their level of tolerance when compared to the pre-intervention sample. Other preventive

measures reported such as not using heroin while alone and asking their dealer about the strength of the heroin, were also reported significantly more often by respondents from the post-intervention sample.

There was a high level of exposure to the intervention, with almost half of the post-intervention sample (47%) coming into contact with some aspect of the intervention. The most common source of exposure to issues around heroin overdose were the intervention materials, particularly the posters.

Significantly more of those respondents who had been exposed to the intervention reported a past overdose compared to those who had not, indicating that the intervention had reached the group at which it was aimed (i.e. those at risk of overdose). Similarly, comparison of the exposed and non-exposed groups showed that older respondents who had been using heroin for longer were more likely to have been exposed to the intervention. Given that it is the older, more experienced user who is more at risk of overdose, this suggests that the targeting of the intervention materials and processes were successful. More of those who were exposed to the intervention were in methadone treatment. It may be that regular contact with treatment agencies and exposure to harm minimisation messages which are frequently available at such agencies may in part explain this finding.

Unprompted recall of the main intervention messages was high, with the majority of those exposed to the intervention accurately recalling at least one specific intervention message, particularly the message regarding the avoidance of concomitant heroin and other substance use. Prompted recall of the three posters was also high among those respondents who had been exposed to the intervention, the most commonly recognised poster being the one bearing the message *'It's rarely just the 'h''.*

The practice of prevention strategies such as not mixing heroin with psychoactive substances such as benzodiazepines, and not using heroin while they were alone were nominated significantly more often by respondents who had been exposed to the intervention, compared to those not exposed.

Increasing calls to ambulance services and reducing the fear of police involvement in overdose events were major aims of the intervention. While there were no differences between the exposed and the non-exposed groups in terms of their initial response to a witnessed overdose, significantly more of those who rang an ambulance as an initial or subsequent response to an overdose had been exposed to the intervention. Among those who had been present at an overdose, no differences were found between the exposed and the non-exposed groups in terms

of being stopped or delayed in seeking help at their most recent witnessed overdose. However, those who had been exposed to the intervention were less likely to have been delayed from help-seeking by a fear of police involvement. These findings suggest that exposure to the intervention may have had a pronounced effect on reducing fear of police involvement and increasing calls to ambulances.

Information regarding fatal and non-fatal overdose among heroin users was also sought via institutional sources in South Australia: the State Coroner's office, SAAS and major metropolitan hospitals in Adelaide. Most hospital overdose presentations were treated in A&E departments, few opioid overdose cases being admitted for treatment. These A&E presentations are not coded and/or recorded under ICD-9 classifications. Further, in most Adelaide metropolitan hospitals, A&E records are not computerised, so manual searches of all A&E attendance sheets is required to identify heroin overdose presentations. It was not possible to do this investigation within the time constraints of the present study.

Estimation of the number of opioid or suspected opioid-related overdoses were made from rates of naloxone usage by SAAS personnel. The SAAS treated an average of 30 opioid overdoses or suspected opioid overdoses per month in 1995, 69 per month in 1996 and 23 per month (Jan–April) in 1997. This analysis identified a peak in the utilisation of naloxone in October 1996, followed by a marked reduction beginning in November 1996, the month of the intervention launch.

Concurrent with data collection from other institutional sources, a review of data from the State Coroner's office and Forensic Science in Adelaide was undertaken. This review identified a total of 85 accidental substance-related fatalities among heroin users in South Australia for the study period (i.e. 1.1.94 – 30.6.97). The annual rate of fatalities remained steady from 1992 until 1995 after which they reduced by about half. Although this decrease in deaths among heroin users in 1996 was encouraging, it was estimated that deaths returned to previous levels in 1997. Data from the entire three and a half year study period showed that accidental substance-related fatalities among heroin users in South Australia typically involve a male, usually an experienced, long-term heroin and other psychoactive substance user, suffering a collapse following the concomitant use of two or more central nervous system depressants including heroin.

Despite popular perceptions of a causative relationship, there was no clear evidence of an association between the level of heroin purity and the number of accidental substance-related fatalities among heroin users in South Australia.

There was a predominance of adult Caucasian males among the fatalities, with a mean age at death of 29 years. A ratio of 2.5:1 male to female deaths was found. Less than 5% were in methadone maintenance treatment at the time of death. Fourteen percent had been released from prison within the four weeks preceding their death. In the majority of cases where the time interval between heroin use and death could be determined, there was time to intervene and potentially avoid the overdose event progressing to a fatal outcome. The majority of deaths occurred in a private home, and in the presence of other people. However, despite the presence of others and the opportunity to intervene, an ambulance was called either as an initial or subsequent action in only 19% of cases.

Two or more psychoactive substance types were detected in more than three-quarters of cases. The most commonly detected substances (in addition to morphine) were benzodiazepines (most commonly diazepam) which were detected in over two-fifths of the sample. Alcohol was detected in almost two-fifths of the total sample. Eighteen percent of the total sample showed levels of codeine in excess of that which would be expected if codeine was present as a function of the refining process associated with heroin production.

Overall, the findings of this study showed that the majority of overdoses among heroin users (both fatal and non-fatal) involved the concomitant use of heroin and other central nervous system depressants. These findings strongly suggested that heroin overdose, rather than being a unitary phenomenon chiefly related to the amount or strength of the heroin used, commonly occurs in conjunction with the use of other psychoactive substances and particularly other central nervous system depressants.

SUMMARY OF MAJOR FINDINGS

1. This study provided the first detailed data on the circumstances and experience of non-fatal overdose among heroin users in South Australia. It is now clear that, as in other states, the experience of overdose (personal or as a witness) is a common event among South Australian heroin users.
2. Messages and materials developed during the study were shown to be effective vehicles for delivering health-positive concepts to the user community.
3. Effective systems change occurred through cooperation and dialogue between the major stakeholders resulting in the development of new police and ambulance protocols.
4. Dissemination of the intervention materials was successful in reaching the target group. Older users, who had been using heroin for longer, with a history of heroin overdose were more likely to have been exposed to the intervention.
5. Following exposure to the intervention, there was increased awareness of the signs of overdose among heroin users.
6. Following exposure to the intervention, users were more likely to call an ambulance to an overdose event.
7. Following exposure to the intervention, there was a reduction in the fear of police involvement if an ambulance was called to an overdose event.
8. There was a peak in the utilisation of naloxone by SAAS personnel in October 1996, followed by a marked reduction beginning in November 1996 (the same month as the heroin overdose intervention launch). While it is difficult to draw a direct comparison between the estimated number of opioid overdoses attended by SAAS officers and the number of fatalities among South Australian heroin users, it is interesting to note the substantially increased use of naloxone during 1996, a year when fatalities among South Australian heroin users decreased by half in comparison with previous years. It is possible that the increased utilisation of naloxone during 1996 represented an increase in calls to ambulance services by witnesses to overdose events, resulting in fewer fatal outcomes.
9. This study provided the first detailed data on the circumstances of accidental substance-related fatalities among heroin users in South Australia. Eighty-five fatalities were identified for the study period (i.e. 1.1.94 – 30.6.97). The annual rate of fatalities remained steady from 1992 until 1996 when they reduced by about half. It was estimated that deaths returned to previous levels in 1997. Data from the entire three and a half year study period showed that accidental substance-related fatalities among heroin users in South Australia typically involved a male, usually an experienced, long-term heroin and other substance user, suffering a collapse following the concomitant use of two or more central nervous system depressants including heroin. The majority of deaths occurred in a private home,

and in the presence of other people. However, despite the presence of others and the opportunity to intervene, an ambulance was called either as an initial or subsequent action in less than one-fifth of cases.

10. Major factors associated with fatalities among heroin users were, male gender and being an older more experienced heroin and other psychoactive substance user. The principal behaviour associated with fatalities among heroin users was that of using other centrally acting substances concomitantly with heroin prior to death. Post-release prisoners were identified as an at-risk group for fatal heroin overdose. A further risk factor was the failure of witnesses to the overdose event to correctly identify the signs of impending narcosis and to call for help in time to prevent a fatality.

11. Major factors associated with non-fatal overdose among heroin users were, higher levels of heroin dependence, not being in methadone treatment and being an older more experienced heroin and other psychoactive substance user. The principal behaviour associated with non-fatal overdose among heroin users was that of using other centrally acting substances concomitantly with heroin prior to overdose. Post-release prisoners were again identified as an at-risk group for non-fatal heroin overdose. A further risk factor was the failure of witnesses to the overdose event to call for help, principally due to a fear of police involvement.

RECOMMENDATIONS

1. This study has highlighted the need for the development of standard criteria for establishing the involvement of heroin in any death. While the detection of 6-monoacetylemorphine is a valid marker for heroin use, as this study shows, it may not be present in all fatalities. Moreover, testing for 6-monoacetylemorphine usually requires a urine sample which may not be available in all cases. Even where urine is available, this metabolite may only be present for a limited period. An alternative measure such as hair analysis would provide a valid historical record of heroin as well as other substance use prior to death.
2. The present system of coding and categorising fatalities (ICD-9) does not distinguish deaths involving the use of heroin from those involving the use of other opioids. Additionally, the present focus on determining the principal 'cause' of death tends to obscure the role of other factors, such as concomitant substance use. There is now extensive evidence that multiple psychoactive substance use is a risk factor in morbidity and mortality among heroin users.
3. The implication of heroin purity in fatal and non-fatal heroin overdose cannot be determined until there is systematic collection and analysis of heroin across jurisdictions and the resultant data is in a form which will allow comparisons with the relevant morbidity and mortality data. There is a need for an accessible and current national database for both heroin purity, and morbidity and mortality among heroin users.
4. Computerisation of hospital (including A&E) records and the identification of particular psychoactive substances involved in hospital presentations and admissions would provide a data base which would assist in monitoring the extent of the heroin overdose problem.
5. The systematic coding by ambulance officers of opioid or heroin overdose cases as such (whether or not these cases were transported to hospital) would provide important data on the number of overdose events occurring in any particular period or locality. Such data could then be linked with information on levels of heroin purity and alternative sources of morbidity and mortality statistics to assist in the planning of timely interventions targeting substance users.
6. The identification of newly released prisoners as a group at risk of overdose points to the need for increased education and an expansion of treatment options, including pre-release methadone for this group.
7. Consideration should be given to an extension of the present range of substitution treatment options (e.g. methadone maintenance treatment) seen to be preventive for heroin-related overdose.
8. Given the proven efficacy and safety of naloxone, the supply of this medication to heroin users should be considered, particularly to those heroin users at higher risk of overdose,

(e.g. following discharge from prison). The potential for abuse of naloxone is negligible, it has no reinforcing properties and is strongly antagonistic to opioids. It rapidly produces a markedly unpleasant withdrawal syndrome in heroin users and is therefore unlikely to be abused.

SECTION 1 INTRODUCTION

1.1 Background

The impetus for a South Australian heroin overdose intervention arose with a meeting of representatives from a range of agencies in December 1994. The agencies represented were the Drug and Alcohol Services Council (DASC), the Department of Clinical and Experimental Pharmacology (The University of Adelaide), Forensic Science, Drug Task Force (SA Police), South Australian Ambulance Service (SAAS), National Drug and Alcohol Research Centre (NDARC), South Australian Voice for Intravenous Education (SAVIVE), AIDS Council of SA (ACSA), and A&E Departments of South Australian hospitals. This preliminary meeting provided the basis for the development of a submission for funding to run an evaluation of interventions to reduce the incidence of heroin overdose in South Australia.

A reference group was established, with membership drawn from the agencies represented at this original meeting. The interventions were to address issues raised in research conducted by NDARC, which identified the group most at risk of overdose as being experienced, long-term users of heroin, using heroin at home, and combining other central nervous system depressants with heroin. The research also showed that those present when someone overdosed were reluctant to call for assistance from emergency services, primarily due to a fear of police intervention. Thus, the interventions were to be aimed at both users (a prevention focus) and observers (an intervention focus).

1.2 Study aims

The major aims of this study were to:

- Identify the experience and circumstances of fatal and non-fatal overdose among heroin users in South Australia.
- Develop appropriate interventions aimed at the reduction of fatal and non-fatal overdose among heroin users in South Australia.

- Evaluate the effectiveness of a targeted intervention aimed at reducing risk factors associated with the experience of non-fatal overdose among South Australian heroin users.
- Review of institutional sources of data (i.e. Coroner's Office, Forensic Science, ambulance and hospital data) to identify the frequency and circumstances of fatal and non-fatal overdose among heroin users in South Australia.

1.3 South Australian heroin overdose interventions

The interventions involved three components:

1.3.1 Information Materials

The first component was the development and distribution of printed materials (these finally took the form of three posters, nine postcards, three fridge magnets and one booklet).

1.3.2 Peer Education

A second component of the intervention was a peer education strategy overseen and implemented by the user group SAVIVE. Issues initially identified as being relevant for inclusion in this intervention were the:

- identification of overdose
- overdose prevention
- management of overdose in others

1.3.3 Partnerships

A third component was ongoing collaboration between the key stakeholders – users, police, emergency services, accident and emergency services and alcohol and other drug (AOD) services – to create a climate in which it was possible to reach agreement that the priority issue was to reduce the risk of fatal or non-fatal overdose following heroin use. While communication between key groups had been ongoing for a number of years in South Australia, DASC was in a unique position to facilitate and extend this discussion, particularly between users and police. This background of cooperation facilitated a productive relationship throughout this project, ensuring a consistency of approach between agencies and allowing other intervention strategies to address one of the primary causes of the reluctance to call for help (i.e. fear of police attendance).

1.4 Data collection and evaluation of the heroin overdose intervention

1.4.1 Pre- and post-intervention surveys of South Australian heroin users

To identify the experience and circumstances of fatal and non-fatal overdose among heroin users in South Australia and to provide a baseline against which the intervention described above could be evaluated, a total of 218 heroin users (the pre-intervention sample) were interviewed during September/October 1996. Following collection of the pre-intervention data, the intervention (materials and process) was launched in November, 1996. The effectiveness of this intervention was evaluated in a second round of interviews (the post-intervention survey) with 211 heroin users. This second survey, which included an evaluation component, was conducted six months after the launch, in May/June 1997.

1.4.2 Review of institutional sources

Information regarding fatal and non-fatal overdose among heroin users was sought via institutional sources in South Australia the State Coroner's office, SAAS and major metropolitan hospitals in Adelaide.

1.5 Structure of the report

This report is divided into nine sections. This brief introduction comprises **Section One**. In **Section Two**, a literature review is presented to provide the background and rationale for the study methodology and aims. **Section Three** details the methods used in determining the form, content and process of the intervention. **Section Four** provides an analysis of the data from the pre- and post-intervention surveys of South Australian heroin users. **Section Five** describes the penetration, recall and recognition of the intervention materials and **Section Six** assesses the effects of exposure to the intervention. **Section Seven** presents a review of data from ambulance and hospital records. In **Section Eight**, results of the review of fatalities among South Australian heroin users are given and discussed. Findings from the entire study are discussed in **Section Nine** followed by a summary of major findings and a list of recommendations arising from this work.

SECTION 2 LITERATURE REVIEW OF OVERDOSE AMONG HEROIN USERS

2.1 Introduction

Cohort studies conducted overseas have reported excess mortality rates among heroin users compared to their non-heroin-using peers (Engstrom, Adamsson, Allebeck, & Rydberg, 1991; Frischer, Goldberg, Rahman, & Berney, 1997; Perucci, Davoli, Rapitii, Abeni, & Forstieri, 1991). Several European studies have

shown that HIV and fatal overdose are the two major contributors to this excess mortality (Perucci et al., 1991; Puschel, 1993; Risser & Schneider, 1994). In Australia, where HIV prevalence rates are relatively low (see Loxley, McDonald, & Marsh, 1992), fatal opioid overdose is the principal contributor to this excess mortality. Deaths due to opioid use among persons aged 15–44 years increased from 70 in 1979 to 550 in 1995, while the average age at death increased steadily from 24 to 30 years during the same period (Hall & Darke, 1997). Despite increasing death rates among opioid users, there has been no major public health initiative aimed at this important clinical and public health issue.

2.2 Tolerance

The stereotypical view of the individual who overdoses is that of one who is young, inexperienced and using too much heroin or heroin that is too strong. Overdoses are also commonly thought to occur with greater frequency in the street or other public places and when the person is alone. Another popular perception is that overdose among heroin users is principally a function of the purity of heroin used. That is, both fatal and non-fatal overdoses are thought to occur when the strength of heroin used is in excess of the individual's level of tolerance at the time of that use. Tolerance to opioids, including heroin, can develop rapidly. The rate at which tolerance occurs depends on a number of factors, including the pattern of use. For example, if heroin administration is intermittent, and dosage kept within a certain range, it is possible to maintain a consistent level of opioid effect indefinitely. However, if heroin use is continuous, significant tolerance may develop. Moreover, if the individual is seeking the 'rush' or 'high' associated with heroin, then they must constantly increase the dose to negate the effects of tolerance, and achieve these desired effects.

Thus, for an opioid-naive individual, the lethal dose of heroin may be comparatively low compared to a regular user who has developed a higher tolerance. However, at a high enough dose, death from respiratory depression will occur, even in those with a high tolerance. Tolerance to heroin is reversible and may decline rapidly on complete cessation. Should resumption of heroin use occur following a period of abstinence, even long-term, regular users may be vulnerable to overdose at a lower dose than previously used (see Jaffe, 1992 for a detailed review of tolerance).

2.3 Circumstances of accidental fatalities among heroin users

Several factors make the assessment of the numbers and circumstances of heroin-related fatalities difficult. Current Commonwealth data recording systems

do not separate deaths involving heroin use from deaths involving all opioids, including heroin. While information regarding substance-related deaths is available from State-based sources (e.g. forensic and coronial data), such information remains unstandardised across jurisdictions. Moreover, the present method of encoding and recording information means that the identification of specific substance-related deaths requires manual searching of individual toxicological and coronial files. Extraction of the relevant data from these files requires a substantial investment of time and is therefore costly. Possibly because of the need for this substantial investment, few studies of heroin-related deaths have been conducted in Australia. Without such detailed analysis, an increase in opioid-related deaths can only be presumed to reflect an increase in heroin-related deaths. Those studies which have been published are reviewed below.

In Western Australia, Swensen identified a marked increase in heroin-related deaths, from a total of twelve in the ten years between 1974 and 1984 (Swensen, 1988), to 63 in 1995 alone (Swensen, 1996). A smaller regional study by Walsh provided data on the number of 'opioid-drug' accidental deaths in the Newcastle area of New South Wales between 1970 and 1987. A total of 19 heroin-related deaths were identified for this period (Walsh, 1991). Forty-two heroin-related deaths were identified in the South-Western area of Sydney during 1995 (Darke, & Ross, 1998).

The examination of individual case records was the method used by Zador and colleagues in their review of opioid-related deaths in NSW (Zador, Sunjic, & Darke, 1996). This review identified 82% of all opioid-related deaths in NSW during 1992 as being heroin-related. This study provided the first detailed data on heroin-related deaths in an Australian state. The circumstances of death and toxicological findings for all heroin-related deaths in NSW for the year 1992 were described. The majority of the 152 cases identified were male, with a mean age at death of 29.7 years. Although over two-thirds (69%) of these fatal heroin overdoses had occurred in a home environment, an ambulance had been called in only 10% of cases while the person was still alive. This suggested that potentially life-saving help was either delayed or not sought in most cases of overdose. Importantly, the presence of other persons at some time during the interval of time from the administration of heroin to the death of the individual was noted in 58% of cases.

Toxicological analysis revealed that in only 29% of cases was morphine[1] the sole substance found at autopsy. Forty-five per cent of cases were positive for alcohol, while over one-quarter of cases (26%) was positive for benzodiazepines. Further analyses showed that the presence of alcohol at autopsy was independently associated with lower blood morphine levels for those cases where alcohol was found at autopsy. These findings support existing evidence showing the presence of alcohol markedly increased the likelihood of a fatal outcome when used concomitantly with other centrally-acting substances (King, 1982) including heroin, (Levine, Green, & Smialek, 1995). The presence of alcohol at autopsy was also identified in the Newcastle area study. Walsh reported that positive blood alcohol levels were identified in 48% of the cases where analyses were done (Walsh, 1991). These studies show that the concomitant use of other substances, particularly other central nervous system depressants such as alcohol and benzodiazepines, is an important factor in overdose among heroin users.

2.4 Non-fatal overdose among heroin users

Contrary to popular perception, heroin overdose is not invariably fatal, and information on the extent of non-fatal overdose is accumulating. In a detailed investigation, the incidence of, and responses to, non-fatal heroin overdose in Sydney, NSW was examined in two studies conducted by the National Drug and Alcohol Research Centre (NDARC). For these studies, 329 heroin users were interviewed regarding their experience of non-fatal heroin overdose, both personal and in others (Darke, Ross, & Hall, 1996a; 1996b). Sixty-eight percent of those surveyed had experienced an overdose. The median number of lifetime overdoses was three, with the prevalence of overdose increasing with the length of heroin-using career. Consistent with the review of heroin-related deaths in NSW (Zador et al., 1996), two-thirds of reported non-fatal overdoses had occurred in a private home, and in 85% of cases other people were present (Darke et al., 1996a).

A concurrent investigation by Darke and colleagues into responses to overdose showed that an overwhelming majority (86%) had been present at another person's overdose on a median of six occasions. Calling an ambulance was the initial response in only 17% of these overdose events. Of major concern was the finding that nearly half of the sample had been delayed from seeking help for a person who had overdosed, fear of police involvement being overwhelmingly the main reason (Darke et al., 1996b). Three factors were identified as being

---

1 Heroin (diacetylmorphine) is rapidly hydrolysed to 6-monoacetylemorphine, which, in turn, is hydrolysed to morphine. Both heroin and 6-monoacetylemorphine are more lipid soluble than morphine and enter the brain more readily. Current evidence suggests that morphine and 6-monoacetylemorphine are responsible for the pharmacological actions of heroin (Jaffe & Martin, 1991).

independently associated with having overdosed: longer heroin-using career, greater heroin dependence and higher levels of alcohol consumption. Older, more dependent users had experienced one or more heroin-related overdoses. Few subjects in the Sydney sample avoided the use of alcohol (5%) and other substances (3%) when they used heroin (Darke et al., 1996a). Given what we now know about the role of multiple substance use in heroin-related overdose, these usage patterns and beliefs among heroin users have significant implications for the design of interventions aimed at reducing morbidity and mortality in this group.

Further data on the frequency of non-fatal overdose came from the multi-centre Australian Study of HIV and Injecting Drug Use (ASHIDU). In this study, Loxley and colleagues reported that 53% of illicit substance users (including heroin users) interviewed in 1994 had experienced an overdose during their lifetime. Of this group, 81% had at some time overdosed when using heroin. The same study identified regional differences in the experience of overdose. Forty-four percent of illicit substance users interviewed in Melbourne had overdosed, 47% in Adelaide, 58% in Perth and 65% in Sydney. The purity of the heroin used was seen as the main reason for the most recent overdose by 44% of those who had ever overdosed. Of those who had ever overdosed, 82% had been using more than one substance on the last occasion (Loxley, Carruthers, & Bevan, 1995).

Information regarding the prevalence of overdose among heroin users in the Australian Capital Territory came from a study by Bammer and Sengoz, who found that one-third reported overdosing on a median of two occasions in their lifetime (Bammer & Sengoz, 1994). In Brisbane, Queensland, a 52% overdose rate was reported among indigenous injecting substance users (Larson, 1996).

Frequency of overdose was comparatively lower in the UK. A study conducted in the UK found that 23% of a sample of heroin users had overdosed at least once in their lifetime. While overdose in the UK sample was unrelated to gender, or to reported frequency or quantity of heroin use, those who had overdosed were found to be older and more dependent on heroin. Of those who reported having overdosed, 98% had injected, while only 2% smoked heroin (Gossop, Griffiths, Powis, Williamson, & Strang, 1996).

2.5 Pharmacodynamics of multiple psychoactive substance use

An important finding of the non-fatal overdose study by Darke and colleagues (Darke et al., 1996a) was that the majority (62%) of most recent heroin-related

overdose events occurred in conjunction with the consumption of other central nervous system depressants (i.e. alcohol, benzodiazepines and other opioids such as methadone and/or codeine). Multiple substance use among heroin users is of particular concern, as central nervous system depressants, such as alcohol or benzodiazepines, may have a physiologically additive effect with heroin. For example, alcohol and heroin both produce respiratory depression when taken alone, and a combination of the two may increase the likelihood of this occurring. Moreover, the administration of other opioids with heroin may combine synergistically, further increasing the risk of respiratory depression. Previous studies have suggested that if substances other than heroin are also taken, they are almost always administered prior to using heroin (Darke et al., 1996a). Therefore, when a dose of heroin that is normally tolerated is combined with a central nervous system depressant, the respiratory depressant effects may be potentiated, resulting in an increased likelihood of overdose, and possibly death.

2.6 Patterns of multiple substance use

Patterns of alcohol use or the use of other opioids among injecting substance users have been examined in a limited number of studies in different jurisdictions. The multicentre ASHIDU study found that 68% of illicit substance users surveyed had used alcohol, and 29% had used other opioids (excluding legal methadone) in the month prior to interview (Loxley et al., 1995). In Sydney, 64% of opioid users surveyed had used alcohol, and 19% had used opioids other than heroin in the month prior to interview (Darke, Heather, Hall, Ward, & Wodak, 1991). A later study showed that of a sample of heroin users in Sydney, 37% had used alcohol, while 18% had used other opioids in the month prior to interview (Darke & Ross, 1997).

Conversely, there is a well established national and international literature detailing benzodiazepine usage patterns among illicit substance users. Personal lifetime experience of between 2 and 15 different benzodiazepines was found in clients of an Austrian methadone maintenance clinic (Barnas, Rossmann, Roessler, Riemer, & Fleischhacker, 1992). Similarly, of 973 heroin users admitted to a Spanish clinic for detoxification over a ten year period, 68% were found to be consuming benzodiazepines at the time of admission (San, Tato, Torrens, Castillo, Farre, & Cami, 1993). Comparable benzodiazepine usage rates have been found in Australian samples of illicit substance users. The multicentre ASHIDU study reported that 49% of users interviewed in 1994 had used ‘tranquillisers’ in the month prior to interview (Loxley et al., 1995). In Sydney,

Ross and colleagues found that 41% of a sample of heroin users had used benzodiazepines, and 17% had injected benzodiazepines during the previous six months (Ross, Darke, & Hall, 1996).

Additionally, a number of studies conducted both in Australia and overseas have comprehensively documented the harms associated with benzodiazepine use. These include increased risk of transmission of blood-borne diseases, and poorer psychosocial functioning, (Darke, Hall, Ross, & Wodak, 1992). Furthermore, the use of benzodiazepines has been associated with both fatal and non-fatal overdose among heroin users (Darke et al., 1996a; Zador et al., 1996).

2.7 Summary

Studies to date show that the majority of overdoses, both fatal and non-fatal, occur in home surroundings and in the presence of other people. Further, concomitant central nervous system depressant use is likely to be involved (see Darke et al., 1996a; Zador et al., 1996). The opportunity for those present to correctly identify an opioid overdose and to instigate timely, life-saving intervention therefore exists. Although regional differences in non-fatal overdose rates among illicit substance users have now been identified (Loxley et al., 1995).

Interventions to modify the harms associated with heroin use are more likely to be effective if they are both evidence-based and informed by accurate and current knowledge of local conditions. Therefore, information regarding the current circumstances and experience of overdose among heroin users in South Australia was seen as essential to the development of an effective intervention.

SECTION 3 DEVELOPMENT OF THE SOUTH AUSTRALIAN HEROIN OVERDOSE INTERVENTION

In this section, the development and application of an intervention aimed at reducing the risk of heroin overdose will be detailed. This will include a description of the process undertaken to identify appropriate messages, the process of concept development, the use of a facilitator and focus groups, the complexities of meeting the needs of all stakeholders, and dissemination of the final product. In addition, the development of a peer education approach to the heroin overdose problem will be outlined, followed by a description of efforts aimed at achieving structural change relating to responses to heroin overdose.

A reference group was established to oversee the project as a whole, and to ensure that all agencies were kept informed of progress. Membership was drawn from the agencies present at the original meeting and comprised representatives from DASC, NDARC, the Drug Task Force, SAAS, A&E Departments, SAVIVE, and ACSA. The early meetings of this reference group focused on the content, style and target groups for the intervention components, with consideration given to how their implementation could be evaluated.

3.1 Development of the information materials

Printed information materials on all relevant aspects of heroin overdose and associated risks were regarded as being of key importance in the proposed intervention. The target group was conceived of as comprising established heroin users and others who, while not using heroin themselves, may be present when heroin is used.

Development of the information resources began twelve months after the initial meeting of relevant stakeholders in December, 1994 (see **Section One**). This meeting began a process which eventually included three rounds of focus groups, fourteen drafts of an information booklet, and extensive consultation with all stakeholders. A further dimension was added by the decision in June 1996 to disseminate the project nationally.

3.1.1 Review of existing materials

In determining the need for printed resources, it was considered important to review material currently available on the topic of overdose among opioid users. An extensive search was carried out throughout Australia and overseas to locate resources. A range of drug and alcohol treatment, education and research agencies, as well as user groups and HIV/AIDS treatment and support agencies were contacted.

This review found that many of the existing materials did not incorporate the full range of prevention messages identified through the consultation process undertaken during the present project. In Australia, most of the available printed material was produced and distributed by user groups, and reflected the extent of support and networking that occurred among these groups. There was considerable duplication of content in the resources reviewed, with the emphasis being on cardio-pulmonary resuscitation (CPR) techniques as a means of reviving someone who had ‘dropped’ (overdosed).

The South Australian reference group had concerns about the effectiveness of basing an intervention solely or primarily on the use of a complex technique (i.e. CPR) in a situation where the observers were likely to be in a state of confusion or panic, or to be under the influence of substances themselves. A decision was made to focus on the maintenance of a patent airway and the prevention of a situation that would require the use of CPR. Thus, the emphasis would be on prevention of overdose situations arising, and encouraging individuals to seek ambulance assistance at an early stage.

3.1.2 Identification of messages

Participants in the first full reference group meeting in 1996 identified a number of key messages, based on the review of existing resources, previous research (see **Section Two**) and on consultation with experts and user group representatives.

The initial messages identified for users were:

- never use alone
- don't use cocktails
- know your heroin strength
- be aware of risky times/situations (e.g. on release from prison, just out of treatment)
- smoke heroin in preference to injecting
- wait 30 minutes while your mate settles

The initial messages for observers of an overdose related to:

- calling for help in cases of likely overdose
- what to do while waiting for help
- what not to do in response to an overdose

Early focus group testing showed that these initial message concepts were well accepted. The notion of users looking after each other became a theme throughout the development of the intervention. However, the suggestion that users wait thirty minutes while their companion ‘settled’ before using themselves (and the related concept of test-dosing) was not supported in the form initially proposed. This message did not figure as prominently in the final versions as originally conceptualised by the reference group. Typical comments from group participants included:

> *'If you are in a group, get someone whose judgment you trust to test dose first – and try to wait a while before the rest of you hit up. You are not going to be much help to each other if you all drop at the same time'*

While not explicitly addressed in the initial messages developed, the reference group was aware of other issues which would impact upon any efforts to improve responses to heroin overdose, e.g. fear of police presence if an ambulance was called; cost of calling an ambulance, etc. These issues would be addressed in final versions of the information materials.

Three slogans were coined by a representative of SAVIVE, in conjunction with the manager of the Needle Exchange Program for SA, as encapsulating the primary themes of the project. These slogans were:

‘don't slow it alone’

‘it's rarely just the 'h''

‘watch out for your mates’

The last of these slogans was modified during the process of focus group testing.

3.1.3 *Development of information materials*

The project interventions, including health promotion strategies of developing personal skills and community development were aimed at achieving behaviour change in the target group. However, as previous research has shown (see Gore & Mahs, 1994) if interventions are to result in behaviour change among a particular target group, the group must be involved in:

- identifying the problem
- suggesting solutions
- recommending acceptable delivery formats

Further, the content must be acceptable to the target group and couched in terms that enabled ease of understanding. The imagery must be meaningful and appealing, and the formats acceptable and relevant. Therefore, it was considered essential that the printed interventions be developed in consultation with members of the target group. Extensive consultation therefore occurred with the user community regarding issues such as imagery, formats, language, content and present practice. In addition, the reference group provided input on issues such as police involvement, ambulance practices, research findings, and clinical practice.

Previous research (see **Sections One** and **Two** for a review) had identified the target group at highest risk of heroin overdose as being older, male, predominantly unemployed long-term users of heroin. The popular belief that young inexperienced heroin users were at risk was not supported by research conducted in Australia. Naive users were therefore excluded as a primary target group, although it was recognised that there are concerns around this group (see Loxley & Davidson, 1998). Nevertheless, younger users may require different approaches, different access routes, and possibly different formats.

3.1.4 *Community consultation*

Three rounds of consultation with the user community were undertaken during the development of the materials.

In the first round of consultation, the concepts were presented to a group composed of peer educators, users and needle exchange workers. The graphic designer was also present to ensure that feedback was accurately incorporated in the later development of the materials and messages. Comments were sought from the group on the three slogans and accompanying images, with specific attention to the following questions:

- are the images appropriate and meaningful to the target group?
- are the slogans and accompanying text relevant?
- will unintended interpretations be placed on these images and text?
- which formats are preferred – posters, cards, wallet cards, magnets, stickers, novelties of some other sort, booklet, fliers?

These initial consultations led to the conclusion that injecting equipment ought not to be displayed on printed materials, in order to provide greater discretion, i.e. non-users would not immediately identify the materials as being drug-related. It was also found that the preferred formats for messages were postcards, stickers for telephones, posters and fridge magnets.

The group provided feedback regarding content and intended interpretation that proved to be crucial for the production of the final product. This was demonstrated most strikingly by reaction to the poster carrying the slogan 'Watch out for your mates'. Immediate reaction centred around the lack of a constricted pupil and the loss of credibility that would occur if the image went to print in the proposed form. There was also agreement that 'watch out for your mates' was likely to be interpreted negatively. Typical interpretations included 'be careful of overdosing because your mates will rip you off while you are ‘out of it'. This interpretation was reinforced when the coma position illustration was interpreted as someone running away rather than someone lying in a recovery position. The lesson learned by those responsible for the resource development was that even where a slogan had been coined with the assistance of a representative of the target group, producers of information materials must subject drafts to scrutiny by members of the target group.

Subsequent discussion identified the need for a comprehensive booklet encompassing all aspects of heroin overdose. This was conceived as being a resource which could be given to heroin users, and could also be used by peer educators as a training resource.

The following areas were thought important for inclusion in the information booklet:

- a summary of current research findings relating to fatal and non-fatal heroin overdose
- what happens to a person who overdoses, i.e. the physiology of overdose
- risk factors for overdose e.g. polydrug use, reduced tolerance, using alone
- how to avoid an overdose
- how to identify an overdose
- what to do when others overdose
- what not to do in an overdose situation
- emergency services and their role, including the use of naloxone (Narcan)
- police and their role, including how to interact with police at the scene of an overdose
- contact details for user groups, information lines and emergency services

The second round of consultation included participants involved in the first group. A first draft of the information booklet was developed for this round of consultation. Guidance was also sought from the SA Ambulance Service and the SA Police at this stage. A critical topic was the perception that police were likely to arrive at an overdose situation as a result of a call to emergency services. Research had identified this as a major cause of people not ringing for an ambulance. Hence it was essential that the materials be accurate in their portrait of the likelihood of a police presence and also provide advice on how to interact with the police should they arrive.

Feedback from ambulance services at this stage indicated that they could reach any overdose situation within seven minutes of being contacted. It was decided that detailed instructions on cardio-pulmonary resuscitation (CPR) and taking of a pulse would not be included in the materials, as it was considered to be too technical and detailed for emergency situations.

The third round of consultations involved the recruiting of users, through needle exchanges, to participate in one of three focus groups. These three groups were held in different geographic regions (northern, southern and central Adelaide). Participation was actively sought from those who were not involved in the first two rounds.

A health worker experienced in facilitating discussion with marginalised community members was recruited through SAVIVE and retained for the second and third rounds of focus groups. This facilitator was external to the heroin-using community, and independent from the research team.

Approximately ten people were invited to attend each group with the expectation that there would be at least a 30% dropout rate. The final group membership ranged in size from two to six. Some thought went into ensuring that participants felt comfortable in the group setting. The groups, lasting sixty to ninety minutes, were held in familiar venues such as needle exchanges or community health centres. Sessions were structured to reduce the likelihood of the group losing focus and energy. Within this structure there were two phases – individual responses to the language and imagery contained in the resource materials and group discussions about the imagery and the booklet.

The third round of community consultation was more extensive than the previous two rounds to provide an opportunity to involve a wide user population. The imagery and slogans to be used had received endorsement by the first two rounds of consultation and postcards and magnets or wallet cards had been identified as preferred additional formats.

Postcards and magnets require discrete bits of information. By their very nature they preclude the presentation of information in a sequential fashion and it is important to assume that each postcard or magnet will be seen in isolation. It was therefore critical that information to be conveyed by these resources be carefully selected.

Selection was guided to some extent by the issues which aroused the most interest in the early groups – role of police, what to tell emergency services when ringing for assistance, what is naloxone (Narcan), how to recognise an overdose – but was also driven by the project aims of dispelling myths and providing practical guidance. Ten postcards were originally envisaged, but one that outlined police obligations at an overdose scene became problematic once national dissemination became a reality and was therefore dropped from the final set. The topics finally decided on were:

- it’s rarely just the ‘h’ (depressants)
- it’s rarely just the ‘h’ (polydrug use)
- how to avoid overdose

- how to recognise overdoses
- what to do if someone ‘drops’
- what not to do when someone ‘drops’
- when you ring an ambulance
- the role of naloxone (Narcan)
- overdoses and the police

Selection of topics for the magnets was based on an assessment of the most immediate needs for people present at a suspected overdose. The information had to be accessible to people who may be in a state of panic or intoxicated, and had to provide a guide to behaviour in these circumstances. Three magnets were produced. The point made during the third round of testing, that intoxicated people have some difficulty in focusing their eyes, meant that some information had to be dropped to allow the text to be enlarged. Topics covered were:

- when someone drops (how to determine whether someone has dropped)
- what to do if someone drops
- when you ring an ambulance

Throughout the consultation process the issue of test-dosing generated considerable discussion. The strategy as originally outlined by the reference group was unacceptable to the participants in the focus groups. Nevertheless, there was agreement among participants that care needed to be taken with heroin obtained from unknown sources. Current strategies reportedly practiced by users included: use only a third at first; only buy a little until the dealer is known to them; inject very slowly (as opposed to injecting in two stages which would mean the rush was lost).

Among the focus group participants opinion varied as to how long it takes an individual to determine the strength of the heroin being used (estimates ranged from one to ten minutes). Participants cautioned against relying on a mate’s judgment of the strength of the heroin.

Consideration was given to the inclusion of a range of the practices undertaken by users. This was followed by suggestions by the group participants that if the person was not going to test-dose, they should make sure they are not alone. There was no interest in smoking being offered as an alternative route of administration.

There was a surprising level of support for the lack of identifiable injecting equipment throughout the materials. Typical comments on this issue were:

> *'I like the fact that there's no syringes all the way through it'* and '*Can't see any fits in it, cause that's the sort of things that make parents go ahhh!'*

There was a certain amount of tension between the desire for resources that users could identify with and images that did not advertise their heroin use to non-users.

These three rounds of consultation provided identifiable milestones in the process of resource development. Participants began by looking at images and slogans presented in poster format. This was followed by a re-examination of the posters and a first consideration of the booklet. Finally, a review of the posters and booklet together with a detailed scrutiny of the postcards and fridge magnets completed the process. Significant changes were made at each stage of consultation.

3.2 Dissemination of heroin overdose intervention materials – South Australia

The success of the interventions relied on their wide distribution and acceptance among the target community. Because the printed interventions were targeted at long-term heroin users, and because they were based on the principles of harm minimisation, the content assumed that the audience would continue to engage in heroin use, and made no recommendations for its cessation. Consequently, the materials were inappropriate for general distribution through mainstream outlets for health promotion materials. Needle exchanges were identified as sites which the general public was unlikely to access and as ideal contact points for injecting drug users. Statewide distribution therefore occurred through needle exchanges, with a substantial proportion of the resources distributed in tandem with a peer education strategy undertaken by SAVIVE. A total of 139 outlets distributed 13 825 resources (325 sets of 3 magnets, 450 sets of 3 posters, 1000 sets of 9 postcards[2] and 2500 booklets) during three months from December 1996.

---

2 The postcards produced as part of the intervention materials for this study have been recognised with three major design awards including: a bronze award at the Adelaide Art Directors Club Annual Awards; selection for publishing in the Australian Writers and Arts Directors Association AWARD Annual; and more recently, a commendation award at the Australian Graphic Design Association Awards which was received on 24 October 1998.

Briefings on the project and desired outcomes were made to Heads of A&E Units, senior personnel in Correctional Services, and to ambulance officers and paramedics. Planned briefing sessions for operational police in areas of known high heroin use did not eventuate for a range of reasons.

The project aimed for broad acceptance not only among members of the using community, but also among workers who had contact with the community, many of whom had expressed concern about the incidence of overdose among users. Thus, presentations outlining the aims of the project, the process by which the resources had been developed and the messages conveyed were made to interested workers at northern, central and southern metropolitan locations. Internal presentations were also given to DASC clinical staff, outreach workers, general DASC staff, and personnel from NCETA.

SAVIVE played a major role in taking the intervention to its intended audience. This was done through two complementary processes. The first involved distributing the intervention resources through its needle exchange and user support and advocacy services. Each such occasion of contact with heroin using customers was to be used as an opportunity to discuss opioid overdose and as an opportunity for one-to-one peer education. This level of peer education through SAVIVE fitted into the broad intervention dissemination strategy, in which a large number of agencies played complementary roles in distributing the resources to users.

3.2.1 Aboriginal and Non-English Speaking Background groups

A conscious decision was made to exclude these groups from the targeted group of users. It was felt that properly targeted materials for these groups would require a separate process, although it was acknowledged that these communities did have problems with heroin overdose. Discussions were held with key Aboriginal and Torres Strait Islander groups to offer assistance in adapting the materials to suit the audience if required. A number of agencies were comfortable using the materials as they were.

3.3 National dissemination program

Following significant national interest in the project from an early stage, a submission was developed for the funding of production and dissemination of the South Australian interventions on a national level. This included a component for training of key workers from around Australia.

Expansion of the program to one with a national distribution added a further dimension to the development of appropriate resource materials. A series of adjustments was therefore made and are listed below:

- The use of language became more crucial – terms employed by users vary across the country and while it was not necessary to forgo the use of slang, it was important to ensure that terms that were used were acceptable to users across Australia.

- The issue of police practices across jurisdictions became important. Material that related to police activity in South Australia had to be rewritten to take into account variations in practice.

- The information booklet had to include contact details for user groups in all jurisdictions; for other materials, a contact number was chosen which was consistent across jurisdictions (the emergency services number – 000).

Distribution across the country was through agencies similar to those involved in the South Australian distribution (i.e. needle exchanges, user groups, government agencies with responsibility for programs affecting injecting drug users). National distribution occurred February–April 1997 and involved a total of 140 500 resources (25 000 booklets, 5000 sets of 3 posters, 10 000 sets of 9 postcards, and 3500 sets of 3 magnets). Within two months, the same number of postcards and magnets had been reprinted and distributed nationally, followed two months later by a further 5000 booklets and 1500 sets of posters.

In addition to the national dissemination project, sets of the printed materials were posted to leading personnel in the illicit drugs field throughout the world. Positive feedback was received from those to whom the materials were sent, mirroring the feedback received at a national level. A community-based organisation within the United Kingdom gained permission to reproduce all of the materials with minor changes to reflect regional terminology, practices and support services. Within Australia (Queensland, Western Australia and New South Wales), requests have been received for copyright permission to use images or text in local projects. A list of the publications, workshops and conference presentations which have arisen from this study to date is included in Appendix A.

3.4 Peer education: development of the model

The model of peer education to be used in this study was developed by participants in a two-day workshop conducted in September 1996. Agencies represented at the workshop were: DASC, CEIDA, NCETA, SAVIVE and ACSA.

During the two days of the workshop various categories of peer education were discussed: peer teaching, peer support, peer counselling, and peer participation. What was traditionally considered to be peer education could be classified as peer teaching where peers are trained as 'experts' and required to teach their peers particular behaviours or to pass on particular information to them. This approach, along with peer support and peer counselling, is a 'top-down' approach. The category preferred by the workshop participants, and considered as the desirable option for the national training program, was the peer participation approach. The peer participation process recognises the knowledge and expertise which already exist in a community, and uses existing networks to disseminate information and skills. A process of community development occurs in which communities identify those issues which are of concern to them and are assisted to find ways in which to address these issues.

This approach had been used successfully in similar projects (the ROW and MetROW projects) conducted by the Sydney user group, NSW Users and AIDS Association Inc (NUAA) (see Gore & Mahs, 1994). These projects identified that opioid users access information regarding safe substance use from a variety of sources, including the print and electronic media as well as information materials produced through health promotion activities. Importantly, these projects identified that the most important influence on the behaviour of users around substance use was other users. That is, information and knowledge around substance use is spread by word of mouth and by observing the behaviour of other users.

The process of designing the heroin overdose intervention study provided an opportunity to further refine and pilot test a new approach to peer education. Thus the peer education component of the project was intended to be complementary to the broad resource dissemination strategy. It was further hoped that this component of the project would stimulate an on-going, self-perpetuating process of peer-mediated overdose education within the heroin using community. The peer education process was funded by SAVIVE, allowing SAVIVE greater autonomy in managing this component of the study. This ‘low intervention’ model of peer education involved minimal interaction between the unit providing the ‘education’

and complete separation from the government body with responsibility for coordinating the major study (i.e. DASC).

It was decided to address popular myths around heroin overdose through the peer education component of the intervention, where sufficient time and attention could be devoted to the issue. It was necessary to handle this area with some caution, as many users were likely to retain strong personal investments in the efficacy of 'folk remedies' for overdose. Having a friend live because, it is believed, they were injected with sodium chloride (for example) is a powerful reinforcement for that behaviour. Rather than debate every conceivable inappropriate overdose 'remedy' in the text of the resources, the agreed approach was to place the emphasis on positive, affirmative messages, such as calling for emergency help and maintaining an airway until help arrives (see Brogan & Lai, 1997).

The training provided by SAAS, as part of the briefing and orientation for SAVIVE's peer educators involved in the heroin overdose project, provided a highly effective forum for discussing appropriate emergency procedures. Unfortunately, such training is not practically available to the large number of people at risk of opioid overdose.

The peer participation approach was to utilise the every-day, normally occurring situations of contact between peers and other heroin users to disseminate the intervention messages, utilising the printed resources as tangible icons, where appropriate. SAVIVE paid honoraria to the peer educators as a partial compensation for the time they spent away from their normal lives and activities while attending training, orientation and feedback sessions. But it was emphasised that they were not to be paid for talking to other heroin users about overdose prevention - this had to be voluntary. Indeed, as the peer educating was to be done only in the context of their normally occurring interactions with others, as they went about their normal (usually illegal) business, paying a wage did not seem particularly appropriate.

3.4.1 Method

Two teams of eight heroin users were recruited to the peer education component. Most of these were recruited through SAVIVE contacts, and most had participated in earlier focus groups relating to the information materials for the project. A small number were recruited as nominees of a youth agency and had no previous contact with SAVIVE networks. Criteria for participating were:

- must be current injectors of heroin or other opioids
- must be in regular (daily) contact with at least eight other opioid injectors
- must be personally motivated to reduce overdose deaths
- must agree to abide by a confidentiality agreement
- must agree to attend three scheduled group sessions at SAVIVE

The participants were given the option of attending an overdose management training session with SAAS; 14 of them took up this option. They were required to participate in one intervention orientation session, one halfway progress session and one final debriefing and feedback session at SAVIVE (see Brogan & Lai, 1997).

3.5 Achievement of structural change

Previous research (see Darke et al., 1996b) found that few of the injecting drug users interviewed in their study identified contacting ambulance services as a first line strategy for helping their overdosed friend or peer. The researchers concluded that users' perceptions around the likely responses of emergency workers were central to this reluctance. These perceptions included:

- any call for ambulance attendance would lead to the attendance of the police;
- that such police attendance was part of the ambulance services' standard response to overdose; and
- Police involvement would lead to them and/or their overdosed peer being charged for drug related offences.

These concerns have been identified consistently by users across Australia, but discussions with police and ambulance services in South Australia revealed that no policy or protocol for automatic police attendance at overdoses exists in either service.

At inaugural discussions held in December 1994, the SAAS identified the utilisation of ambulance services in response to opioid overdose as being a significant factor in ensuring victim survival. The SAAS undertook to review its overdose response protocols and work with SA Police to determine joint operational protocols.

The ongoing collaboration between key stakeholders (i.e. heroin users, police, SAAS, A&E and AOD services) involved in the heroin overdose project resulted in negotiations to identify the circumstances in which police presence is essential at

overdose events. These negotiations have resulted in the production of an amended police protocol regarding police attendance at overdoses.

This General Duties Manual Amendment (General Order 7700, General Accidents and Illness Guidelines for Police Attending Drug Overdoses) was gazetted on the 15th January 1997. This amendment clarifies the function and responsibilities of police in terms of their attendance at overdose events i.e:

> *'If you are called to standby at the scene of a non-fatal overdose where there is evidence of other drug-related activity and the offences only relate to self-administration or simple possession, it may be in the greater public interest to use your discretion and overlook minor offences. This action may well have the effect of removing the fear of prosecution and encourage people present at overdoses to call an ambulance without delay.'*

Negotiations with the SAAS have similarly resulted in revised guidelines on attendance at overdoses. These revised instructions to ambulance officers indicate that police will only be notified of those cases involving illicit substances where:

> *'death or imminent death of a person from an overdose is likely' and/or 'our crews request police support. This would include any scene that we would normally request police for crew safety'*

The establishment of these guidelines was an important step in removing the barriers to help-seeking at overdose events and demonstrated that it was possible for diverse agencies to agree that the health and safety of individuals was the first priority at overdose events.

3.6 South Australian heroin overdose intervention launch

The launch of the intervention materials and peer education program developed as part of the reduction of heroin overdose intervention took place at the premises of SAVIVE in November 1996. The launch, which received favourable media attention, was attended by representatives from wide a range of organisations including DASC, the Drug Task Force (SA Police), SAAS, SAVIVE and ACSA.

The launch closely followed a pre-intervention round of heroin user interviews conducted in September/October 1996, which provided baseline information for an evaluation of the impact of the intervention. Immediately following the launch, widespread dissemination of the printed information materials was undertaken within South Australia, through the agencies and outlets identified above.

SECTION 4 PRE- AND POST-INTERVENTION SURVEYS OF SOUTH AUSTRALIAN HEROIN USERS

The major aims of this study component were to:

- Identify the experience and circumstances of fatal and non-fatal overdose among heroin users in South Australia.

- Evaluate the effectiveness of a targeted intervention aimed at reducing risk factors associated with the experience of overdose among South Australian heroin users.

Two samples of heroin users were surveyed six months apart. A total of 218 heroin users (the pre-intervention sample) were interviewed during September/October 1996. Following the collection of the pre-intervention data, the intervention was launched in November 1996. The effectiveness of this intervention was evaluated through a second round of interviews (the post-intervention survey) with 211 heroin users, conducted six months after the launch, in May/June 1997. The second survey enabled evaluation of the impact of the intervention materials and structural changes implemented as a result of the study process, a further aim of this study.

4.1 Method

4.1.1 Study questionnaire

A modified version of the questionnaire employed by Darke and colleagues (Darke et al., 1996a; 1996b) was developed for use in this study. The questionnaire elicited information on demographic characteristics, drug use history, level of heroin dependence, recognition of overdose signs, experience of heroin overdose in others, personal experience of overdose, use of preventive measures, and risk perceptions and behaviours associated with heroin overdose.

For clarity, overdose was distinguished from being ‘on the nod’ and described as involving: collapse; blue skin colour; difficulty breathing; loss of consciousness; inability to be woken or roused; or death associated with heroin use. To evaluate the impact of the intervention among the post-intervention sample, an additional section assessing exposure to and understanding of the intervention messages was added to this questionnaire. Level of heroin dependence was assessed by the Severity of Dependence Scale (SDS), measured on an 0–15 point scale, in which higher scores reflect greater dependence (Gossop et al., 1995).

4.1.2 Recruitment and training of interviewers

Interviewers for the present study were recruited via three major sources. The Needle Exchange Program (administered by DASC) ACSA and SAVIVE. With the cooperation of these organisations, individuals who were identified as having developed a variety of networks within the heroin user community and who possessed the skills necessary for accurate data gathering were recruited as ‘privileged access interviewers’ (see Biernacki, 1986; Gore & Mahs, 1994; Griffiths, Gossop, Powis, & Strang, 1993; Power, Hunter, & Ward, 1996 for a review of the literature regarding ‘privileged access interviewers’).

Training of the interview team consisted of an initial three hour workshop during which the interviewer’s rights and responsibilities as employees were discussed with particular reference to their own safety and the importance of confidentiality in dealing with subjects. Next, the questionnaire was examined in detail and the rationale for its structure and content explained to the interviewers. Finally, the method of administration of the questionnaire was explained and discussed. Particular emphasis was placed on the importance of administering the questionnaire without prompts or hints, and to avoid ‘educating’ participants until after the completion of the questionnaire. Finally, the procedure associated with the arrangement and conduct of interviews was discussed.

Each interviewer recruited one subject for a practice interview which was conducted in the presence of the project manager. These practice interviews afforded the opportunity for the interviewer to practice the administration of the questionnaire under supervision and to seek clarification of any points of difficulty. The practice subject was also encouraged to provide feedback on both the interviewing technique and the questionnaire. Data from practice interviews was not included in subsequent analyses.

Following the training workshop and practice interviews final adjustments were made to the questionnaire.

4.1.3 Subject recruitment

In order to provide a broad cross-section of subjects for the sample, a total of eleven interviewers were recruited and trained to conduct interviews for both surveys. Starting with their own established networks, these trained interviewers accessed heroin users from across socio-economic groupings and from different geographic regions within metropolitan Adelaide, the hills region and to a lesser extent, non-metropolitan centres within the state. Each interviewer conducted around five interviews per week until a total of 20–26 interviews each had been completed, and an adequate coverage had been achieved.

4.1.4 Interview procedures

All subjects were volunteers, and were compensated $20 for their time and any inconvenience caused in attending the interview and completing the questionnaire. Subjects were assured that any information they gave would be entirely confidential and anonymous. Where possible, interviews were conducted at the premises of ACSA or SAVIVE (these premises are on the same campus). If this was inconvenient, interviews were conducted in an open public area such as a coffee shop with other people present. Interviews took between 30 and 45 minutes.

All subjects in this study were recruited through peer networks by a process known as 'snowballing' whereby several members of the target group were identified and interviewed by the trained interviewers. Following this interview, participants were encouraged to identify other suitable subjects for inclusion in the study.

The same recruitment methods were used for both pre- and post-intervention surveys. This resulted in two distinct samples with some overlap, in that some subjects participated in both surveys.

As both a safety, and as a quality control measure, interviewers were issued with a kit which allowed them to conduct five interviews. Each kit contained 5 copies each of the questionnaire, consent form, information sheet, interviewer guidelines and five $20 bills. Interviewers did not carry more that $100 in cash at any time.

When these five interviews were completed, they were returned to the project manager for review and discussion.

This review process provided a valuable opportunity for ongoing supervision and support of individual interviewers. At the conclusion of this review, each interviewer was issued with another kit for the next five interviews.

4.1.5 Analyses

For normally distributed continuous variables, *t*-tests were employed. Categorical variables were analysed by Chi-square tests and the Mann-Whitney *U*-test. Where distributions were highly skewed, medians were reported. Highly skewed continuous data were analysed using the Mann-Whitney *U*-test. Alpha level was set at .05 and confidence intervals of 95% were used. All analyses were conducted using SPSS for Windows Version 6.

4.2 Results

4.2.1 Subjects

A total of 218 heroin users (i.e. who had used heroin in the previous six months) participated in the pre-intervention survey during September/October 1996. Six months after the intervention launch, the post-intervention survey, comprising 211 subjects was conducted during May/June 1997. Less than a third (30.3%) of the post-intervention sample had also participated in the pre-intervention survey. All subjects (from both pre- and post-intervention samples) had injected heroin but two subjects from the pre-intervention sample had used alternative routes (one had smoked and the other snorted heroin) during the six months prior to interview. Table 4.2.1 shows the geographic distribution of both samples.

Table 4.2.1 Sample Demographics

Australian Bureau of Statistics South Australian sub-divisions	**Pre-int (%) (*n* = 217*)**	**Post-int (%) (*n* = 209**)**
Eastern metropolitan (including the city)	29.5	29.3
Southern metropolitan	22.1	21.2
Western metropolitan region	21.2	28.8
Northern metropolitan	15.7	18.8
Non-metropolitan areas	11.5	1.9
Total	**100**	**100**

* One missing case
** Three missing cases

The majority of subjects in both samples were drawn from metropolitan Adelaide. Fewer of the post-intervention sample came from non-metropolitan areas in comparison to the pre-intervention sample.

4.2.2 Characteristics of the samples

The age range and gender breakdown in each sample was satisfactory and there were no significant differences in terms of sample characteristics between the two samples (see Table 4.2.2).

Table 4.2.2 Characteristics of the samples

Characteristics	**Pre-int (*n* = 218)**	**Post-int (*n* = 211)**
Age (mean years)	29.5	29.5
Currently in methadone treatment %	24.8	29.4
Gender		
Male %	54.6	59.7
Female %	45.4	40.3
Education		
Trade or technical courses completed %	31.7	32.7
College or university course completed %	26.6	28.4
Employment		
Unemployed %	41.3	37.4
Part-time or casual work %	27.1	25.1
Full-time work %	17.4	19.4
Student/ home duties %	14.2	18.0

Over half of the subjects in each sample had completed post-secondary education or training, and approximately two-fifths in each sample were unemployed.

4.2.3 *Lifetime heroin use*

All subjects in both samples had used heroin in the previous six months.

For both samples the average age of first heroin use was in the late teens or early twenties, while the average length of heroin use was between nine and ten years.

There were no differences between pre- and post-intervention samples in terms of the age at which heroin was first used or in the average length of time for which heroin had been used (see Table 4.2.3).

Table 4.2.3 Length of heroin-using career

	Age of first heroin use				**Length of heroin-using career**			
	mean	*median*	*SD*	*Range*	*mean*	*median*	*SD*	*range*
Pre-int (years) (*n* = 218)	19.9	19	3.8	12 – 35	9.6	8	7.0	<1 – 29
Post-int (years) (*n* = 209*)	20.6	20	4.1	12 – 39	9.0	7	7.4	<1 – 31

* Three missing cases

Twelve subjects from the pre-intervention sample, and nine in the post-intervention sample had been using heroin for less than one year.

4.2.4 *Lifetime psychoactive substance use history*

While multiple psychoactive substance use among both samples was common, respondents in the post-intervention sample had both *used* (by any route) and *injected* a greater number of different substance types during their lifetime (see Table 4.2.4).

Table 4.2.4 Psychoactive substance types ever used or injected

Sample	Substance types ever *used* by any route				Substance types ever *injected*			
	mean	**median**	**SD**	**range**	**mean**	**median**	**SD**	**range**
Pre-int (*n* = 218)	9.2	10	2.9	1–14	3.4	3	1.8	1–9
Post-int (*n* = 211)	9.9	10	2.2	4–14*	4.0	4	1.8	1–9***

* $p < .05$, *** $p < .001$

A more detailed examination of respondent's lifetime substance use patterns showed that for the pre-intervention sample, the most common substances used after heroin were, in order cannabis, alcohol and tobacco. For the post-intervention sample, alcohol, cannabis and amphetamines were the most common substances used (see Table 4.2.5).

Table 4.2.5 Lifetime psychoactive substance use

Substance	Pre-int Ever used (%) (*n* = 218)	Post-int Ever used (%) (*n* = 211)	Pre-int Ever injected (%) (*n* = 218)	Post-int Ever injected (%) (*n* = 211)
Heroin	100.0	100.0	100.0	100.0
Cannabis	93.6	97.2		
Alcohol	90.4	98.6***		
Tobacco	87.2	89.1		
Amphetamines	80.3	94.8***	73.4	88.2***
Hallucinogens	75.2	85.3**	17.0	15.2
Benzodiazepines	73.9	80.1	10.1	19.4**
Cocaine	64.7	74.9*	49.1	64.0**
Other opioids	60.6	71.6*	38.5	49.8*
Ecstasy	55.0	60.7	24.3	22.3
Prescribed Methadone	43.6	38.9	11.5	18.0*
Inhalants	39.4	42.7		
Street Methadone	30.3	46.4***	12.8	18.5
Barbiturates	21.6	21.8	8.3	9.0
Other substances	11.0	8.1	4.1	2.4

* $p < .05$, ** $p < .01$, *** $p < .001$

Least commonly used were the barbiturates, although these had still been used by over one-fifth in each sample.

Significantly more of the post-intervention sample had used alcohol, amphetamines, hallucinogens, cocaine, other opioids (not including methadone) and street methadone (methadone bought from others) during their lifetime in comparison to the pre-intervention sample. Significantly more of the post-intervention sample had ever *injected* amphetamines, cocaine, benzodiazepines, methadone (prescribed for self) and other opioids.

4.2.5 Psychoactive substance use in the previous six months

As shown in Table 4.2.6, multiple psychoactive substance use in the previous six months was common in both samples. Respondents in the post-intervention sample reported the use (by any route) of significantly more substance types in the previous six months.

Table 4.2.6 Number of psychoactive substance types used or injected in the previous six months

Sample	**Substance types *used* in the previous six months**				**Substance types *injected* in the previous six months**			
	mean	*median*	*SD*	*range*	*mean*	*median*	*SD*	*range*
Pre-int (*n* = 218)	5.3	5	2.1	1–13	1.8	2	1.1	1–4
Post-int (*n* = 211)	5.9**	6	2.1	2–14	2.0	2	1.2	1–9

** $p < .01$

However, in both samples, similar numbers of substance types were *injected* during the previous six months.

Table 4.2.7 shows the substance use patterns (both used and injected) during the six months immediately prior to the interview for subjects in both samples. For the pre-intervention sample, the most common substances used (after heroin) in the previous six months were, in order, tobacco, alcohol and cannabis while the most common substances injected were amphetamines, other opioids and cocaine.

For the post-intervention sample, alcohol, tobacco and cannabis were, in order, the most common substances used after heroin. After heroin, the most common substances injected during the previous six months were amphetamines, cocaine and other opioids. More subjects from the post-intervention sample reported using cannabis, alcohol, cocaine and street methadone (methadone bought from others) during the six months prior to interview.

Table 4.2.7 Psychoactive substance use in the previous six months

Substance	Used in previous 6 months		Injected in previous 6 months		Days used in previous 6 months Mean (median, range)	
	Pre-int (*n* = 218)	**Post-int (*n* = 211)**	**Pre-int (*n* = 218)**	**Post-int (*n* = 211)**	**Pre-int (*n* = 218)**	**Post-int (*n* = 211)**
Heroin	100.0	100.0	100.0	99.1	75.4 (49, 1–180)	81.4 (72, 1–180)
Tobacco	81.7	86.7			174.0 (180, 20–180)	178.3 (180, 5–180)**
Alcohol	77.1	88.6**			48.3 (30, 1–180)	48.0 (48, 1–180)
Cannabis	76.6	85.8*			113.8 (140, 1–180)	112.4 (130, 1–180)
Benzodiazepines	43.1	50.2	4.1	5.2	47.8 (24, 1–180)	45.1 (24, 1–180)
Amphetamines	39.0	31.8	35.8	29.9	22.0 (5, 1–180)	16.7 (6, 1–150)*
Other opioids	29.4	37.4	13.8	18.0	18.9 (8.5, 1–180)	14.3 (6, 1–120)
Ecstasy	17.4	21.8	5.5	9.0	3.9 (2, 1–30)	4.4 (2, 1–24)
Street Methadone	15.6	24.2*	6.9	10.0	35.5 (5.5, 1–180)	15.9 (3, 1–180)
Hallucinogens	14.7	11.8	1.4	1.9	4.6 (2, 1–20)	2.5 (2, 1–10)
Cocaine	14.7	25.6**	12.4	19.0	15.0 (4, 1–120)	6.0 (3, 1–60)*
Inhalants	12.8	10.9			13.4 (2.5, 1–100)	14.0 (2, 1–180)
Methadone (inj. pres. methadone)	6.0	7.6	6.0	7.6	41.5 (3, 1–180)	60.7 (61, 1–180)
Barbiturates	1.8	1.4	0	0.5	9.8 (8.5, 2–20)	2.7 (3, 1–4)
Other substances	2.3	2.4	0	0	55.6 (6, 1–180)	42.4 (5, 1–180)

* $p < .05$, ** $p < .01$

There were no significant differences between the samples in terms of the number of days on which heroin had been used during the previous six months. The pre-intervention sample used heroin on a mean of 75.4 days while the post-intervention sample had a mean of 81.4 days of heroin use.

On the days that heroin was used, respondents from the post-intervention sample spent a mean of $75.04 (SD = 62.2) per day on heroin. The median amount spent was $50.00 per day, range: $25–$500 per day (this question was not asked of the pre-intervention sample).

Respondents from the post-intervention sample had used tobacco on more days, and amphetamines and cocaine on fewer days during the previous six months in comparison to the pre-intervention sample.

Daily use of heroin was reported by 15.1% of the pre-intervention sample and 17.1% of the post-intervention sample. Weekly use was reported by 9.2% of the pre-intervention sample and 4.3% of the post-intervention sample. Fortnightly heroin use was reported by 2.3% of the pre-intervention sample and 11.4% of the post-intervention sample. For the remainder of the samples heroin use was sporadic, following no regular pattern.

4.2.6 Severity of Dependence Scale

The Severity of Dependence Scale (SDS) yielded a high reliability coefficient (Alpha) of .89 in the pre-intervention survey, and .87 in the post-intervention sample.

There were no significant differences between the samples in dependence on heroin as measured by the SDS. In the pre-intervention sample, the SDS showed a mean score of 6.5 (SD = 4.1; range: 0–15). For the post-intervention sample, the mean SDS score was 7.05 (SD = 3.93; range: 0–15). SDS scores greater than 6, generally considered indicative of severe dependence (see Gossop et al., 1996), were found for 48% of the pre-intervention sample and 53% (non-significant difference) of the post-intervention sample. SDS scores indicated higher levels of dependence on heroin for women in both samples. Women in the pre-intervention sample showed a mean SDS score of 7.2 vs 5.9 for men, (t = 2.33, df 215, p <.05). In the post-intervention sample, women showed a mean SDS score of 7.8 vs 6.6 for men,
(t = 2.23, df 209, p <.05).

4.2.7 Recognition of opioid overdose signs

Without prompting, subjects were asked to nominate those signs which they would identify as being associated with opioid overdose. Recognition of the major signs of acute overdose was high (see Table 4.2.8).

For both samples, the three most commonly nominated signs were cyanosis, (characterised by blue discolouration around the lips, fingernails and/or toenails), depressed level of consciousness, and depressed respirations. These three signs, together with pupil constriction, are characteristic of acute narcosis. Overdose signs such as unconsciousness, unresponsiveness, collapse and slow pulse were indicated significantly more often by respondents from the post-intervention sample.

Table 4.2.8 Recognition of opioid overdose signs

Overdose sign (multiple choices)	**Pre-int (%) (*n* = 218)**	**Post-int (%) (*n* = 211)**
Blue colour around the lips, blue fingernails and/or toenails	65.6	72.0
Person unconscious	59.6	69.2*
Very slow, shallow breathing or no breathing at all	57.8	64.5
No response to shaking, calling their name, or pain	37.2	52.1**
Person falls over	33.0	24.6*
Very slow or faint pulse	25.2	35.5*
Snoring or gurgling breathing in someone who is asleep	15.1	27.5**

* $p < .05$, ** $p < .01$

Less well recognised was the gradual descent into central nervous system depression characterised by snoring or gurgling breathing in someone who has fallen asleep following heroin use. Only 15% of the pre-intervention sample included this sign as being indicative of opioid overdose. However, this less obvious sign was nominated significantly more often by the post-intervention sample.

4.2.8 *Personal experience of overdose*

As shown in Table 4.2.9, almost half of the pre-intervention, (48.2%) and 44.5% of the post-intervention sample had overdosed on heroin at some time during their lifetime (non-significant difference). The median lifetime number of overdoses reported was 2 in both samples.

Table 4.2.9 Personal experience of overdose

Personal experience of overdose	**Pre-intervention (*n* = 218)**	**Post-intervention (*n* = 211)**
Ever overdosed (%)	48.2	44.5
Number of overdoses (median)	2	2
Overdosed in the previous six months (%)	11.5	9.0
Time since most recent heroin overdose (median)	18 months (range: 1 day – 21 years)	2 years (range: 3 days – 20 years)
Been to a hospital because of an overdose (%)	21.6	11.8**
Time since been to a hospital because of an overdose (median)	2 years ago (range: 21 days – 15 years)	3 years ago (range: 60 – 21 years)*
Ambulance ever attended a personal overdose (%)	28.4	28.0
Time since ambulance attended a personal overdose (median)	2 years ago (range: 21 days – 15 years)	2 years ago (range: 1 day – 20 years)
Opioid antagonist naloxone (Narcan®) ever administered (%)	26.1	25.6
Time since naloxone administered (median)	18 months ago (range: 21 days – 15 years)	18 months ago (range: 3 days – 20 years)

* $p < .05$, ** $p < .01$

Approximately one-quarter of the respondents from each sample had been administered naloxone following an overdose. While an ambulance had attended an overdose for similar numbers in both samples, fewer of the post-intervention sample had been to a hospital because of an overdose.

For both samples, the prevalence of overdose increased with the length of heroin-using career. Of the 36% of the pre-intervention sample who had been using heroin for 0–5 years, 36% had overdosed during their heroin-using careers. Of the 21.6% who had been using for 6–10 years, 47% reported an overdose. Of the 43%

reporting more than 10 years of heroin use, 59% had experienced an overdose (χ^2 = 9.22, df 2, p < .01).

Similarly, of the 41.8% of the post-intervention sample who had been using heroin for 0–5 years, 26.4% had overdosed during their heroin-using careers. Of the 24% who had been using for 6–10 years, 46% reported an overdose. Of the 34.1% reporting more than 10 years of heroin use, 66.2% had experienced an overdose (χ^2 = 25.04, df 2, p < .001).

4.2.9 Perceived reasons for personal overdose

There were no significant differences between the samples in terms of the perceived reasons for their most recent personal overdose. When asked to nominate the main reason for their most recent overdose, responses focused on the characteristics of the heroin itself as the cause (see Table 4.2.10).

Table 4.2.10 Perceived main reason for most recent personal overdose

Reason	**Pre-int (%*) (*n* = 105)**	**Post-int (%*) (*n* = 94)**
Used more than usual	28.6	31.9
Heroin stronger than expected	20.0	17.0
Benzodiazepines also consumed	15.2	21.3
Alcohol also consumed	7.6	13.8
Low tolerance	7.6	5.3
Other substances consumed	3.8	2.1
Impurities in dose	2.9	0
Didn't test strength of heroin	2.9	5.3
Mixed different heroins	1.9	0
Didn’t care about the risks at the time	1.9	0
Emotional problems	1.9	0
Suicide attempt	1.9	1.1
Other	3.8	2.1
Total	**100**	**100**

*Percentage of those who had ever overdosed

Following the quantity and strength of the heroin used at the time, the consumption of benzodiazepines was given the next most common reason for their most recent overdose in both samples.

Two respondents from the pre-intervention sample and one from the post-intervention sample indicated that their most recent overdose was an attempt to commit suicide.

4.2.10 Circumstances of most recent personal overdose

Among the pre-intervention sample, one subject had just left a therapeutic community and 12% had been discharged from prison within the two weeks prior to their most recent overdose.

For the post-intervention sample, 6.5% had been discharged from prison within the two weeks prior to their most recent overdose. Four respondents indicated that their most recent overdose occurred following discharge from a therapeutic community, one had recently left a detoxification unit and seven were sporadic users or had been trying to 'get straight' at the time of their most recent overdose.

As shown in Table 4.2.11, in both samples the majority of those who had ever overdosed had done so in a private home on the most recent occasion. Few subjects reported overdosing in a public place.

Table 4.2.11 Circumstances of most recent personal overdose

Circumstance	**Pre-int (%*) (*n* = 105)**	**Post-int (%*) (*n* = 94)**
In methadone treatment	16.2	10.6
Discharged from prison within two weeks prior to last overdose	12.4	6.5
Location		
Overdosed in private home	81.0	80.9
Overdosed in car	8.6	7.4
Overdosed in park/street	3.8	1.1

*Percentage of those who had ever overdosed

In both samples, the majority had been in the presence of other people when they last experienced an overdose. Among those who had ever overdosed, only 12.4% of the pre-intervention sample and 10.6% of the post-intervention sample reported being alone at the time of their most recent overdose.

4.2.11 Concomitant psychoactive substance use at time of most recent personal overdose

Among those who had ever overdosed, 52% of the pre-intervention and 58% of the post-intervention sample (non-significant difference) had used other substances in addition to heroin on the most recent occasion (see Table 4.2.12). Concomitant use of opioids other than heroin (e.g. methadone, codeine, morphine) at the time of their most recent overdose was relatively low in both samples.

Table 4.2.12 Concomitant substance use at time of most recent personal overdose

Substances used in addition to heroin at most recent overdose	**Pre-int (%*) (*n* = 105)**	**Post-int (%*) (*n* = 94)**
None	38.1	33.0
Benzodiazepines	33.3	36.2
Alcohol	21.9	30.8
Cannabis	11.4	27.7**
Methadone	7.6	6.4
Antidepressants	2.9	1
Morphine	1.0	0
Codeine	0	0
Amphetamines	1.9	2.1
Cocaine	1.0	0
Hallucinogens	0	0
Ecstasy	0	0
Barbiturates	0	0
Inhalants	0	0
Other	1.9	0

*Percentage of those who had ever overdosed
** $p < .01$

No subject reported the use of codeine, hallucinogens, ecstasy, barbiturates, or inhalants in conjunction with their most recent overdose. Among the pre-intervention sample, use of other central nervous system depressants (alcohol, benzodiazepines, methadone or other opioids) in addition to heroin was reported by over half of those who had ever overdosed (52%). For the post-intervention sample, 58% had used other central nervous system depressants in conjunction with their most recent overdose (non-significant difference). There was an increase in concomitant cannabis use among the post-intervention sample.

Of those respondents who had been discharged from prison within two weeks prior to their most recent overdose, 73% reported the concomitant use of other central nervous system depressants at that time.

4.2.12 *Presence at heroin-related overdoses*

Of the pre-intervention sample, 70.2% had been present at someone else's overdose (median: 3 occasions, range: 1–50) vs 61.6% (median: 3 occasions, range: 1–100) for the post-intervention sample
(non-significant difference). Over a quarter (28.4%) of the pre-intervention sample and 30.1% of the post-intervention sample had been present at an overdose in the previous six months. For the pre-intervention sample the median time since being present at another's overdose was one year (range: 3 days – 20 years). For the post-intervention sample the median time since being present at another's overdose was 11.5 months (range: 1 day – 20 years).

4.2.13 *Responses to overdose*

Those respondents who had been present at another's overdose reported their initial response to their most recently witnessed overdose (see Table 4.2.13).

The most common initial response for both samples was to check whether the person was conscious by shaking them or calling their name, and the next most common was checking the person's breathing and/or pulse.

Checking whether the person was conscious was reported significantly more often by those in the post-intervention sample while placing the affected person in the coma position if they were unconscious, and giving mouth to mouth or cardio-pulmonary resuscitation (CPR) were reported significantly less often among the post-intervention sample.

Table 4.2.13 Initial action taken at most recent witnessed overdose

Initial action	**Pre-int (%+) (*n* = 153)**	**Post-int (%+) (*n* = 130)**
Checked whether the person was conscious	35.3	50.0*
Check breathing and/or pulse	15.7	11.5
If unconscious, placed in the coma position	9.2	3.1*
Rang ambulance	9.2	8.5
Mouth to mouth/CPR	8.5	0.8*
Nothing, other people helping	5.2	5.4
Caused pain to try to rouse person	3.9	5.4
Walk them around if awake	3.3	3.8
Shower/bath/splashed with water	2.6	2.3
Went for help from others	2.6	2.3
Take to hospital	1.3	0
Left/Did nothing	0	0.8
Injected with speed	0	0.8
Other action	3.3	5.4
Total	**100**	**100**

+Percentage of those who had ever been present at an overdose

* $p < .05$

There were no significant differences between the samples in terms of calling an ambulance, either as an initial or subsequent response to the last overdose at which they were present. Among the pre-intervention sample, almost half of those subjects (45.1%), who had been present at an overdose rang an ambulance as either the initial (9.2%), or subsequent response (35.9%). For the post-intervention sample, over half (55.4%) of those who had been present at an overdose rang an ambulance as either the initial (8.5%), or subsequent response (47.7%).

4.2.14 Perceived obstacles to help-seeking at overdose

On the most recent occasion that someone overdosed in their presence, 39.9% (*n* = 61) of those who had ever been present at an overdose among the pre-intervention sample were delayed or stopped from getting help on that occasion. Similarly, among the post-intervention sample, 36.2% (*n* = 47) of those who had ever been present at an overdose were delayed or stopped from getting help at that time.

Of those who had been delayed from help-seeking at their most recently witnessed overdose, a fear of police involvement was indicated as the major

reason by 80.3% (*n* = 49) in the pre-intervention sample and 70.2% (*n* = 33) in the post-intervention sample
(non significant difference). Table 4.2.14 shows that the next most common reason for delay, being stopped by another person, was nominated by only 4.9% from the pre-intervention sample and 14.9% from the post-intervention sample.

Table 4.2.14 Perceived obstacles to help-seeking at overdose

Reason	**Pre-int (%*) (*n* = 61)**	**Post-int (%*) (*n* = 47)**
Fear of police involvement	80.3	70.2
Stopped by other person	4.9	14.9
Loss of confidentiality	1.6	0
Outstanding warrants	1.6	0
Fear of manslaughter charges	1.6	0
Out of it	0	4.3
Worried about OD person's reaction	0	0
Negative attitudes of medical staff	0	0
Cost of ambulance	0	0
Other	9.8	10.6
Total	**100**	**100**

*Percentage of those who had been delayed from help-seeking at last witnessed overdose

No subject mentioned the negative attitudes of medical staff, the cost of an ambulance, or concern regarding the reaction of the affected person as a delaying factor in seeking help.

4.2.15 Overdose risk perceptions

For both samples, there was a striking contrast between personal perceptions of overdose risk and another's chances of overdose (see Table 4.2.15). Less than one-fifth from each sample regarded their own chance of overdosing in the future as likely or very likely. In contrast, 62% of the pre-intervention sample and 81% of the post-intervention sample perceived the chance of a future overdose for other people as likely or very likely.

Table 4.2.15 Overdose risk perceptions

Category	**Own chance of future overdose**		**Other's chance of future overdose**	
	Pre-int (%)	**Post-int (%)**	**Pre-int (%)**	**Post-int (%)**

	(*n* = 218)	(*n* = 211)	(*n* = 218)	(*n* = 211)
Very likely	3.2	2.8	20.3	20.1
Likely	16.6	13.3	41.5	61.2
Not likely	54.8	59.2	32.7	15.3
Very unlikely	25.3	24.6	5.5	3.3

Comparison of the two samples showed that there were no differences in perceptions of the personal risk of a future overdose. However, significantly more of the post-intervention sample perceived a greater risk of future overdose for other people (χ^2 = 22.61, df 3, $p < .001$).

When respondents were asked how often during the previous six months they had 'worried' about the possibility of overdosing, the majority of respondents in both samples were unconcerned about the possibility of a personal overdose in the future (see Table 4.2.16).

Table 4.2.16 Concern regarding future personal overdose

Category	Pre-int (%) (*n* = 218)	Post-int (%) (*n* = 211)
Very often	1.8	0
Often	5.5	1.4
Sometimes	19.7	20.4
Rarely	35.8	48.8
Never	37.2	29.4

During the previous six months respondents in the post-intervention sample had 'worried' significantly less about the possibility of a future personal overdose compared to those in the pre-intervention sample (χ^2 = 15.27, df 4, $p < .01$).

When asked to assess the percentage of regular heroin users who would overdose during their heroin-using careers, the mean percentages nominated by the two samples were similar (51.8% for the pre-intervention sample and 48.2% for the post-intervention sample). The actual rate of overdose among these samples was 48% and 44% respectively. Estimations of the *number* of overdoses which would be experienced during their lifetime by regular heroin users in Adelaide were also similar for both samples, (median: 2 for each sample).

During the collection of the pre-intervention data it became apparent that there was a widespread perception among South Australian heroin users that local heroin was of low purity and therefore less likely to cause an overdose. To test this perception, the post-intervention sample were asked to give an estimate of the average current purity of local (South Australian) heroin. The mean purity indicated by respondents was 27% (median 20%, range: 2–100%). This estimate was compared with data supplied by Forensic Science in South Australia.

As it is not possible to identify the source of samples of heroin analysed by this laboratory, only those samples which weighed 2 g or less were included in the analyses. Small quantities, (i.e. 2 g or less) are more likely to be representative of street heroin, whereas it is possible that quantities of heroin greater than 2 g may have come from a dealer prior to cutting for later sale. Examination of the 53 heroin samples weighing 2 g or less which were analysed during the first six months of 1997 showed that the average purity of heroin for this period was 33% (median 24%, range: 9–77%).

4.2.16 *Prevention of heroin-related overdose*

When respondents were asked what measures they took to avoid overdosing when they used heroin, (see Table 4.2.17) the majority of respondents in both samples nominated one or more preventive measures. Significantly more of the post-intervention sample avoided mixing heroin with any other psychoactive substance or exceeding their tolerance to heroin.

Table 4.2.17 Heroin overdose prevention strategies

Strategy (multiple choices)	Pre-int (%) (*n* = 218)	Post-int (%) (*n* = 211)
Don't mix with any other drug	44.5	56.9**
Don't use more than you know you can tolerate	43.1	60.7***
Test dose of new batch of heroin	38.5	39.8
Don't mix with alcohol	32.6	48.8***
Ask dealer how strong	28.0	33.6
Ask other users how strong	26.1	36.0*
Always go to same source/dealer	25.7	22.3
Don't mix with benzodiazepines	25.2	44.1***
Don't use alone	15.6	30.8***
Let others shoot up first	11.5	14.2
Inject slowly	3.7	6.2
Nothing	3.2	1.4
Place some heroin on tongue to see how it tasted	1.4	0.9
Dilute with more water if unsure of strength	0.5	0.5
Other	8.3	3.3*

* $p < .05$, ** $p < .01$, *** $p < .001$

Similarly, not mixing heroin with alcohol or benzodiazepines was nominated significantly more often by respondents in the post-intervention sample. Preventive measures such as not using heroin while alone and asking their dealer about the strength of the heroin were also nominated more often by respondents from the post-intervention sample.

4.2.17 *Frequency of risk behaviours and the use of prevention strategies in the previous six months*

Respondents from both samples were asked how frequently specific risk behaviours were practiced during the previous six months, (i.e. trial tasting a new batch of heroin, using heroin while alone and using heroin behind locked doors). As can be seen in Table 4.2.18, no significant differences were found.

Table 4.2.18 Frequency of risk behaviours and the use of prevention strategies in the previous six months

Category	**Trial taste of new batch of heroin**		**Used heroin while alone**		**Used heroin behind locked doors**	
	Pre-int (%) (*n* = 218)	**Post-int (%) (*n* = 211)**	**Pre-int (%) (*n* = 218)**	**Post-int (%) (*n* = 211)**	**Pre-int (%) (*n* = 218)**	**Post-int (%) (*n* = 211)**
Every time/Often	17.0	22.3	23.4	17.1	22.0	27.0
Sometimes	23.9	15.1	23.9	32.2	20.6	19.0
Rarely/Never	59.1	62.6	52.8	50.7	57.2	54.0

The frequent use of test dosing techniques was reported by approximately one-fifth in each sample, with no significant increase in the practice of this preventive measure among the post-intervention sample. Approximately, one-fifth of each sample had used heroin while alone ‘every time’ or ‘often’; while approximately one-quarter of each sample had used heroin behind locked doors ‘every time’ or ‘often’ during the previous six months.

To further identify risk behaviours, respondents were surveyed on the frequency of concomitant alcohol and/or benzodiazepine use with heroin during the previous six months. As Table 4.2.19 shows, no significant differences were found between the samples in terms of their concomitant use of heroin and alcohol, or heroin and benzodiazepines in the previous six months.

Table 4.2.19 Concomitant alcohol / benzodiazepine and heroin use

Category	**Alcohol and heroin use**		**Benzodiazepine and heroin use**	
	Pre-int (%) (*n* = 218)	**Post-int (%) (*n* = 211)**	**Pre-int (%) (*n* = 218)**	**Post-int (%) (*n* = 211)**
Every time/Often	11.0	10.9	9.6	5.7
Sometimes	22.5	19.4	14.7	12.3
Rarely/Never	66.5	69.7	75.7	82.0

Approximately two-thirds in each sample (59% of the pre-intervention and 67% of the post-intervention sample) reported at least some concomitant alcohol and heroin use in the previous six months.

Two-fifths (40%) of the pre-intervention and almost one-third (32%) of the post-intervention sample reported concomitant benzodiazepine and heroin use in the six months prior to interview.

4.2.18 Motivation for concomitant alcohol and heroin use

Respondents who had reported concomitant alcohol and heroin use in the previous six months were asked to give a single main reason for doing so. The main reason given by both samples was that alcohol had been combined with heroin for enjoyment, or to be sociable (see Table 4.2.20).

Almost one-quarter of those who had combined alcohol with heroin from the pre-intervention sample did so to boost the effects of heroin to produce a better rush or 'high', less than 9% of the post-intervention sample reported the same main reason for use. Over one-fifth of those who had combined alcohol with heroin from the post-intervention sample did so unintentionally while less than 8% of the pre-intervention sample reported the same main reason. A frequent comment from respondents was 'I was already drinking, then scored'.

Table 4.2.20 Main reason for concomitant alcohol and heroin use

Main reason	**Pre-int (%*) (*n* = 128)**	**Post-int (%*) (*n* = 142)**
Enjoyment or to be sociable	62.5	59.2
Boost the effects of heroin	23.4	8.5**
Unintentional	7.8	22.5**
Makes heroin last longer	3.9	1.4
Makes heroin work faster	1.6	0
As a substitute for heroin	0.8	0
Heroin withdrawal	0	2.1
Other reason	0	6.3
Total	**100**	**100**

* Percentage of those who drank alcohol with heroin in the previous six months
** $p < .01$

Few subjects reported using alcohol to manage heroin withdrawal or to make the heroin last longer or work faster.

4.2.19 Motivation for concomitant benzodiazepine and heroin use

Those respondents who reported concomitant benzodiazepine and heroin use during the previous six months were asked to indicate the single main reason for

doing so. While for both samples, enhancement of the effects of heroin was the main reason given for the concomitant use of benzodiazepine and heroin, fewer of the post-intervention sample did so (see Table 4.2.21).

Table 4.2.21 Main reason for concomitant benzodiazepine and heroin use

Main reason	Pre-intervention (%) (*n* = 87)	Post-intervention (%) (*n* = 68)
Boost the effects of heroin	55.2	36.8
To relieve anxiety, depression, insomnia	32.2	10.3
As a substitute for heroin	9.2	10.3
Makes heroin last longer	3.4	11.8
Unintentional	0	13.2
Heroin withdrawal	0	11.8
Makes heroin work faster	0	0
Other reason	0	5.9
Total	**100**	**100**

Table 4.2.21 shows that more of the post-intervention sample used benzodiazepines with heroin unintentionally and in an effort to alleviate symptoms of heroin withdrawal. The relief of symptoms such as anxiety, depression and insomnia were indicated by a substantial minority of those reporting concomitant benzodiazepine and heroin use in the previous six months. Anxiety, depression and insomnia are features of the heroin withdrawal syndrome and it is possible that there was some overlap between these two items. No subject reported that concomitant use made heroin work faster.

4.2.20 Concomitant 'other opioid' and heroin use among the post-intervention sample

The need to assess the concomitant use of heroin and other opioids became apparent during the collection of data on fatalities among heroin users. Therefore the post-intervention sample was further assessed on the frequency of the concomitant use of 'other opioids' with heroin.

Table 4.2.22 Concomitant 'other opioid' and heroin use among the post-intervention sample

Frequency	Post-int (%) (*n* = 210*)
Every time	1.4
Often	0.9
Sometimes	5.7

Rarely	10.4
Never	81.0

* One missing case

As Table 4.2.22 shows, almost one-fifth(18.5%) of the post-intervention sample had used other opioids with heroin during the previous six months.

4.2.21 Motivation for concomitant 'other opioid' and heroin use among the post-intervention sample

As shown in Table 4.2.23, two main reasons for the use of other opioids with heroin were given: to boost the effects of heroin, and the unintentional use of other opioids with heroin. This question was not asked of the pre-intervention sample.

Table 4.2.23 Main reason for concomitant 'other opioid' and heroin use among the post-intervention sample

Main reason	**Post-int (%*) (*n* = 39)**
Boost the effects of heroin	30.8
Unintentional	28.2
As a substitute for heroin	17.9
Heroin withdrawal	10.3
Makes heroin last longer	7.7
Makes heroin work faster	0
Other reason	5.1
Total	**100**

*Percentage of those subjects from the post-intervention sample who used other opioids with heroin in the previous six months

Almost one-fifth of those who reported concomitant other opioid and heroin use during the previous six months saw other opioids as a substitute for heroin.

4.2.22 Perception of overdose causes

When the perceived reasons for overdose in others were assessed, both samples had a majority of subjects who believed that the quantity of heroin being used was the most likely reason for overdose in others (see Table 4.2.24).

Table 4.2.24 Perceived reasons for overdose in others

Reason (multiple responses)	**Pre-int (%) (*n* = 218)**	**Post-int (%) (*n* = 211)**

Used more than usual	31.2	27.5
Used more than usual	31.2	27.5
Low tolerance	13.8	14.2
Heroin stronger than expected	13.3	13.3
Other substances consumed	11.5	2.4***
Benzodiazepines also consumed	9.2	19.0**
Did not test strength of heroin	6.0	7.1
Alcohol also consumed	5.0	12.8**
Did not care about risks at the time	4.1	2.4
Mixed different heroins	1.8	0
Emotional problems	0.9	0
Suicide attempt	0.9	0
Impurities in dose	0.9	0.9
Other	1.4	0.5
Total	**100**	**100**

** $p < .01$ *** $p < .01$

More respondents from the post-intervention sample indicated that the concomitant use of benzodiazepines and/or alcohol with heroin was causative in overdose among other users. Fewer respondents from the post-intervention sample indicated that the use of unspecified other substances were causative in overdose among other users.

4.2.23 *Sources of information on safe substance use*

Most information on the safe use of substances and the avoidance of overdose (see Table 4.2.25) was obtained through friends, a partner, or the family of respondents.

Table 4.2.25 *Sources of information on the safe use of substances*

Source (multiple responses)	**Pre-int (%) (*n* = 218)**	**Post-int (%) (*n* = 211)**
Friends/partner/family	66.7	74.4
Users groups	44.4	47.4
Media, e.g. TV, radio, newspapers	18.1	18.0
Personal experience	16.5	10.4
Educational interventions	12.0	12.8
Watching other people	8.3	15.6
Own research	6.4	22.7
Professional sources (e.g. doctor, chemist/hospital)	3.7	1.9

For both samples, user groups such as SAVIVE were also viewed as an important source of information on the safe use of psychoactive substances and the avoidance of overdose. More of the post-intervention sample gained information by watching other people and by doing their own research. Few users gained information through their doctor, chemist or hospital.

SECTION 5 EVALUATION OF EXPOSURE TO THE HEROIN OVERDOSE INTERVENTION

This section will report on responses to those questionnaire items which sought to evaluate the effects of exposure to the intervention materials. These materials comprised three posters, nine postcards, three fridge magnets and one booklet.

Following completion of the questionnaire, those subjects from the post-intervention sample who had been exposed to the intervention were invited to respond to additional items. These items were designed to assess the effects of exposure to the intervention materials and to evaluate any changes in their level of knowledge or behaviour relating to heroin use or heroin overdose following such exposure. As reported in **Section Five**, almost half (47%, *n* = 99) of the post-

intervention sample had been exposed to at least some elements of the intervention. The following section will report the findings from this group only.

5.1 Awareness of overdose signs among those exposed to the heroin overdose intervention

Those exposed to the intervention were asked to rate the degree to which they believed they had changed in their level of awareness of how to avoid overdose, and in their awareness of the signs of opioid overdose in others.

Table 5.1 Awareness of overdose signs

Response choices	Aware of how to avoid personal overdose (%) (*n* = 99)	Aware of overdose signs (%) (*n* = 99)
No more aware	17.2	24.2
Slightly more aware	27.3	30.3
Somewhat more aware	26.3	23.2
Much more aware	29.3	22.2

Table 5.1 indicates that following exposure to the intervention, the majority of this group believed they had increased their awareness of how to avoid the personal experience of overdose and how to recognise signs of overdose in others. It should be noted however, that recognition of overdose signs was already high among the sample. Several respondents from the exposed group commented that they were already aware of the necessary strategies for the avoidance of overdose, and the importance of overdose signs. So for these people, the intervention did not bring about change in their awareness of the issues.

5.2 Changes in risk factors associated with heroin overdose

Respondents from the exposed group were assessed on their awareness of some of the risk factors associated with heroin overdose, beginning with the likelihood of their using a trial taste of a new batch of heroin.

Table 5.2 Likelihood of trial tasting a new batch of heroin

Response choices	Likelihood of trial taste (%) (*n* = 99)
No more likely	44.4
Slightly more likely	29.3

Somewhat more likely	15.2
Much more likely	11.1

Table 5.2 shows that more than half of those who had been in contact with the intervention reported being more likely to trial taste a new batch of heroin following exposure to the intervention.

Similarly, a majority of those who had been exposed to the intervention indicated a decreased likelihood of using heroin while alone, or of using heroin behind a locked door (see Table 5.3).

Table 5.3 Likelihood of using heroin alone or with door locked

Response choices	Likelihood of using heroin alone (%) (*n* = 99)	Likelihood of using with door locked (%) (*n* = 99)
No less likely	37.4	35.7
Slightly less likely	21.2	22.4
Somewhat less likely	26.3	19.4
Much less likely	15.2	22.4

The respondents' perceptions of the future likelihood of using other psychoactive substances (particularly central nervous system depressants) in conjunction with heroin (among those who had come in contact with the intervention) was assessed.

Table 5.4 Likelihood of using other psychoactive substances with heroin

Response choices	Likelihood of drinking alcohol with heroin (%) (*n* = 99)	Likelihood of taking benzodiazepines with heroin (%) (*n* = 99)	Likelihood of taking other opioids with heroin (%) (*n* = 99)
No less likely	36.4	29.3	40.4
Slightly less likely	19.2	10.1	18.2
Somewhat less likely	22.2	20.2	18.2
Much less likely	22.2	40.4	23.2

As Table 5.4 shows, the majority of those subjects who had been exposed to the intervention indicated that they were less likely to use other psychoactive substances with heroin.

5.3 Exposure to heroin overdose intervention materials

Given the media coverage of heroin overdose, it was anticipated that during the study period subjects may have been exposed to information from a range of sources, both those associated with the intervention and sources independent of the intervention. To assess the extent of such exposure, respondents who had been in contact with the intervention were asked to nominate **all** recent sources of information regarding heroin overdose (including the intervention materials).

Table 5.5 shows that the most common source of exposure to heroin overdose information were the intervention materials, particularly the posters. Respondents had also been in contact with the intervention material via the print and electronic media.

Table 5.5 Sources of information regarding heroin overdose

Sources (multiple responses)	**Group exposed to intervention (%) (*n* = 99)**
Intervention posters	86.9
Intervention user booklet	65.7
Intervention postcards	57.6
Intervention fridge magnets	41.4
Magazines/newsletters	39.4
Newspapers	36.4
Television	30.3
Radio	18.2
Other	10.1

Respondents who had been in contact with the intervention postcards (*n* = 57) indicated the location of that contact. Table 5.6 shows that over half of this group had come in contact with the intervention postcards through the user group, SAVIVE. Other sources were through friends and/or relatives, other needle exchange units, and ACSA.

Table 5.6 Location of exposure to intervention postcards

Location of exposure (multiple responses)	**Group exposed to intervention postcards (%) (*n* = 57)**
SAVIVE	52.5
Friends/relatives	13.1
Other needle exchange unit	10.1
ACSA	9.1
Seminar/workshop	4.0
Magazine articles	2.0
Newspaper articles	1.0
Nu hit (Aboriginal needle exchange unit)	0
Other	8.1

More than half (52.6%) of those exposed to the intervention postcards had seen them between one and five times. Just under one-fifth (17.5%), had seen them six to ten times, and 29.8% had seen them more than ten times.

Respondents who had seen the intervention fridge magnets (*n* = 43), indicated where they had seen them. Table 5.7 shows that two-fifths of this group had come in contact with the intervention fridge magnets through SAVIVE.

Table 5.7 Location of exposure to intervention fridge magnets

Location (multiple responses)	**Group exposed to intervention fridge magnets (%) (*n* = 43*)**
SAVIVE	40.4
Friends/relatives	11.1
ACSA	8.1
Seminar/workshop	5.1
Magazine articles	1.0
Other Needle exchange unit	0.2
Newspaper articles	0
Nu hit (Aboriginal needle exchange unit)	0
Other	4.0

*One missing case

More than half (52.6%), of those exposed to the intervention fridge magnets had seen them between one and five times. Just under one-fifth (17.5%), had seen them six to ten times, and 29.8% had seen them more than ten times.

Respondents who had seen the intervention user booklet (*n* = 65) were asked where they had seen them (see Table 5.8). A similar pattern to that observed for exposure to the intervention postcards and fridge magnets was observed, with SAVIVE being the most frequently reported location where the booklets had been seen. Over one third (35.4%) of those exposed to the intervention user booklet had seen them between one and five times. Under one-fifth (16.2%) had seen them six to ten times, and 14.1% had seen them more than ten times.

Table 5.8 Location of exposure to intervention user booklet

Location (multiple responses)	**Group exposed to intervention user booklet (%) (*n* = 65)**
SAVIVE	56.6
Friends/relatives	13.1
ACSA	11.1
Other Needle exchange unit	5.1
Seminar/workshop	5.1
Magazine articles	1.0
Newspaper articles	0
Nu hit (Aboriginal needle exchange unit)	0
Other	5.1

Respondents who had seen the intervention posters (*n* = 86), were asked where they had come in contact with them (see Table 5.9).

Table 5.9 Location of exposure to intervention posters

Location (multiple responses)	**Group exposed to intervention posters (%) (*n* = 86*)**
SAVIVE	65.7
Friends/relatives	20.2
ACSA	12.1
Other needle exchange unit	11.1
Seminar/workshop	5.1
Magazine articles	3.0
Newspaper articles	1.0
Nu hit (Aboriginal needle exchange unit)	0
Other	18.2

*One missing case

Again, SAVIVE was the major source of contact with the intervention posters, with friends/relatives, ASCA and other needle exchange units also being significant sources of contact. Over two-fifths (42.4%) of those exposed to the intervention posters had seen them between one and five times. One quarter (25.9%) had seen them six to ten times, and 31.8% had seen them more than ten times.

5.4 Recall of main heroin overdose intervention messages

Respondents who had been exposed to the intervention were asked to indicate (without visual or verbal prompts) what the main messages of the intervention had been.

Table 5.10 Unprompted recall of main intervention messages

Intervention messages (multiple responses)	**Group exposed to intervention (%) (*n* = 99)**
Avoid using other drugs with heroin	69.8
Avoid using heroin when alone	61.5
Call an ambulance if an overdose occurs	33.3
Look after your friends	31.3
Avoid using heroin behind locked doors	14.6
No specific messages recalled but showed a general awareness of intervention messages	5.1

The majority of those exposed to the intervention could accurately recall at least one specific intervention message (median: 2). As Table 5.10 shows, the message regarding the avoidance of concomitant heroin and other substance use was the most commonly recalled. The next most commonly recalled message involved the avoidance of using heroin while alone. A minority of respondents (5.1%) could not recall specific messages but were aware that the general aims of the intervention were to reduce overdose among heroin users.

Respondents who had been exposed to the intervention were shown each of the three intervention posters and asked to indicate which of them (if any) they had seen prior to interview.

Table 5.11 Prompted recall of intervention posters

Intervention messages (multiple responses)	**Group exposed to intervention (%) (*n* = 99)**
'It's rarely just the 'h''	91.9
'Don't slow it alone'	87.9
'Look after your mates'	82.8

As Table 5.11 shows, prompted recall of the three posters was high, with the most commonly recognised poster being the one bearing the message *'It's rarely just the h''.*

SECTION 6 EXPOSURE TO HEROIN OVERDOSE INTERVENTION: GROUP COMPARISONS

6.1 Exposure group comparisons

This section further explores the impact of the heroin overdose intervention, by comparing two sub-groups from the post-intervention survey: those who had been exposed to one or more aspects of the intervention, and those who had not. Impact was measured by looking at behaviour, knowledge and intentions regarding heroin use and responses to overdose events.

Of the post-intervention sample (n = 211) 99 respondents had been exposed to the intervention and 112 had not. Over half (54.5%) of the exposed group had overdosed during their lifetime, compared with 35.7% of the non-exposed group (χ^2 = 7.54, df 1, p < .01). There were no differences between the two groups in terms of having overdosed during the previous six months.

Table 6.1 Group characteristics

Characteristics	Exposed to intervention (n = 99)	Not exposed to intervention (n = 112)
Age (mean years)	30.6 (median: 29, range: 17–47)	28.5 (median: 26, range: 18–50)*
Length of heroin-using career (mean years)	10.1 (median: 8, range: <1 year – 31 years)	7.9 (median: 5, range: <1 year – 31 years)**
Currently in methadone treatment (%)	38.4	21.4**
Gender		
Male (%)	51.5	67.0
Female (%)	48.5	33.0*
Education		
Trade or technical courses completed (%)	30.3	34.8
College or university course completed (%)	33.3	24.1
Employment		
Unemployed (%)	29.3	44.6
Part-time or casual work (%)	25.3	25.0
Full-time work (%)	25.3	14.3
Student/ home duties (%)	20.2	16.1

* p < .05, ** p < .01

Comparison of the two groups showed significant differences in terms of age, length of heroin-using career and currently being in methadone treatment (see Table 6.1).

Those exposed to the intervention were older, had been using heroin for a longer period and were more likely to be in treatment. Additionally, there were fewer females in the non-exposed group.

6.2 Overdose risk perceptions

There were no significant differences between the exposed and the non-exposed groups in terms of the perceived chances of a regular heroin user in Adelaide overdosing during their lifetime. Nor were there any differences in their perceptions of their own chance of overdosing in the future. Similarly, in respect of the possibility of a personal overdose during the previous six months, there was no difference between the groups in terms of the degree to which they worried about it.

6.3 Responses to overdose in others

Significantly more (70.7%) of the exposed group, compared to the non-exposed group (53.6%) had been present at some time at another person's overdose (χ^2 = 6.52, df 1, $p < .05$). However, there were no differences between the groups in terms of being present at another's overdose during the previous six months.

While there were no differences between the exposed and the non-exposed groups in terms of their *initial* responses to a witnessed overdose, significantly more of the exposed group (65.3% compared to 39.7% of the non-exposed group) called an ambulance as either an initial or subsequent response to the most recent overdose at which they were present (χ^2 = 8.49, df 1, $p < .01$).

For those respondents who had been delayed from help-seeking at their most recently witnessed overdose, a fear of police involvement was indicated as the major reason. Significant differences in terms of exposure to the intervention were found among this group. The majority of those who had been delayed by a fear of police involvement (88%) had not been exposed to the intervention (χ^2 = 8.08, df 1, $p < .01$).

6.4 Prevention strategies

The exposed and non-exposed groups were compared in terms of the strategies they reported using to prevent heroin-related overdose.

Table 6.2 Reported prevention strategies

Reported prevention strategies (multiple responses)	Exposed to intervention (%) (*n* = 99)	Not exposed to intervention (%) (*n* = 112)
Don't mix with any other drug	67.7	47.3**
Don’t use more than you know you can tolerate	63.6	58.0
Don't mix with alcohol	54.5	43.8
Don't mix with benzodiazepines	54.5	34.8**
Have a test dose of new batch of heroin	46.5	33.9
Ask other users how strong	41.4	31.3
Don't use alone	41.1	21.4**
Ask dealer how strong	33.3	33.9
Always go to same source/dealer	17.2	26.8
Let others shoot up first	16.2	12.5
Inject slowly	6.1	6.3
Nothing	2.0	0.9
Place some heroin on tongue to see how it tasted	1.0	0.9
Dilute with more water if unsure of strength	1.0	0
Other	5.1	1.8

** $p < .01$

As shown in Table 6.2 prevention strategies such as not mixing heroin with other substances, not mixing with benzodiazepines and not using alone were reported significantly more times by respondents from the exposed group.

There were no differences between the groups in regard to the frequency with which prevention strategies were practised during the previous six months (i.e. trial tasting a new batch of heroin, avoiding using alone or behind locked doors, and avoiding the concomitant use of alcohol, benzodiazepines or other opioids with heroin).

6.5 Perceived main reason for overdose in others

Significantly more of those who had been exposed to the intervention identified the concomitant use of benzodiazepines and heroin as the main reason for overdose in others.

Table 6.3 Perceived main reason for overdose in others

Reason	Exposed to intervention (%) (*n* = 99)	Not exposed to intervention (%) (*n* = 112)
Benzodiazepines also consumed	25.3	13.4*
Used more than usual	19.2	34.8*
Alcohol also consumed	17.2	8.9
Heroin stronger than expected	13.1	13.4
Low tolerance	12.1	16.1
Did not test strength of heroin	7.1	7.1
Other drugs consumed	3.0	1.8
Did not care about risks	2.0	2.7
Impurities in dose	1.0	0.9
Other	0	0.9
Total	**100**	**100**

* $p < .05$

Fewer of those who had been exposed to the intervention identified the quantity of heroin used as the main reason for overdose in others (see Table 6.3).

SECTION 7 REVIEW OF INSTITUTIONAL SOURCES: HOSPITAL, AMBULANCE AND AUSTRALIAN BUREAU OF STATISTICS DATA

As noted earlier, information regarding fatal and non-fatal overdose among heroin users was sought directly from institutional sources in South Australia and the Australian Bureau of Statistics (ABS). Sources included the Coroner's office, the South Australian Ambulance Service and major metropolitan hospitals in Adelaide. This section describes the process and results from a review of hospital and ambulance data relating to heroin overdose in South Australia. Information gained from the Coroner's office and Forensic Science will be reviewed in the following section (see **Section Eight**).

7.1 Australian Bureau of Statistics data

While data regarding morbidity and mortality associated with opioids are available from the ABS, there are some limitations to their usefulness. For example, there is a thirteen to fifteen month delay between the collection of data and release. This delay prevents analysis of recent trends in morbidity and mortality.

A further difficulty arises from the coding system. ABS mortality statistics are compiled from data supplied by the Coroner's office in each state. Based on the information provided on death certificates, deaths are routinely classified by the ABS according to the International Classification of Diseases (ICD-9). There are a number of difficulties associated with using this coding system to categorise opioid-related deaths. For example, an opioid-related death may involve heroin, morphine, codeine, dextropropoxyphene, methadone or a number of less common opioids, either singly or in combination. Under the ICD-9 system, a case involving any of these substances would be recorded as being due to opioids. No separate recording of heroin-related deaths occurs. However, an increase in opioid-related deaths could usually be presumed to reflect an increase in fatalities involving heroin. Zador and colleagues undertook such a review and found that 82% of all opioid-related deaths in NSW for 1992 were heroin-related (Zador et al., 1996).

7.2 Hospital admissions and attendances

Hospital cases are routinely classified internally using the ICD-9 coding system. Computerised hospital records were requested from major metropolitan hospitals in Adelaide to ascertain the number of overdose cases treated during the study period.

Specifically, information regarding the number of cases which involved the use of heroin alone, or in combination with other substances, from the beginning of 1994 to the end of June 1997, was requested. Heroin-related overdoses would most likely be recorded under the ICD-9 classifications listed below.

ICD-9 classifications (E = external cause)

304.0	**Drug dependence - morphine type**
304.7	**Drug dependence - combinations of morphine type drug with any other**
965.0	**Opioids and related narcotics**
E850.0	**Accidental opioid poisoning**
E950.0	**Opioid-caused suicide**

The process of collecting data on numbers of heroin-related overdose presentations and/or admissions to major metropolitan hospitals revealed several problems. As previously outlined, the classifications include cases involving the use of any opioid. Under the present coding system it was not possible to separately identify the involvement of a particular opioid such as heroin in any individual case. Additionally, while hospital records are based on ICD-9 classifications, it was found that admissions due to opioid use may in some cases be coded under alternative ICD-9 classifications (principally psychiatric), and may therefore not be recorded under any of the above classifications. In such cases, while information on possible heroin use or overdose may be contained in the person's casenote record, the hospital's computerised record of reason for admission would not enable an investigator to identify the case as a possible overdose.

Reportedly, most hospital overdose presentations are treated in accident and emergency departments (A&E), with few opioid overdose cases being admitted for treatment. These A&E presentations are not necessarily coded and/or recorded under ICD-9 classifications. Further, in most Adelaide metropolitan hospitals, A&E records are not computerised and details of individual presentations to A&E are recorded by hand. Manual searches of all A&E attendance sheets are therefore required to identify likely heroin overdose presentations. Even then, the presentation may be recorded as 'overdose' only, without reference to the particular substance or substances involved. It was not possible to do this investigation within the time constraints of the present study.

7.3 Ambulance attendances

Following a review of SAAS records, it was decided that naloxone (Narcan) usage was the most reliable method of estimating the number of emergency cases involving opioids which were treated by SAAS officers during the study period. Naloxone is an opioid antagonist with an established use in heroin overdose. Because of its safety and ability to rapidly reverse the effects of opioids, naloxone is widely used for suspected opioid toxicity and coma of undetermined aetiology.

An average of two 400 microgram ampoules of naloxone is given per opioid overdose (personal communication: Dr. Hugh Grantham, Medical Director, South Australian Ambulance Service). Therefore, an estimate of the number of overdose or suspected overdose cases involving opioids attended by SAAS officers can be

made from the numbers of ampoules of naloxone issued to SAAS officers over a given period.

Figure 7.3.1 shows data supplied by SAAS for the period August 1995 to April 1997 on naloxone utilisation.

Naloxone usage remained steady between August 1995 and February 1996. From March 1996, there was a steady rise in naloxone usage peaking in October 1996. This peak was followed by a marked reduction beginning in November 1996.

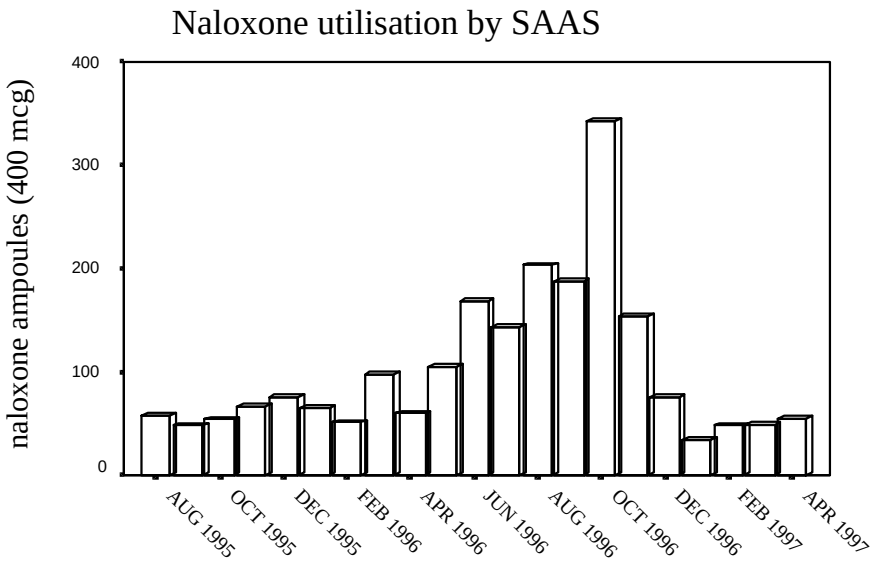

Figure 7.3.1 Naloxone utilisation by SAAS officers from August 1995 to April 1997

From these data it was estimated that the SAAS treated an average of 30 suspected opioid overdoses per month in 1995, 69 in 1996 and 23 per month (Jan–April) in 1997.

SECTION 8 REVIEW OF INSTITUTIONAL SOURCES: TOXICOLOGICAL AND CORONIAL DATA FROM SOUTH AUSTRALIA

This section describes the process and results from a review of toxicological and coronial records relating to overdose among heroin users in South Australia during the study period. During the course of conducting this review it became clear that this component of the heroin overdose project was a study in itself.

8.1 Method

Permission was gained from the State Coroner, South Australia to access relevant toxicological and coronial files for the study period. A screening process based on objective data (i.e. toxicological data), rather than verbal or written reports of heroin use, ensured the optimal detection of heroin-related deaths via the State Coroner. Femoral blood samples are taken routinely at autopsy and analysed for morphine and alcohol concentrations. Levels or presence of other substances e.g., benzodiazepines, or cannabis in the blood or urine, may be investigated at the request of the pathologist.

Individual fatalities were examined in a three-stage procedure:

- Examination of computer listing of those cases where morphine[3] was detected in the blood
- Examination of the relevant toxicological files to screen for heroin or suspected heroin use prior to death
- Examination of the relevant coronial files to determine the likelihood of heroin use prior to death

As morphine is one of the major, active metabolites of heroin, an initial step was to conduct a computer search to identify all cases during the study period where morphine was detected. However, morphine is found in a range of pharmaceutical products and can be found in the body either following administration of morphine itself or as a metabolite of heroin. Additional evidence is therefore needed to confirm the involvement of heroin in those deaths where morphine is detected. Heroin use prior to death may be confirmed in those cases where 6-MAM (another active metabolite of heroin) is detected on post-mortem toxicological analysis, as this metabolite is unique to heroin metabolism (Cone, Welch, Mitchell, & Paul, 1991).

In some cases the toxicological files provided a brief description of the circumstances of death as well as noting injection sites and/or a known history of heroin use.

Because the study intervention was aimed at reducing accidental overdose among heroin users in South Australia, deaths due to road traffic accidents and suicide

---

3 Heroin (diacetylemorphine) is rapidly hydrolyzed to 6-monoacetylemorphine, which, in turn, is hydrolyzed to morphine (Jaffe & Martin, 1991).

among heroin users were excluded. Using these criteria, seven fatalities among heroin users were excluded from the analysis. In five cases during the study period the Coroner made a finding of suicide. Additional means (e.g. drowning) were employed in most of these cases. In a further two cases, death was found to have occurred as a result of injuries received in road traffic accidents. In all seven cases, heroin had been used prior to death. These seven cases were not included in the data set for analysis.

For the remaining cases, criteria used to determine the likely involvement of heroin use from the toxicological file data included:

- detection of morphine in the blood
- identification of 6-monoacetylemorphine in the urine
- identification of injection sites
- presence of heroin-specific injecting equipment (e.g. spoons, foils or 'white powder' at the scene)
- recorded history of heroin use (including witness reports)

Having examined the toxicological files and identified those cases in which heroin use was identified or suspected, the relevant coronial files were examined to confirm or eliminate the involvement of heroin in each case which met the above criteria. These coronial files contained copies of toxicological reports, the autopsy report, detailed statements by the attending police and ambulance officers, statements by the family and associates of the deceased and any witnesses to the death or the events surrounding the death (e.g. last person to see the deceased alive).

While 6-MAM, is a marker for heroin use, this test was not requested by the pathologist in four cases, possibly because of the absence of urine in the bladder. Also, 6-MAM may not be detected where death followed rapidly after heroin administration and when death occurs after a substantial length of time has elapsed since heroin use (Cone, Welch, Mitchell, & Paul, 1991).

Where 6-MAM was not detected, or the test for this metabolite not requested, a case was included in the data set if at least two of the following criteria were met:

- identification of injection site/s
- presence of heroin-specific injecting equipment at the scene (e.g. spoons, foils)
- family or witness statements confirming recent heroin use

8.1.1 Cause of death

The recorded cause of death in coronial files was not universally helpful in identifying fatalities involving heroin. In cases involving opioid use, causes of death most commonly noted in coronial files were ‘IV narcotism’ or ‘mixed drug toxicity’ or ‘morphine toxicity’. The involvement of heroin in the death was noted infrequently, although there was a trend towards inclusion of this information in more recent years.

Additionally, in cases involving the use of opioids, there were wide variations in the stated cause of death, although there was a tendency in more recent years to give a more detailed and specific cause of death. Some stated causes of death were extremely brief, e.g. ‘IV narcotism’, while some were highly detailed. For example, one case was recorded on the death certificate as, ‘ (1) Suppurative bronchitis complicating (2) hypoxic brain damage and right parietal infection due to (3) intravenous morphine abuse’.

8.2 Results

8.2.1 Accidental substance-related fatalities among heroin users in South Australia

A total of 85 accidental substance-related deaths among heroin users were identified in South Australia for the period 1.1.94 – 30.6.97. Two coronial files from 1994 could not be located, but sufficient evidence of heroin use was derived from the available toxicological files to establish that heroin was involved in both deaths and to therefore include them in the data set.

Table 8.2.1 shows the number of deaths for each calendar year from 1994 to 1996, and for the first half of 1997.

Table 8.2.1 Accidental fatalities among heroin users in South Australia

Time period	Deaths
1994	29
1995	27
1996	15
1997	14
Total	**85**

There were less than thirty accidental substance-related deaths among heroin users in South Australia during both 1994 and 1995, while in 1996 the number of deaths reduced by almost half. Extrapolation of death rates from the first half of 1997 suggests that the number of deaths for that year was similar to that recorded in 1994 and 1995.

8.2.2 Characteristics of the cases

As shown by Table 8.2.2, the mean age at death was 29.4 (SD = 6.8) years (median: 30, range: 16–46 years). Twenty-nine percent of the sample was aged 25 years and under, while 71% were aged 26 years and over. Less than 5% (*n* = 4), were in methadone treatment, three in the public program and one in a private program.

Fourteen percent had been released from prison within four weeks prior to death. There was a ratio of 2.5:1 male to female cases. In three-quarters of the cases the deceased was single and only 13% had been employed at the time of death.

Table 8.2.2 Characteristics of the cases

Characteristics	**(*n* = 85)**
Age (mean years)	29.4
In methadone treatment at time of death %	4.7
Recent release from prison %	14.5
Gender	
Male %	71.8
Female %	28.2
Employment	
Unemployed %	87.1
Employed %	12.9
Marital status	
Single/separated/divorced %	75.3
Married/de facto %	24.7

8.2.3 Accidental substance-related deaths among heroin users in South Australia by appearance

Autopsy reports contained descriptions of the deceased person such as, 'adult Caucasian/white female' or 'male of Asian appearance' or 'Aboriginal male' (see Table 8.2.3).

Table 8.2.3 Accidental substance-related deaths among heroin users in South Australia by appearance

Year	**Aboriginal**	**Asian**	**Caucasian**	**Deaths**
1994*	2 (7.4%)	1 (3.7%)	24 (88.9%)	27
1995	0	2 (7.4%)	25 (92.6%)	27
1996	1 (6.7%)	0	14 (93.3%)	15
1997+	2 (14.3%)	0	12 (85.7%)	14
Total	**5 (6.0%)**	**3 (3.6%)**	**75 (90.4%)**	**83***

*Two missing cases for appearance in 1994
+1.1.97–30.6.97 only

In the majority of cases the deceased person was identified as of Caucasian or of 'white' appearance.

8.2.4 Presence of other people

In almost two-thirds (63%) of cases other people were present in the same room or in another room of the building (segregated) at the time of death (see Table 8.2.4).

Table 8.2.4 Presence of other people

Presence of other people	(*n* = 83*)	Percentage
Alone	28	33.7
Others present	32	38.6
Segregated	20	24.1
Unclear	3	3.6
Total	**83**	**100**

*2 missing cases

In a small proportion of cases, it was not possible to ascertain from the available information on file whether others were present at the time of death.

8.2.5 Initial action

While there was opportunity to intervene prior to death in 53% of fatalities, as can be seen in Table 8.2.5, an ambulance was called as an initial action in only nine cases (10.8%). In seven cases an ambulance was called as a subsequent action. Therefore, in 18.8% of cases an ambulance was called as either a first, or subsequent action, by witnesses to a collapse following heroin use.

Table 8.2.5 Initial action

Initial action	Number of cases	Percentage
None (person dead)	38	45.8
No intervention while alive	17	20.5
Resuscitation by friends/bystanders/police	12	14.5
Ambulance called	9	10.8
Showered/splashed with water	3	3.6
Injected with salt	1	1.2
Person shaken/slapped	1	1.2
Placed on back	1	1.2
Called lawyer	1	1.2
Total	**83***	**100**

*2 missing cases

In one-fifth of cases, there was no intervention while the person was still alive. In 10.8% of cases there was evidence of a previous heroin-related overdose, and in 7.2% of cases there was evidence of a previous overdose involving a substance or substances other than heroin.

8.2.6 History of psychoactive substance use

In 90.6% of cases the person was identified in police, witness or family statements as a known, long-term heroin user. In only 7% of cases was the individual described as an 'occasional or naive user'. In two cases there was no recorded history of heroin use, although there was evidence of heroin use prior to death.

In six cases, (7%) there was a recorded history of amphetamine use, and 19% were known benzodiazepines users. Almost one-quarter (23.5%) had a history of heavy alcohol use, while 14% were known cannabis users.

8.2.7 Detection of 6-monoacetylemorphine in the urine

In 68% of cases, the heroin metabolite, 6-MAM, was detected in the urine indicating that morphine had been taken in the form of diacetylmorphine or heroin.

Table 8.2.6 Identification of 6-monoacetylemorphine in the urine

6-monoacetylemorphine	Number of cases	Percentage
Negative	23	27.1
Positive	58	68.2
Not requested	4	4.7
Total	85	100

In twenty-three cases, 6-MAM was not detected (see Table 8.2.6) but there were other indications that heroin was involved in the death. In four cases the pathologist did not request the test, possibly because of the absence of urine in the bladder at autopsy.

A single substance (morphine) was detected in less than one-quarter of cases (23.5%). Two or more substances were detected for the remainder of the cases. In 15.3% of cases, both alcohol and benzodiazepines had been used prior to death. Data shown in Table 8.2.7 includes cases where either the specific substance (or metabolite) was detected in blood or urine.

Table 8.2.7 Substances detected at autopsy

Substances (overlapping cases)	(*n* = 85)	Percentage

Benzodiazepines	39	45.9
Codeine	34	40.0
Alcohol	33	38.8
Cannabis	20	23.5
Antidepressants	9	10.6
Methadone	4	4.7
Amphetamines	4	4.7
Propoxephene	1	1.2
Chlorpromazine	1	1.2

The most commonly detected substances in addition to morphine were the benzodiazepines, which were detected in over two-fifths of the cases. The next most commonly detected substance was codeine, followed by alcohol.

Of the nine cases where antidepressants were detected, seven were tricyclic antidepressants, one selective serotonin reuptake inhibitor (fluoxetine) and one monoamine oxidase inhibitor (moclobemide). There were no gender differences in terms of the types of substances detected on toxicological analysis.

8.2.8 Free morphine concentrations

The mean free blood morphine concentration was 0.27 (SD = 0.28) mg/L, median 0.19 (range: 0.02–1.9). While issues of tolerance make it difficult to determine the lethal level of morphine in individual cases, morphine levels in excess of 0.1 mg/L are generally considered to be fatal or potentially fatal by the laboratory conducting the analysis for the present study (Forensic Science, Adelaide).

As shown in Figure 8.2.1, in 22 cases (25.9%) the concentration of morphine found in the blood was below the level generally considered to be fatal or potentially fatal. Of these 22 cases, 17 had used other central nervous system depressants in addition to heroin prior to death.

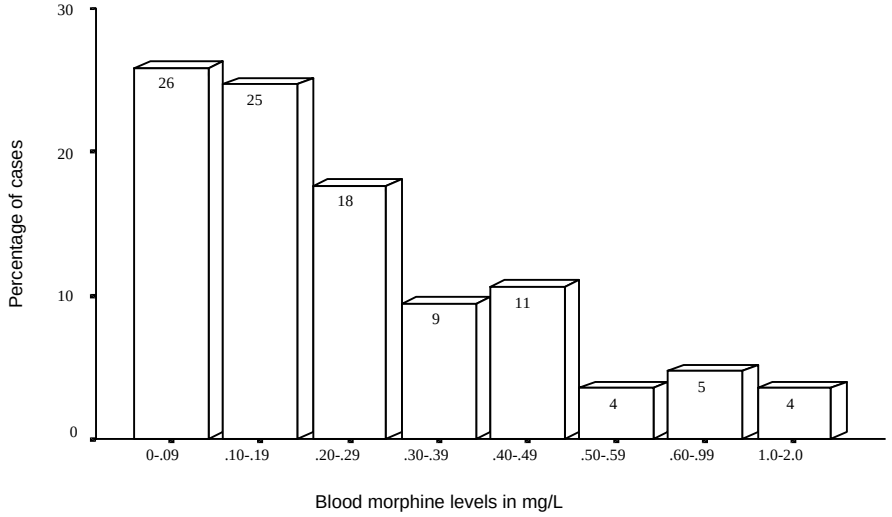

Figure 8.2.1 Distribution of free blood morphine concentrations in 85 heroin-related deaths, South Australia, 1.1.94 – 30.6.97

Although morphine may be present in the blood as a metabolite of codeine it should be noted that for all cases included in the present data set there was additional evidence that heroin had been administered prior to death. There were no gender differences in the levels of free blood morphine, detected on toxicological analysis.

For those thirty-three cases where alcohol was also detected at autopsy, the mean blood morphine concentration was 0.32 (SD = 0.28) mg/L, median 0.23 (range: 0.03–1.2 mg/L). For the fifty-two cases in which no alcohol was detected, the mean blood morphine concentration was 0.24 (SD = 0.29) mg/L, median 0.18 (range: .02–1.9 mg/L).

8.2.9 Femoral blood alcohol concentrations

Alcohol was detected in 33 cases (39% of the total sample). The mean blood alcohol concentration was 0.11 (SD = 0.09)g/100 mL, median 0.08 (range: 0.01–0.32 g/100 mL).

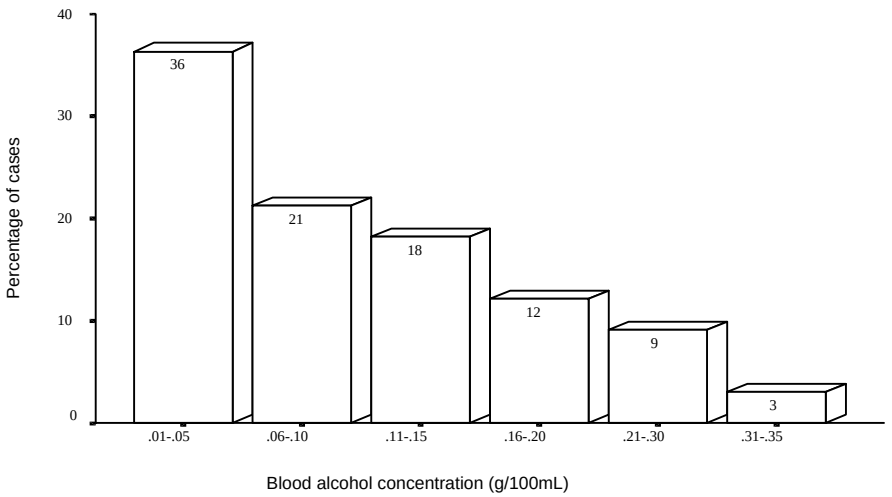

Figure 8.2.2 Distribution of blood alcohol concentrations in 33 heroin-related deaths in South Australia, 1.1.94 – 30.6.97

As Figure 8.2.2 shows, in 36% of cases where alcohol was detected the femoral blood alcohol concentration was 0.05 g/100mL or below. There were no gender differences in the levels of blood alcohol detected on toxicological analysis.

8.2.10 Free blood codeine concentrations

Codeine was detected in 34 cases (40% of the total sample). The mean free blood codeine concentration was 0.15 (0.25) mg/L, median 0.05 (range: 0.01–1.3).

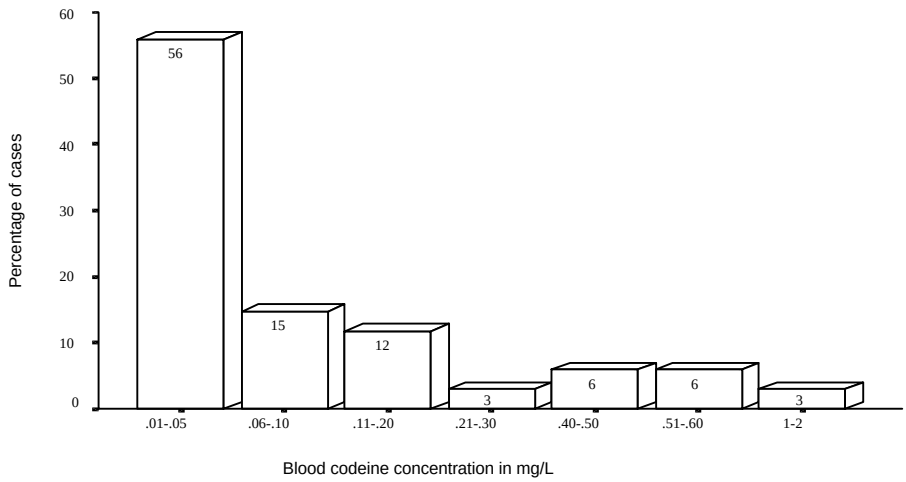

Figure 8.2.3 Distribution of free blood codeine concentrations in 34 heroin-related deaths, South Australia, 1.1.94 – 30.6.97

As can be seen in Figure 8.2.3, over half (*n* = 19, or 56% of codeine positive cases), reported codeine levels were in the lower range (0.01–0.05 mg/L). Low

concentrations of codeine are probably present as a contaminant of heroin. That is, as a result of incomplete refining of opium to diacetylmorphine or heroin. However, in 15 cases (44% of codeine positive cases), codeine levels in excess of 0.05 mg/L were detected.

This suggests that 18% of the total sample had taken some form of pharmaceutical codeine prior to death. In only one case was the level of codeine considered by the attending pathologist to be in the lethal range (morphine concentration was also lethal in this case). In two cases, levels of codeine were reported by the pathologist as being in lethal combination with another substance or substances (including morphine). There were no gender differences in the levels of free blood codeine detected on toxicological analysis.

8.2.11 Benzodiazepines types detected at autopsy

Benzodiazepines were detected in 37 cases (43.5% of the total sample). In 33 cases (38.8%), benzodiazepines were detected in the blood and identified (see Table 8.2.8). In five cases, benzodiazepines or benzodiazepine metabolites were detected in the urine and not identified by benzodiazepine type. Diazepam was detected in over half, and temazepam detected in only one of those cases where the benzodiazepine type was identified.

Table 8.2.8 Benzodiazepines types identified

Benzodiazepines types	**(*n* = 32)**	**Percentage***
diazepam (e.g. Valium)	19	57.6
oxazepam (e.g. Serepax)	6	18.2
flunitrazepam (e.g. Rohypnol)	4	12.1
clonazepam (e.g. Rivotril)	3	9.1
temazepam (e.g. Normison)	1	3.0

* Percentage of those cases where a benzodiazepine type was identified in the blood

Given that oxazepam is an active metabolite of both diazepam and temazepam, it was not possible to determine if oxazepam was present as a result of the administration of this benzodiazepine as a pro-drug or as a metabolite. In two cases, the level of oxazepam was in excess of therapeutic levels, but not fatal. In two of the four cases involving flunitrazepam, the amount of this substance was considered to be at fatal or potentially fatal levels.

Blood concentrations of all other benzodiazepines were at non-toxic concentrations. There were no gender differences in the levels of benzodiazepine use prior to death, or in the type of benzodiazepine detected on toxicological analysis.

8.2.12 *Paraphernalia found at the scene of death*

There was evidence in three cases that the body had been relocated to another site after death. In a further three cases, there was evidence that the person had used heroin in a location other than where they were found. However, paraphernalia associated with heroin use (i.e. syringes, syringe wrappers, spoons, white powder, filters, candles, tourniquet or foils) were found at the scene in the majority of cases (80.5%).

8.2.13 *Injection sites*

Injection sites were identified and dissected at autopsy in 95.3% of cases. In one case, no obvious injection site was found. However, injecting equipment was present at the scene and 6-MAM was detected in the urine on post-mortem toxicological analysis. In another case, decomposition was too advanced to identify an injection site. One coronial file was missing, and in a further case an injection site independent of those resulting from medical intervention could not be identified. There was no evidence that heroin was administered other than intravenously in any of the cases included in this data set.

8.2.14 *Regional differences*

In order to identify any regional factors in accidental substance-related fatalities among South Australian heroin users, cases were divided by region where the deceased resided, and then compared to those regions where heroin was used and/or death occurred.

There was no apparent residential ‘clustering’ of heroin users in a single metropolitan area (see Table 8.2.9). The majority of deaths occurred in the Eastern and Western metropolitan region with less than 11% of total fatalities occurring in the Southern metropolitan region.

Table 8.2.9 *Region of residence/death*

Australian Bureau of Statistics South Australian sub-divisions	**Region of residence (*n* = 85) %**	**Region of death (*n* = 85) %**

Western metropolitan region	25.9	30.6
Northern metropolitan region	23.5	16.5
Southern metropolitan region	20.0	10.6
Eastern metropolitan region (includes the city area)	16.5	36.5
Non-metropolitan areas	9.4	5.9
No fixed abode	4.7	-

An examination of region of residence and region of death showed that all of the non-metropolitan deaths involved people who resided in non-metropolitan areas. Similarly, all but one of the fourteen deaths which occurred in the Northern region involved individuals who lived in the same region. Seven of the nine deaths which occurred in the Southern region involved persons resident in the Southern region.

Of those twenty-six deaths which occurred in the Western region, eighteen occurred among persons living in the Western region. Four were from the Northern region, two from the Southern region, one from outside the metropolitan area and one of no fixed abode. Of the thirty-one deaths which occurred in the Eastern (including the city) region, thirteen resided in the same region, eight resided in the Southern region, three resided in the Western region, three were of no fixed abode, two were from the Northern region and two from outside of the metropolitan area.

8.2.15 *Seasonal variations*

Seasonal data were examined to identify any seasonal trends in accidental deaths among heroin users for the period under study.

Table 8.2.10 Season of year

Season of year	**1994 (*n* = 29) %**	**1995 (*n* = 27) %**	**1996 (*n* = 15) %**	**1997* (*n* = 14) %**	**Total (*n* = 85) %**
Spring	37.9	7.4	13.3	-	**17.6**
Summer	20.7	44.4	26.7	21.4	**29.4**
Autumn	20.7	11.1	26.7	28.6	**20.0**
Winter	20.7	37.0	33.3	50.0	**32.9**

* 1.1.97–30.6.97 only

Table 8.2.10 shows the distribution of deaths across seasons. While the data show some seasonal variation, no significant differences were found for the total number of deaths across seasons of the year.

8.2.16 Day of week

The distribution of deaths across the days of the week was examined to identify any trends toward death occurring at a particular point in the week (see Table 8.2.11).

Table 8.2.11 Day of week

Day of week	**1994 (*n* = 29) %**	**1995 (*n* = 27) %**	**1996 (*n* = 15) %**	**1997* (*n* = 14) %**	**Total (*n* = 85) %**
Sunday	13.8	3.7	6.7	14.3	**9.4**
Monday	6.9	3.7	6.7	14.3	**7.1**
Tuesday	3.4	3.7	6.7	7.1	**4.7**
Wednesday	10.3	11.1	6.7	21.4	**11.8**
Thursday	27.6	22.2	40.0	7.1	**24.7**
Friday	17.2	22.2	13.3	21.4	**18.8**
Saturday	20.7	33.3	20.0	14.3	**23.5**

* 1.1.97–30.6.97 only

Significant differences in numbers of deaths were found across days of the week (χ^2 = 23.13, df 6, p < .001). Fewest deaths occurred on Tuesdays and the greatest numbers occurred on Thursday and Saturdays.

8.2.17 *Estimated time of death*

Approximate estimations of the time of death were made from statements contained in the coronial files, particularly those by witnesses to the event and statements from the last person to see the individual alive. However, in more than one-quarter of cases (28.2%) the time of death could not be estimated from available information. Table 8.2.12 shows the distribution of the estimated time of death for those cases where a time could be ascertained.

Table 8.2.12 *Estimated time of death*

Estimated time of death (hours)	**(*n* = 61)**	**Percentage**
0000 – 0600	24	39.3
0600 – 1200	3	4.9
1200 – 1800	7	11.5
1800 – 0000	27	44.3
Total	**61**	**100**

The majority of those deaths for which a time could be ascertained occurred between 1800 and 0600 hours. Few deaths occurred during the twelve-hour period 0600 to 1800.

8.2.18 *Estimated time interval between heroin use and death*

While it was difficult to determine the time interval between heroin use and death or collapse, approximations were made based on information contained in witness reports, evidence from scene photographs (these were available in a minority of cases), or from information contained in statements by attending police and/or ambulance officers (see Table 8.2.13).

Table 8.2.13 *Estimated time interval between heroin use and death*

Time interval between heroin use and death	**(*n* = 58)**	**Percentage**
less than one hour	36	62.1
1 – 3 hours	2	3.4
more than 3 hours	20	34.5
Total	**58**	**100**

However, in 31% of cases there was not enough evidence to estimate the time lapse. There were no cases in which the person was found with the needle still *in situ*.

In two-thirds of those cases where the time interval could be ascertained, collapse or death was thought to have occurred within approximately one hour of heroin use. Of the 'less than one hour' group, there were two cases in which the syringe was found in the person's hand. In a further two cases, death or collapse occurred within one to three hours of heroin use. In twenty cases there was a time lapse of greater than three hours between heroin use and death.

8.2.19 *Location of death*

As Table 8.2.14 shows, the majority of deaths occurred in a private home, either the person's own home or in another private home.

Table 8.2.14 *Location of death*

Location of death	**(*n* = 85)**	**Percentage**
Private home	60	70.6
Public toilet	6	7.1
Hotel/motel room	6	7.1
Car	5	5.9
Pub/club/restaurant	3	3.5
Street	3	3.5
Park	1	1.2
Prison	1	1.2
Total	**85**	**100**

One person died in prison, and another at home while on home detention. Few deaths occurred in the street or in a public area such as a park.

8.2.20 *Heroin purity*

Prior to 1990, heroin purity remained fairly constant within a range of 10% – 15% (DASC, 1995). As can be seen in Table 8.2.15, while average heroin purity in South Australia increased between 1994 and 1996, accidental substance-related fatalities among heroin users in this state remained relatively stable from 1992 until 1995 after which they decreased markedly. These data does not lend support for a link between the level of heroin purity and the number of accidental substance-related fatalities among heroin users in South Australia.

Table 8.2.15 *Heroin purity and accidental fatalities among heroin users in South Australia*

	heroin purity

Time period	number of samples	mean %	median %	range %	deaths
1992*	na	na	na	11–30	**30**
1993*	na	na	na	13–33	**30**
1994	11	27	23	15–58	**29**
1995	83	34	28	10–79	**27**
1996	83	38	31	9–91	**15**
1997**	59	30	22	6–79	**14**

*Data from 1992–1993 were taken from the report, *Trends relating to heroin in South Australia (DASC, 1995).*
**1.1.97–30.6.97 only

It should be noted that the substantial increase in the number of heroin samples seized for analysis after 1994 does not necessarily reflect an increase in the availability of heroin. This increase in seizures is likely to reflect an increasing emphasis on supply reduction by the South Australian Police.

8.3 Summary of results: toxicological and coronial data

Results of this study were largely consistent with the National Drug and Alcohol Research Centre (NDARC) study of heroin related fatalities in NSW during 1992 (Zador et al., 1996). As in the NDARC study, accidental fatalities among heroin users in South Australia typically involved a male in his late twenties with a history of heroin and other psychoactive substance use, suffering a collapse following the concomitant use of two or more central nervous system depressants, including heroin.

While data on all deaths involving opioids in Australia over time are available (Hall & Darke, 1997), there are only two studies which provide comparable information on heroin-related deaths in an Australian state in any one year. For example, in NSW, a state with approximately four times the population of South Australia, 152 heroin-related deaths were recorded in 1992 (Zador et al., 1996). A total of 30 heroin-related deaths were recorded in South Australia during the same year (see Table 8.2.15). In 1995, sixty-three heroin-related deaths were recorded in Western Australia (Swensen, 1996) a state with a similar population distribution to South Australia. In the same year, twenty-seven heroin-related deaths were recorded in South Australia. Therefore, although existing data are sparse, there would appear to be a lower rate of fatalities among heroin users in South Australia in comparison to other Australian states.

Adult Caucasian males predominated among the fatal cases. The mean age at death of 29 years was consistent with the findings of Zador and colleagues (Zador

et al., 1996). However, the predominance of males among the study was less marked in South Australia. In the present study there was a ratio of 2.5:1 male to female cases, while Zador and colleagues found a ratio of 4.5:1 males to females among heroin users in NSW. In the present study, only four subjects (less than 5%) were in methadone treatment at the time of death. This finding adds to the already extensive evidence of the protective effect of methadone treatment (Darke et al., 1996a; Davoli et al., 1993; Perucci et al., 1991; Ward et al., 1992; Zador et al., 1996). It is possible that many of these deaths could have been prevented if the individuals concerned had entered or remained in methadone maintenance treatment.

In a minority of cases, the deceased person had been released from prison within four weeks preceding their death. While lowered tolerance may have contributed to these post-release deaths, it should be noted that in three-quarters of post-release fatalities, psychoactive substances in addition to heroin were detected, thus making the relative contribution of lowered tolerance to these fatalities difficult to assess.

In the majority of cases, the deceased was single, divorced or separated, and unemployed. As prior research has shown (see Zador et al., 1996), the majority of deaths occurred in a private home, either the deceased person's own home, or another private home. Few accidental substance-related deaths among heroin users occurred in the street or in a public area such as a park. In almost two-thirds of cases there were others present in the same room or in another room in the same building (segregated) at the time of death or collapse. Therefore, the opportunity to intervene (e.g. call an ambulance) was available in over half of fatal episodes. However, despite the presence of others and the opportunity to intervene, an ambulance was called in only a minority of cases. In one-fifth of cases there was no intervention of any kind while the person was still alive.

Few of the deceased were described as 'occasional, or naive users'. In the majority of cases, the person was a known, long-term heroin user. In almost a quarter of the deaths involving heroin users, the deceased had a history of heavy alcohol use, and approximately one-fifth were known benzodiazepine users. Fourteen percent were known cannabis users, and in six cases there was a recorded history of amphetamine use.

Unlike other Australian cities (e.g. Sydney) (see Darke & Ross, 1998; Darke, Zador, & Sunjic, 1997) there was no residential ‘clustering’ of heroin users in particular metropolitan areas. While almost all of the deaths which occurred in the Northern and Southern regions involved individuals who lived in those same regions, comparisons of region of residence and region of use or death indicated that a proportion of heroin users from the Northern and Southern regions collapsed or died following heroin use in the Eastern/Central region.

As in the NDARC study (Zador et al., 1996), no seasonal variation in numbers of deaths among heroin users were identified. However, significant differences in terms of days of the week were noted. The fewest numbers of deaths occurred on Tuesdays, and the highest numbers occurred on Thursday and Saturday.

Police and ambulance reports contained in coronial files provided detailed and comprehensive accounts of the scene of death (including in some cases, scene photographs) which assisted in determining factors such as the likely time interval between heroin use and death. Despite this extensive documentation, the time interval could not be estimated in almost one-third of cases. Nevertheless, consistent with the findings of Zador and colleagues, few deaths occurred rapidly. That is, there were no cases in which death was reported by witnesses to have occurred immediately following heroin use, nor were any cases found where the needle used to administer heroin was still in the person’s arm. In the majority of cases where the time interval between heroin use and death could be determined, there was time to intervene, and therefore, potentially to avoid the overdose event progressing to a fatal outcome.

The majority of those deaths for which a time could be ascertained occurred during the evening and night hours, i.e. between 1800 and 0600 hours. Relatively few deaths occurred during daylight hours.

Again consistent with the NDARC study of fatalities among heroin users in NSW in 1992 (Zador et al., 1996), two or more psychoactive substance types were detected in the majority of South Australian cases. The most commonly detected central nervous system depressants in addition to heroin were the benzodiazepines. These substances (most commonly diazepam) were detected in over two-fifths of the total sample. Interestingly, despite a street reputation as the strongest (and most potentially dangerous benzodiazepine) flunitrazepam was detected in only four cases.

The next most commonly detected substance was codeine. In over half of codeine positive cases, concentrations were below 0.05 mg/L. These low concentrations of codeine are likely to be present as a consequence of contamination during the production of diacetylemorphine, that is, as result of the incomplete refining of opium. Opium, which contains both morphine and codeine is refined to produce diacetylmorphine or heroin. Although morphine is approximately ten times more potent than codeine, it is structurally similar. Because of these structural similarities, not all codeine is refined (this can also happen with proprietary medicines) and small concentrations of codeine may be found in the diacetylmorphine produced by the refining process. Therefore, detection of codeine (at low concentrations i.e. < 0.05 mg/L) is to be expected following heroin use. However, concentrations of codeine in excess of those that would be expected following heroin use were found in almost one-fifth of the total sample. This suggested that codeine in some other form was administered prior to death. Codeine is found in a range of propriety preparations, including analgesics and antitussives in cough mixtures. In only one case was the level of codeine considered by the attending pathologist to be in the lethal range (morphine concentration was also lethal in this case), while in two cases, levels were considered to be in lethal combination with another substance or substances (including morphine). Routine testing for paracetamol in cases where codeine and heroin are found would help in identifying the sources of codeine e.g. from proprietary preparations such as Panadeine® or Panadeine Forte®.

After benzodiazepines and codeine, alcohol was the next most common psychoactive substance found. Alcohol was detected in almost two-thirds of the total sample, although in over one-third of cases the alcohol concentration was 0.05 g/100 mL or below.

In one-quarter of cases, the concentration of morphine found in the blood was below the level considered to be fatal or potentially fatal by the laboratory conducting these analyses. Of these 22 cases, 17 had used other central nervous system depressants in addition to heroin prior to death. The difficulty of using estimated toxic morphine levels to determine the cause of death was highlighted by the results of a recent study by Darke and colleagues (see Darke, Sunjic, Zador, & Prolov, 1996c). For this study, a sample of heroin users was recruited in South Western Sydney and blood samples taken from those users who reported using heroin in the preceding 24 hours. Of this group (n = 100), one-third were

found to have morphine levels of more than twice that considered toxic by the analytic laboratories concerned.

There were no gender differences in terms of the types of substances detected on toxicological analysis. In contrast to previous studies (e.g. Zador et al., 1996), there were no gender differences in the types of substances used prior to death or in the levels of morphine, alcohol or codeine detected at autopsy. Consistent with other studies of Australian injectors (e.g. Darke et al., 1996a), administration of heroin was invariably intravenous, a known risk factor for non-fatal overdose among heroin users (Gossop et al., 1996).

The present review of accidental substance-related fatalities among heroin users in South Australia, together with existing data (DASC, 1995), shows that fatalities among heroin users remained steady from 1992 until 1995 after which they reduced by about half. However, projected figures for 1997 (based on available data from the period, 1.1.97–30.6.97) indicated that accidental fatalities among heroin users returned to previous levels in that year.

While the decrease in overdoses among heroin users in 1996 is gratifying, the data should be interpreted with some degree of caution. This year was a period of intensive activity involving a number of key groups (see **Section Three**). It should be noted that liaison and partnerships between DASC, user groups, police, ambulance, and accident and emergency services commenced approximately eighteen months prior to the launch of the intervention materials and education program in November, 1996. It is possible that the spirit of cooperation which arose out of the common desire to reduce the morbidity and mortality associated with overdose among heroin users facilitated not only the production of appropriate materials and protocols but improved the nature of the relationship between the key groups in meaningful and practical ways. If indeed this resulted in, or contributed to a reduction in deaths among heroin users in South Australia the return to previous mortality levels points toward the need for ongoing and substantial preventive interventions.

This study has highlighted the need for the development of standard criteria for establishing the involvement of heroin in any death. While the detection of 6-MAM is a valid marker for heroin use, it may not be present, or tested for, in all cases. Other indicators such as a recorded history of heroin use may suggest heroin use, but do not offer conclusive evidence that on this particular occasion heroin was

administered. The presence of injecting equipment is similarly suggestive but not conclusive. The identification and dissection of injection sites are also suggestive, but an alternative opioid may have been injected, or alternatively, the heroin may have been administered by another route (e.g. smoking).

In the absence of 6-MAM, witness statements confirming the administration of heroin prior to death offer the strongest evidence of heroin use. However, people are understandably reluctant to provide this information to the police, particularly in the form of a statement. In the absence of 6-MAM, those cases which met the other criteria were included in the data set as, given the evidence, there was a high index of probability that heroin was administered prior to death. It should be noted, however, that the determination that heroin was involved does not indicate that the authors consider that heroin 'caused' the death, but that heroin may have had a role in that death. This study has gone some way towards determining the criteria for the involvement of heroin in a sudden and unexpected death, but further investigation is needed. That is, in very few cases examined can it be determined that heroin was the sole cause of death.

The technique of determining the quantity and type of substance use though the analysis of hair samples offers a complementary or alternative means of testing for opioid (and other substance) use or exposure. This technique provides an historical record (depending on the length of the hair sample) concerning both the severity and pattern of psychoactive substance use (DuPont & Baumgartner, 1995). A further advantage of hair analysis is that hair samples are likely to be available at autopsy. However, the technique is expensive and is not yet conducted routinely in Australia.

Given the available data, there was no evidence of a relationship between the level of heroin purity and the number of accidental substance-related fatalities among heroin users in South Australia. However, the role of heroin purity in fatal and non-fatal heroin overdose cannot be determined until there is systematic collection and analysis of heroin across states, and the resultant data is in a form which will allow comparisons with the relevant morbidity and mortality data. While it is possible that periodic changes in heroin purity may result in 'clusters' of fatal and non-fatal overdoses, without comprehensive data regarding heroin purity levels and numbers of heroin-related deaths, it remains difficult to test this assumption. At this stage, there is no clear evidence that increasing heroin purity is primarily responsible for increases in morbidity and mortality among heroin users over time.

SECTION 9 DISCUSSION AND RECOMMENDATIONS

As noted in **Section One**, the impetus for a South Australian intervention arose from concern at the extent of fatal and non-fatal overdoses which had occurred nationally. Little data were available on the circumstances and experience of overdose among South Australian heroin users, although recent research had provided important information on the risk factors associated with overdose in other states (see Darke et al., 1996a; Zador et al., 1996).

9.1 South Australian heroin overdose interventions

The South Australian project was unique in its combination of strategies, in the partnerships that were developed and the degree of intersectoral collaboration achieved. Through the framework developed during this study, DASC has built on established partnerships with the police, ambulance services, accident and emergency services and user groups to bring about effective structural change, with the goal of reducing the risk of fatal or non-fatal overdose following heroin use.

Collaboration between key stakeholders resulted in negotiations to identify the circumstances in which police presence is essential at overdose events. These negotiations resulted in the production of an amended police protocol for police attendance at overdoses. The General Duties Manual Amendment (General Order 7700, General Accidents and Illness Guidelines for Police Attending Drug Overdoses) was gazetted on the 15th January 1997. This amendment clarifies the function and responsibilities of police in terms of their attendance at overdose events.

Negotiations with SAAS have similarly resulted in revised guidelines on attendance at overdoses. These revised instructions to ambulance officers indicate that police will only be notified of those cases involving illicit substances where, ‘death or imminent death of a person from an overdose is likely’ and/or ‘our crews request police support. This would include any scene that we would normally request police for crew safety’. The establishment of these guidelines was an important step in removing the barriers to help-seeking at overdose events and demonstrated that it was possible for diverse agencies to agree that the health and safety of individuals was the first priority at overdose events.

The partnerships formed during this study were also central to the development of the information materials (3 posters, 3 magnets, 9 postcards and 1 booklet). These materials aimed to provide unbiased, factual and important information to those users who were identified by the research as being most at risk of overdose i.e. long-term users of heroin, and those using at home, particularly in an isolated situation (e.g. behind a closed door).

A further component of the intervention was a peer education strategy overseen and implemented by the user group SAVIVE. Issues initially identified as being relevant for inclusion in this intervention were: the prevention of overdose, identification of overdose and management of overdose in others.

9.2 Institutional sources of data

The process of collecting data on numbers of heroin-related overdose presentations and/or admissions to major metropolitan hospitals revealed several difficulties. Reportedly, most hospital overdose presentations are treated in A&E Departments, with few opioid overdose cases being admitted for treatment. These A&E presentations are not recorded under ICD-9 classifications. Further, in most Adelaide metropolitan hospitals, A&E records are not computerised. Manual searches of all A&E attendance sheets are therefore required to identify heroin overdose presentations. Even then, the presentation may be recorded as 'overdose' only, without reference to the particular substance or substances involved.

Admissions to hospitals, on the other hand, are classified under ICD-9 codes. However, as previously outlined, this coding does not allow for the separate identification of cases involving heroin as distinct from other opioids. Therefore, it was not possible to separately identify the involvement of a particular opioid such as heroin in any individual case. Importantly, while hospital records do include ICD-9 classifications, it was found that admissions due to opioid use may be coded under a variety of ICD-9 classifications (principally psychiatric), none of which may include a classification relating to substance use.

Because of the difficulties outlined above it was considered that available computerised and classified hospital records would substantially underestimate the number of heroin overdoses treated by hospital services. Accurate identification of heroin overdose cases would therefore require manual searching of A&E records and hospital casenotes. Because of the time and costs involved, it

was not possible to do this detailed investigation within the constraints of the present study. This is an area that warrants further research, and such research would be greatly facilitated by the computerisation of A&E records.

SAAS records also presented several difficulties. In South Australia, most opioid overdoses attended by SAAS officers are successfully treated at the scene. While patients experiencing opioid overdose are routinely offered transport to hospital, in many cases this is refused once successful reversal of opioid effects has been achieved by the use of naloxone. Where this occurs, the attendance may be coded under 'Patient refused service' rather than as an overdose case. Such cases are then indistinguishable from thousands of other non-overdose cases where the patient declined transportation to hospital.

Accurate identification of numbers of opioid overdoses attended by ambulance personnel can therefore only be achieved by manual searching of individual attendance sheets. As in the case of the planned hospital records review, it was not possible to do this detailed search within the constraints of this study. While numbers of opioid overdose cases which are transported to hospital can be retrieved from a computer database, they represent a substantial underestimate of the total number of overdose cases treated by SAAS.

Naloxone (Narcan) usage was deemed to be the most reliable method of estimating the number of cases involving opioids which were treated by SAAS officers during the study period. Naloxone is an opioid antagonist with an established use in heroin overdose. Because of it's safety and ability to rapidly reverse the effects of opioids, naloxone is widely used for suspected opioid toxicity and coma of undetermined aetiology. An average of two, 400 microgram ampoules of naloxone are given per opioid overdose (personal communication: Dr. Hugh Grantham, Medical Director, South Australian Ambulance Service).

Naloxone usage remained steady between August 1995 and February 1996. From March 1996, there was a steady rise in naloxone usage peaking in October, 1996. This peak was followed by a marked reduction beginning in November 1996 (the month of the heroin overdose intervention launch). From these data it was estimated that the SAAS treated an average of 30 suspected opioid overdoses per month in 1995, 69 per month in 1996 and 23 per month (Jan–April) in 1997.

While it is difficult to draw a direct comparison between the estimated number of opioid overdoses attended by SAAS officers and the number of fatalities among South Australian heroin users, it is interesting to note the substantially increased use of naloxone during 1996, a year when fatalities among South Australian heroin users decreased by half in comparison with previous years. It is possible that the increased utilisation of naloxone during 1996 represented an increase in the proportion of overdose events for which witnesses called ambulance services, resulting in fewer fatal outcomes.

The provision of naloxone to high-risk groups (e.g. recently released prisoners) may be a useful strategy in reducing the number of fatalities among heroin users.

The review of State Coroner's data (both toxicological data, and coronial files) identified similar problems to the hospital and ambulance records. The present method of encoding and recording information on substance-related deaths meant that the identification of specific substance-related deaths required manual searching of individual toxicological and coronial files. While identification of the relevant deaths was a lengthy process, the current system allowed for the extraction of cases in which morphine was detected, thus minimising the number of case files to be searched.

While it is usual practice for the pathologist conducting a post-mortem investigation to order a range of investigations when a substance-related death is suspected, such practice may vary between clinicians and/or laboratories. The development of standardised guidelines would therefore ensure consistency in approaches to suspected substance-related deaths. Such uniform guidelines would also ensure a basic set of investigations being ordered whenever a substance-related death is suspected. Where they were not ordered (e.g. no EMIT tests done because there was no urine in the bladder) the reason for doing so should be documented.

Coronial file reports (including police, ambulance, witness reports) complement and extend the toxicological data collected at autopsy. Currently, much of this information is collected in a non-systematic manner thereby increasing the likelihood of important information being missed. Police, ambulance and witness statements are by their nature discursive, and may not cover key factors relevant to determining the risk factors associated with fatalities among heroin users. Witnesses, friends and relatives of the deceased may be reluctant to give

information on illegal activities (e.g. illicit drug use) to police and important information such as recent release from prison or psychoactive substance use treatment history may or may not be included. The systematic collection of information would increase accuracy and decrease the time and therefore the costs associated with the current need to search individual casenotes manually.

There is also a need to develop a new instrument for the collection of these data. It is important that someone trained in the collection of health-related statistics be involved in the development and implementation of such an instrument. There is also a need to identify the organisation/s responsible for such data collection. A basic data set should include: age, gender, marital status, location of death, estimation of the time of death, drug use history, prison record, treatment history, ethnicity, presence of others at the time of suspected use and presence of others at the time of death.

In order to collect these data there is a need to develop and extend the current links with other organisations such as ambulance services. Links with Correctional Services would facilitate the monitoring of post-release deaths. Similarly, links to AOD treatment services could provide information on drug use and treatment history.
Accurate and current data regarding trends in fatalities among psychoactive substance users could also be used to help guide policy, assist with evaluating interventions and programs, and facilitate the targeting of education and treatment services.

While data are available on all opioid-related deaths in Australia (Hall & Darke, 1997; Lynskey & Hall, 1998), there are only two published studies which provide comparative information on heroin-related deaths in Australian states in any one year (Swensen, 1988; Zador et al., 1996). This paucity of comparative data is probably related to the difficulty and costs involved in retrieving the relevant information, as well as the absence of a systematic method of data recording, collation and retrieval across jurisdictions.

While in recent years there has been a move away from the recording of ‘causes of death’ in coronial files such as ‘IV Narcotism’ to more detailed and informative findings, the development of standardised ‘causes of death’ would greatly assist retrieval of information and data collection. However, the difficulty of ascribing causality on the basis of toxicological data is acknowledged, as it is that the

coronial investigation process does not always result in the identification of a clear and incontrovertible diagnosis of the cause, timing and circumstances of death. Additionally, it cannot be assumed that the presence of all drugs or even a substantial number of them are investigated in cases of suspected drug toxicity. If a particular substance was not detected, then it may not have been tested for.

In the South Australian context, DASC has developed productive working relationships with key stakeholders in the area of AOD services, including Forensic Science and the Coroner's Office. Periodically, DASC officers review data at both Forensic Science and the Office of the Coroner in order to monitor substance-related deaths in South Australia, with particular emphasis on heroin and methadone-related fatalities. Officers of both Forensic Science and the Coroner's Court have been supportive of these data collection activities. Importantly, the Office of the Coroner has now undergone an extensive update of their data management systems. For post-1996 deaths, it is now possible to retrieve basic demographic data and causes of death from a computer database. Additionally, the Coronial Investigation Section of the South Australian Police has begun a process of providing a brief report from the scene of a suspected substance-related death. While this is helpful in terms of location and presence of others at a death scene, the content of this preliminary report is based on the requirement to establish whether illegal activity has occurred, and may or may not be helpful in determining the involvement of a particular substance in any death.

Clearly, the changes suggested above would involve both systems change and financial investment. A priority may therefore be to extend and develop existing links with other stakeholders to determine the mechanisms for bringing about the changes which would facilitate the efficient collection and retrieval of information on morbidity and mortality associated with psychoactive substance, particularly heroin use.

9.3 Evaluation of the heroin overdose interventions

The pre- and post intervention survey data showed that, in common with heroin users in other Australian states (Bammer & Sengoz, 1994; Darke et al., 1996a; Hando, O'Brien, Darke, & Hall, 1997; Loxley et al., 1995), overdose was a familiar experience among South Australian heroin users. Almost half (48%), of the pre-intervention sample, and 44% of the post-intervention sample, reported having overdosed on heroin during their lifetime, with no gender difference in numbers of reported overdoses. The percentage of South Australian heroin users who

reported having ever overdosed was comparable to that found in a South Australian sample of illicit drug users interviewed as part of the Australian National AIDS and Injecting Drug Use (ASHIDU) study. In this study, Loxley and colleagues reported that 47% of heroin users interviewed in Adelaide in 1994 had overdosed at some time during their heroin-using career (Loxley et al., 1995).

In common with other samples of Australian heroin users (Darke et al., 1996a), in both the pre- and post intervention samples, intravenous injection was the primary method of heroin administration.

Consistent with previous work in the area (see Darke et al., 1996a), both samples showed that the prevalence of overdose was found to increase with the length of heroin-using career, suggesting that overdose risk may be in part a function of cumulative exposure to heroin use.

Findings of the present study, together with previous work in this area further challenges the popular assumptions surrounding fatal and non-fatal overdose among heroin users (see Darke et al., 1996a; Zador et al., 1996). There was little evidence to support the popular perception that overdose commonly occurred when heroin users were alone and in a public place such as the street. Moreover, findings from the interview data with heroin users support the data on fatalities from coronial files. That is, the majority of both fatal and non-fatal overdose episodes among South Australia heroin users seem to occur in private homes and in the presence of others. Also consistent with previous studies was the finding that subjects who were currently in methadone maintenance treatment represented a minority of both fatal and non-fatal overdose cases (Darke et al., 1996a; Zador et al., 1996). This finding adds to the growing body of evidence for the effectiveness of methadone maintenance treatment in reducing the incidence of a number of health risk behaviours (Darke et al., 1996a; Davoli et al., 1993; Perucci et al., 1991; Ward et al., 1992; Zador et al., 1996).

There were no significant differences between the pre-intervention and post-intervention samples with respect to dependence on heroin as measured by the SDS. Scores greater than 6 (see Gossop et al., 1996), generally considered indicative of severe dependence, were found for around half of both samples. Consistent with previous work (see Darke et al., 1996a), SDS scores indicated higher levels of dependence on heroin for women in both samples.

There were some differences in the patterns of substance use between the two samples. For example, while multiple substance use was common in both samples, the post-intervention sample had both used (by any route) and injected a greater number of different substance types during their lifetime.

There were also differences in the use of substances during the six months prior to interview, with respondents in the post-intervention sample reporting the use (by any route) of more substance types in the previous six months. However, for both samples there were similar numbers of substance types *injected* during the previous six months and respondents from both samples had used heroin on a similar number of days during the previous six months. These differences are likely to reflect variations in usage patterns within the population of heroin users sampled. The reported polysubstance use patterns reflect the findings of the review of fatalities among heroin users in South Australia, in that multiple substance use was common among South Australian heroin users.

Recognition of the major signs of acute overdose was high. For both the pre- and post-intervention samples, the three most commonly nominated signs were cyanosis, depressed level of consciousness, and depressed respirations. Importantly, overdose signs such as unconsciousness, unresponsiveness, collapse and slow pulse were indicated significantly more often by respondents from the post-intervention sample. Less well recognised was the gradual descent into central nervous system depression characterised by snoring or gurgling breathing in someone who has fallen asleep following heroin use. It may be that when the level of consciousness decreases slowly over several hours in a ‘slow drift to death’, such ‘overdose’ events are less likely to be identified as such by others present, and are therefore more likely to proceed to a fatal outcome. Witnesses to an overdose may be unaware of the significance of this sign, especially if the individual had exhibited similar signs on previous occasions without subsequent ill effects. However, recognition of this less obvious sign was significantly higher in the post-intervention sample, possibly reflecting a heightened awareness of this important marker of impending unconsciousness following the intervention.

Witnesses to overdose events may be unaware of the different psychoactive substances taken by the overdose victim on any particular occasion, or of their synergistic and/or additive effects. It is important that users of heroin and their associates are familiar with the dangers of combining other central nervous

system depressants, especially alcohol, with heroin as well as the need for immediate medical attention in cases of suspected narcosis.

Approximately one-quarter of the respondents from each sample had been administered naloxone following an overdose. This suggested that at least one-quarter of each sample had experienced an overdose event severe enough to warrant significant medical intervention at that time. There was clearly a high level of contact with health services such as hospitals and ambulance. It is encouraging to note that despite this high level of contact, there were no indications that the cost associated with calling an ambulance or fear of the negative attitudes of medical staff were barriers to help-seeking in cases of overdose or suspected overdose among heroin users in these two samples.

The perception that heroin overdose was principally related to the quantity and strength of the heroin used was evident among both the pre- and post-intervention samples. While there was some awareness of the role of concomitant psychoactive substance use and the effects of lowered tolerance in overdose events, the strength and quantity of heroin was seen by respondents as the major cause of overdose for both themselves and for other heroin users. Impurities or contaminants in the dose of heroin were not regarded as important contributors to overdose among users. Data on impurities are not available at this stage, as Australian laboratories do not routinely test heroin samples for the presence of contaminants (Duflou, 1997).

A substantial minority of both fatal and non-fatal overdoses among heroin users had occurred following recent discharge from prison. It is possible that these overdose events were largely due to a loss of tolerance following a period of reduced, or no, use of heroin. As noted earlier, tolerance to heroin is reversible and may decline rapidly on completion of withdrawal. Should resumption of heroin use occur following a period of abstinence, individuals may be vulnerable to overdose, particularly if they fail to readjust their dose to account for their reduced tolerance (Jaffe & Martin, 1991). However, it should be noted that the majority of both fatal and non-fatal overdose episodes among post-release prisoners had occurred following the concomitant use of heroin and other central nervous system depressants, making it difficult to estimate the relative contributions of multiple psychoactive substance use and reduced tolerance to their deaths.

Pre-release education of prisoners regarding the effects of abstinence on tolerance, and the dangers of multiple psychoactive substance use, may prevent some of these overdoses occurring. Furthermore, given the efficacy of methadone treatment in reducing overdose among heroin users, the initiation of pre-release methadone programs may reduce the risk of overdose in this vulnerable group. A further option may be to investigate ways in which prisoners may be given information and education regarding methods of avoiding overdose and the management of overdose in others.

Consistent with other research (Darke et al., 1996a), in both pre- and post-intervention samples, over half of those who had ever overdosed had used other psychoactive substances in addition to heroin (principally other central nervous system depressants) on the most recent occasion. However, concomitant use of opioids other than heroin (e.g. methadone and/or morphine) at the time of their most recent overdose was relatively low in both samples. No subject reported the use of codeine, hallucinogens, ecstasy, barbiturates or inhalants in conjunction with their most recent overdose. However, coronial data showed that codeine had been administered in almost one-fifth of accidental fatalities among South Australian heroin users. It is possible, that heroin users are unaware of the codeine content of some proprietary medications which may account for the lack of self-reported administration of codeine among the samples surveyed.

Toxicological findings from accidental substance-related fatalities among heroin users showed that a single substance (morphine), was detected on toxicological analysis in less than one-third of cases. These findings, which are consistent with the review of fatalities among heroin users in NSW (Zador et al., 1996) strongly suggest that heroin overdose, rather than being a unitary phenomenon chiefly related to the amount or strength of the heroin used, commonly occurred in conjunction with other psychoactive substances and particularly other central nervous system depressants.

As in prior research in NSW (Darke et al., 1996b), a majority of participants in the present study had been present at someone else's overdose during their lifetime, while over one-quarter had been present at an overdose during the previous six months. Checking the level of consciousness or checking breathing and/or pulse was the most common initial response to overdose in others. Approximately half of the subjects in each sample called an ambulance as either an initial or subsequent response to the last overdose at which they were present, with no

significant increase noted among the post-intervention sample. However, despite a reluctance to call ambulances, witnesses to overdose showed a high level of awareness of the acute signs of heroin overdose as well as the appropriate first-aid techniques. This awareness of the role of vital signs in diagnosing the level of consciousness and the correct application of life-saving techniques should be augmented, and the continued education of heroin users in appropriate responses to opioid-induced coma encouraged.

There were no differences between the pre-intervention and post-intervention samples in the numbers reporting being delayed from help-seeking on the most recent occasion that they witnessed an overdose. Of those who had been delayed from help-seeking at their most recently witnessed overdose, a fear of police involvement was the predominant reason for both samples. No subject mentioned the negative attitudes of medical staff, the cost of an ambulance, or concern regarding the reaction of the affected person as an initial delaying factor in seeking help. These findings are contrasted with those of a West Australian study of injecting drug users aged between 14 and 21 years (Loxley & Davidson, 1998). Among the West Australian sample, few subjects nominated a fear of police as a delaying factor in help-seeking when present at an overdose. The barriers to help seeking among this sample included the cost involved and the fear of having to identify themselves when telephoning emergency services. There was a further concern that being taken to hospital would result in parents, police or welfare agencies being informed of the circumstances of the presentation. Clearly, it is important to assess the concerns of injecting drug users from different age groups when designing interventions or other health promotion activities.

While subjects from both pre-intervention and post-intervention samples considered the risk of overdose for others greater than their own, significantly more of the post-intervention sample perceived a greater risk of future overdose for other people. It is possible that following the intervention, respondents from the post-intervention sample were more conscious of the risk of overdose among heroin users in contrast to the pre-intervention sample, but had, as yet, not personalised that risk.

There was a striking contrast between personal perceptions of overdose risk and the perception of other heroin users' chances of overdose. While the majority felt that the chances of a regular heroin user in Adelaide overdosing in the future was high, less than one-fifth in each sample thought their own chances of overdose

were comparable. Similarly, despite almost half of the respondents in both samples reporting an overdose, the majority of respondents had rarely or never worried about the possibility of overdosing during the previous six months. This apparent lack of concern is in conflict with estimations (given by respondents), that approximately 50% of regular heroin users would overdose during their heroin-using career. It would seem that despite an apparent awareness of the strong possibility of overdose, the future risk of experiencing an overdose was not personalised by either sample.

While the majority of respondents in both samples had been unconcerned about the possibility of a personal overdose during the previous six months, respondents in the post-intervention sample had 'worried' even less about the possibility of a personal overdose than those in the pre-intervention sample. It is possible that following the intervention, the post-intervention sample felt more confident that they could reduce their chances of experiencing an overdose in the future.

When respondents were asked what measures they took to avoid overdosing when they used heroin, almost all respondents in both samples reported the use of at least one preventive measure. The finding that significantly more of the post-intervention sample reported that they avoided concomitant heroin and other psychoactive substance use, or using heroin in excess of their level of tolerance, was gratifying given that the avoidance of concomitant psychoactive substance use was one of the principal messages of the intervention. Other preventive measures such as not using heroin while alone, and asking their dealer about the strength of the heroin, were also nominated significantly more often by respondents from the post-intervention sample. Not using heroin while alone was another of the principal messages of the intervention.

However, despite nominating more prevention strategies, there were no differences in the actual frequency of the practice of specific preventive measures following the intervention. Only around one-fifth of respondents from either sample reported trial tasting a new batch of heroin 'every time' or 'often' during the previous six months. Despite the effectiveness of trial tasting as a preventive measure in overdose, heroin users are reluctant to use this strategy (principally because of the loss of the 'rush' effect). Around one-fifth of each sample reported using heroin while alone or behind locked doors 'every time' or 'often' during the previous six months. Of further concern was the finding that approximately ten percent of respondents in both pre-intervention and post-intervention samples had

reported concomitant alcohol and/or benzodiazepine and heroin use ‘every time’ or ‘often’ during the previous six months.

Overall, more than half of the pre-intervention and over two-thirds of the post-intervention sample reported at least some concomitant alcohol and heroin use in the previous six months. For both samples, the single main reason for doing so was for enjoyment, or to be sociable. More respondents from the pre-intervention sample reported combining alcohol with heroin to boost the effects of heroin to produce a better rush or ‘high’. Fewer respondents from the post-intervention sample reported that combining alcohol with heroin was unintentional. That is, they may have already commenced drinking when the opportunity to use heroin arose. Contrary to clinical reports, few subjects reported using alcohol to manage heroin withdrawal.

Therefore, while most of those who had combined alcohol with heroin did so as a pleasurable part of their social experience, many subjects did so with the clear intention of increasing the effects of heroin to produce a better ‘rush’ or ‘high’. Few subjects drank to make the heroin work faster or last longer, and alcohol was rarely seen as a substitute for heroin.

It may be that any substance which increases the effects of heroin substantially reduces the amount needed to produce the desired effect, and therefore the costs associated with heroin use. However, if as Levine has suggested, even a small amount of alcohol substantially increases the risk of heroin overdose, even such ‘social drinking’ places the individual who uses heroin concurrently with alcohol at greater risk of potentially fatal central nervous system depression (Levine et al., 1995).

Consistent with previous work by Darke and colleagues (Darke et al., 1996a), the desire to boost the effects of heroin was the major motivation for the combined use of heroin and benzodiazepines among both samples. However, fewer of the post-intervention sample reported this as the main reason for their concomitant use. More respondents from the post-intervention sample reported combining benzodiazepines with heroin to make the heroin last longer or to manage heroin withdrawal. No subject reported that concomitant use made heroin work faster. It would seem that in contrast to alcohol, the combination of benzodiazepines and heroin may play a more direct role in both increasing the effects of heroin, and in mediating withdrawal symptoms which may emerge as the effects of the narcotic

‘wear off’. The relief of anxiety, depression or insomnia was nominated by a substantial minority of those who had used benzodiazepines in conjunction with heroin in the previous six months. While these symptoms are appropriate indications for the use of benzodiazepines, concomitant use of these central nervous system depressants with heroin should be explicitly discouraged.

Less than one-fifth of the post-intervention sample had used other opioids with heroin during the previous six months, the major reason being to boost the effects of heroin (this question was not asked of the pre-intervention sample). However, almost as important was the unintentional use of other opioids with heroin. Other opioids were used by a minority of subjects to manage withdrawal.

Other risk behaviours for heroin overdose (i.e. using heroin alone or behind locked doors), during the previous six months were reported by substantial numbers of both samples. Using heroin under conditions which renders assistance, should it be required, delayed or impossible, greatly increases the risk of morbidity or mortality in heroin users.

Friends, partners, or the families of respondents were the most common sources of information on the safe use of psychoactive substances and the avoidance of overdose. User groups such as SAVIVE were also important sources. Few respondents gained information through their doctor, chemist or hospital.

There was substantial exposure to the intervention materials (i.e. posters, fridge magnets, postcards and the user booklet). Around one-third to one-half of those who had been exposed to these materials had been in contact with them on more than five occasions. Of those respondents who had been in contact with the intervention materials, over half had come into contact with them through the user group, SAVIVE. Other minor but important sources were through friends and/or relatives, other needle exchange units and ACSA.

Unprompted recall of the main intervention messages was high, with the majority of those exposed to the intervention accurately recalling at least one specific intervention message, particularly the message regarding the avoidance of concomitant heroin and other psychoactive substance use. Prompted recall of the three posters was also high among those respondents who had been exposed to the intervention, the most commonly recognised poster being the one bearing the message *‘It’s rarely just the ‘h’’*.

Encouragingly, a majority of those who had been exposed to the intervention indicated that following this exposure, they were more likely to trial taste a new batch of heroin, less likely to use heroin while alone, or behind a locked door and less likely to use other psychoactive substances with heroin.

The majority of those who had been exposed to the intervention reported an increased awareness of how to avoid the personal experience of overdose as well as the accurate recognition of signs of overdose in others. It should be noted, however, that recognition of overdose signs was already high among the total sample. Several respondents who had been exposed to the intervention commented that they were already aware of the necessary strategies for the avoidance of overdose, and the importance of overdose signs. Therefore, they felt no more aware of these issues than prior to the intervention.

Comparison of the exposed and non-exposed groups, showed that older respondents who had been using heroin for longer were more likely to have been exposed to the intervention. Similarly, more of those respondents who had been exposed to the intervention reported a past overdose (in comparison with those who had not). Given that it is the older, more experienced user who is more at risk of overdose, this suggests that the targeting of the intervention materials and processes were successful in that the intervention had reached the group at which it was aimed (i.e. those at risk of overdose).

More of those who were exposed to the intervention were in methadone treatment. It may be that methadone clients, because of their attendance at treatment sites, have the opportunity to view printed intervention materials on a regular basis.

Despite the greater likelihood of respondents from the exposed group having experienced a past overdose, there were no significant differences between these groups in terms of the perceived chances of a regular heroin user in Adelaide overdosing during their lifetime. Nor were there any differences in perceptions of their own chance of overdosing in the future. Similarly, in respect of the possibility of a personal overdose, there were no differences between the groups in terms of the degree of ‘worry’ regarding the possibility of experiencing an overdose during the previous six months. It would seem that exposure to the intervention had no effect on perceptions of the risk of heroin overdose either for themselves or for other heroin users.

While there were no differences between the exposed and the non-exposed groups in terms of their initial responses to a witnessed overdose, significantly more of those who rang an ambulance as an initial or subsequent response to an overdose had been exposed to the intervention. Importantly, those who had been exposed to the intervention were less likely to have been delayed from help-seeking by a fear of police involvement. These findings suggest that exposure to the intervention may have had a pronounced effect on reducing fear of police involvement and increasing calls to ambulances, a major aim of the intervention.

Prevention strategies such as not mixing heroin with other psychoactive substances, not mixing heroin with specific psychoactive substances such as benzodiazepines and not using heroin while they were alone were nominated significantly more times by respondents who had been exposed to the intervention. However, despite this, there were no differences between the two groups in regards to the actual frequency with which such prevention strategies were practised during the previous six months. It is possible that exposure to the intervention resulted in an increase in awareness of the risk factors associated with heroin overdose but that this awareness had not been expressed in behavioural changes around the personal use of heroin.

9.4 Conclusions

Findings of the review of accidental substance-related fatalities among South Australian heroin users were consistent with the study of non-fatal overdose events among heroin users. That is, both fatal and non-fatal overdoses commonly occur in conjunction with the use of other central nervous system depressants. Moreover, the majority of both fatal and non-fatal overdose events occur in a private home and in the presence of others. Increased recognition of the significance of the signs of heroin overdose and an increase in calls for help while the affected person was still alive would reduce the morbidity and mortality associated with heroin use. It is also important that heroin users and their associates feel safe and confident in contacting an ambulance and in particular, that calling an ambulance will not result in the involvement of police and possible charges arising from such involvement. It is concluded that exposure to the targeted intervention developed in this study has succeeded in reducing the fear of police and increasing calls to ambulances in cases of suspected heroin overdose. Therefore, the intervention process and materials described in this report show promise as an effective public health approach to heroin overdose.

While the decrease in fatalities among heroin users in 1996 is gratifying, the data should be interpreted with some degree of caution, as other factors in addition to the targeted intervention may be involved. This year was a period of intensive activity involving a number of key groups (see **Section Three**). It should be noted that liaison and partnerships between DASC, user groups, police, ambulance, and accident and emergency services commenced approximately eighteen months prior to the launch of the intervention materials and education program in November, 1996. It is possible that the spirit of cooperation which arose out of the common desire to reduce the morbidity and mortality associated with overdose among heroin users facilitated not only the production of appropriate materials and protocols but improved the nature of the relationship between the key groups in meaningful and practical ways. If indeed this resulted in, or contributed to a reduction in deaths among heroin users in South Australia the return to previous mortality levels points toward the need for ongoing and substantial preventive interventions.

Overdose among heroin users is largely preventable. Changes in behaviour and intentions related to the use of heroin may be best achieved by means of a targeted intervention aimed at educating heroin users regarding appropriate responses to overdose in others, as well as ways of avoiding personal overdose. Particular emphasis should be placed on avoiding the concomitant use of other centrally-acting substances, particularly benzodiazepines, alcohol and codeine. Interventions to address behaviour change among heroin users are best addressed though an integrated process across a broad range of domains. This project has succeeded in facilitating strong intersectoral links between relevant sectors, including heroin users, police, emergency services, accident and emergency services and AOD services. It is essential that a consistent approach across all sectors be maintained in order to ensure optimal outcomes for all stakeholders.

9.5 Summary of major findings

1. This study provided the first detailed data on the circumstances and experience of non-fatal overdose among heroin users in South Australia. It is now clear that, as in other states, the experience of overdose (personal or as a witness) is a common event among South Australian heroin users.
2. Messages and materials developed during the study were shown to be effective vehicles for delivering health-positive concepts to the user community.

3. Effective system change occurred through cooperation and dialogue between the major stakeholders resulting in the development of new police and ambulance protocols.
4. Dissemination of the intervention materials was successful in reaching the target group. Older users, who had been using heroin for longer, with a history of heroin overdose were more likely to have been exposed to the intervention.
5. Following exposure to the intervention, there was increased awareness of the signs of overdose among heroin users.
6. Following exposure to the intervention, users were more likely to call an ambulance to an overdose event.
7. Following exposure to the intervention, there was a reduction in the fear of police involvement if an ambulance was called to an overdose event.
8. There was a peak in the utilisation of naloxone by SAAS personnel in October 1996, followed by a marked reduction beginning in November 1996 (the same month as the heroin overdose intervention launch). While it is difficult to draw a direct comparison between the estimated number of opioid overdoses attended by SAAS officers and the number of fatalities among South Australian heroin users, it is interesting to note the substantially increased use of naloxone during 1996, a year when fatalities among South Australian heroin users decreased by half in comparison with previous years. It is possible that the increased utilisation of naloxone during 1996 represented an increase in calls to ambulance services by witnesses to overdose events, resulting in fewer fatal outcomes.
9. This study provided the first detailed data on the circumstances of accidental substance-related fatalities among heroin users in South Australia. Eighty-five fatalities were identified for the study period (ie. 1.1.94 – 30.6.97). The annual rate of fatalities remained steady from 1992 until 1996 when they reduced by about half. It was estimated that deaths returned to previous levels in 1997. Data from the entire three and a half year study period showed that accidental substance-related fatalities among heroin users in South Australia typically involved a male, usually an experienced, long-term heroin and other substance user, suffering a collapse following the concomitant use of two or more central nervous system depressants including heroin. The majority of deaths occurred in a private home, and in the presence of other people. However, despite the presence of others and the opportunity to intervene, an ambulance was called either as an initial or subsequent action in less than one-fifth of cases. Two or more psychoactive substance types were detected in more than three-quarters of cases, most commonly benzodiazepines, codeine and alcohol.
10. Major characteristics associated with fatalities among heroin users were, male gender and being an older more experienced heroin and other psychoactive substance user. The principal behaviour associated with fatalities among heroin users was that of using other centrally acting substances concomitantly with heroin prior to death. Post-release

prisoners were identified as an at-risk group for fatal heroin overdose. A further risk factor was the failure of witnesses to the overdose event to correctly identify the signs of impending narcosis and to call for help in time to prevent a fatality.

11. Major characteristics associated with non-fatal overdose among heroin users were, higher levels of heroin dependence, not being in methadone treatment and being an older more experienced heroin and other psychoactive substance user. The principal behaviour associated with non-fatal overdose among heroin users was that of using other centrally acting substances concomitantly with heroin prior to overdose. Post-release prisoners were again identified as an at-risk group for heroin overdose. A further risk factor was the failure of witnesses to the overdose event to call for help, principally due to a fear of police involvement.

9.6 Recommendations

1. This study has highlighted the need for the development of standard criteria for establishing the involvement of heroin in any death. While the detection of 6-monoacetylemorphine is a valid marker for heroin use, as this study shows, it may not be present in all fatalities. Moreover, testing for 6-monoacetylemorphine usually requires a urine sample which may not be available in all cases. Even where urine is available, this metabolite may only be present for a limited period. An alternative measure such as hair analysis would provide a valid historical record of heroin as well as other substance use prior to death.
2. The present system of coding and categorising fatalities (ICD-9) does not distinguish deaths involving the use of heroin from those involving the use of other opioids. Additionally, the present focus on determining the principal ‘cause’ of death tends to obscure the role of other factors, such as concomitant substance use. There is now extensive evidence that multiple psychoactive substance use is a risk factor in morbidity and mortality among heroin users.
3. The implication of heroin purity in fatal and non-fatal heroin overdose cannot be determined until there is systematic collection and analysis of heroin across jurisdictions and the resultant data is in a form which will allow comparisons with the relevant morbidity and mortality data. There is a need for an accessible and current national database for both heroin purity, and morbidity and mortality among heroin users.
4. Computerisation of hospital (including A&E) records and the identification of particular psychoactive substances involved in hospital presentations and admissions would provide a database which would assist in monitoring the extent of the heroin overdose problem.
5. The systematic coding by ambulance officers of opioid or heroin overdose cases as such (whether or not these cases were transported to hospital) would provide important data on the number of overdose events occurring in any particular period or locality. Such data

could then be linked with information on levels of heroin purity and alternative sources of morbidity and mortality statistics to assist in the planning of timely interventions targeting substance users.

6. The identification of newly released prisoners as a group at risk of overdose points to the need for increased education and an expansion of treatment options, including pre-release methadone for this group.
7. Consideration should be given to an extension of the present range of substitution treatment options (e.g. methadone maintenance treatment) seen to be preventive for heroin-related overdose.
8. Given the proven efficacy and safety of naloxone, the supply of this medication to heroin users should be considered, particularly to those heroin users at higher risk of overdose, (e.g. following discharge from prison). The potential for abuse of naloxone is negligible, it has no reinforcing properties and is strongly antagonistic to opioids. It rapidly produces a markedly unpleasant withdrawal syndrome in heroin users and is therefore unlikely to be abused (Strang, Darke, Hall, Farrell, & Ali, 1996).

The views expressed in this report do not necessarily represent the views of the Drug and Alcohol Services Council of South Australia.

REFERENCES

Bammer, G., & Sengoz, A. (1994). Non-fatal heroin overdoses. *Medical Journal of Australia, 161* (7 November 1994), 572–573.

Barnas, C., Rossmann, M., Roessler, H., Riemer, Y., & Fleischhacker, W. W. (1992). Benzodiazepines and Other Psychotropic Drugs Abused by Patients in a Methadone Maintenance Program: Familiarity and Preference. *Journal of Clinical Psychopharmacology, 12* (6), 397– 402.

Biernacki, *P*. (1986). *Pathways from heroin addiction: recovery without treatment*. Philadelphia: Temple University Press.

Brogan, D., & Lai, S. (1997). *'Looking after your mates' a user group's experience of the South Australian Opioid Overdose Prevention Project* . Adelaide: A report of the South Australian Voice for IV Education (SAVIVE) A program of the AIDS Council of South Australia Inc.

Cone, E. J., Welch, P., Mitchell, J. M., & Paul, B. D. (1991). Forensic Drug Testing for Opiates: 1. Detection of 6-Acetylmorphine in Urine as an Indicator of Recent Heroin Exposure; Drug and Assay Considerations and Detection Times. *Journal of Analytical Toxicology, 15*(January/February), 1–7.

Darke, S., Hall, W., Ross, J., & Wodak, A. (1992). Benzodiazepine use and HIV risk-taking behaviour among injecting drug users. *Drug and Alcohol Dependence, 31*, 31–36.

Darke, S., Heather, *N*., Hall, W., Ward, J., & Wodak, A. (1991). Estimating drug consumption in opioid users: reliability and validity of a 'recent use' episode method. *British Journal of Addiction, 86*, 1311–1316.

Darke, S., & Ross, J. (1997). Overdose Risk Perceptions and Behaviours among Heroin Users in Sydney, Australia. *European Addiction Research, 3*, 87–92.

Darke, S., & Ross, J. (1998). Heroin-related deaths in South-Western Sydney 1992–1996, *National Drug and Alcohol Research Centre, Technical Report No 52* . Sydney, Australia.

Darke, S., Ross, J., & Hall, W. (1996a). Overdose among heroin users in Sydney, Australia: 1. Prevalence and correlates of non-fatal overdose. *Addiction, 9* (3), 405–411.

Darke, S., Ross, J., & Hall, W. (1996b). Overdose among heroin users in Sydney, Australia: ll. Responses to overdose. *Addiction, 9* (3), 413–417.

Darke, S., Sunjic, S., Zador, D., & Prolov, T. (1996c). *A Comparison of Blood Toxicology of Heroin-related Deaths and Current Heroin Users in South Western Sydney* (NDARC Technical Report 39). Sydney: National Drug and Alcohol Research Centre..

Darke, S. G., Zador, D. A., & Sunjic, S. D. (1997). Heroin-related deaths in south-western Sydney (letter). *Medical Journal of Australia, 167* (21 July 1997), 107.

DASC. (1995). *Trends relating to heroin in South Australia* . Adelaide: Report compiled by the Drug and Alcohol Services Council, Adelaide, South Australia.

Davoli, M., Perucci, C., Forastiere, F., Doyle, *P*., Rapiti, E., Zaccareli, M., & Abeni, D. (1993). Risk Factors for Overdose Mortality: A Case-Control Study within a Cohort of Intravenous Drug Users. *International Journal of Epidemiology, 22* (2), 273–277.

Duflou, J. (1997). Classification of Opioid Deaths - A Forensic Pathologist's Perspective. In W. Hall (Ed.), *Proceedings of an International Opioid Overdose Symposium held in Sydney, Australia, 14–15 August, 1997. Monograph No 35* . Sydney, Australia.

DuPont, R. L., & Baumgartner, W. A. (1995). Drug testing by urine and hair analysis: complementary features and scientific issues. *Forensic Science International, 70* (1–3), 63–76.

Engstrom, A., Adamsson, C. M., Allebeck, *P*., & Rydberg, W. (1991). Mortality in patients with substance abuse: a follow-up in Stockholm County, 1973–1984. *International Journal of the Addictions, 26*, 91–106.

Frischer, M., Goldberg, D., Rahman, M., & Berney, L. (1997). Mortality and survival among a cohort of drug injectors in Glasgow, 1982–1994. *Addiction, 92* (4), 419–427.

Gore, C., & Mahs, S. (1994). The 1994 ROW and MetROW Project . Sydney, Australia: NSW Users and AIDS Association Inc (NUAA).

Gossop, M., Darke, S., Griffiths, *P*., 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.

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.

Griffiths, *P*., Gossop, M., Powis, B., & Strang, J. (1993). Reaching hidden populations of drug users by privileged access interviewers: methodological and practical issues. *Addiction, 90*, 607–614.

Hall, W., & Darke, S. D. (1997). Trends in Opiate Overdose Deaths in Australia 1979–1995, *National Drug and Alcohol Research Centre* . Sydney: University of New South Wales.

Hando, J., O'Brien, S., Darke, S., & Hall, W. (1997). The Illicit Drug Reporting System (IDRS) Trial: Final Report, *National Drug and Alcohol Research Centre, Technical Report No. 31*. Sydney, Australia.

Jaffe, J. H. (1992). Drug Addiction and Drug Abuse. In A. Goodman Gilman, T. W. Rall, A. S. Nies, & *P*. Taylor (Eds.), *The Parmacological Basis of Therapeutics* (Vol. 1, pp. 533). Singapore: McGraw-Hill Book Co.

Jaffe, J. H., & Martin, W. R. (Eds.). (1991). *The Pharmacological Basis of Therapeutics* (8 ed.). New York: Pergamon Press, Inc.

King, L. A. (1982). Effect of Ethanol on Drug Levels in Blood in Fatal Cases. *Medicine, Science and the Law, 22* (4), 232–234.

Larson, A. (1996). *What injectors say about drug use: preliminary findings from a survey of indigenous injecting drug users* (No 2). IDU Project Working Paper, May 1996: Australian Centre for International and Tropical Health and Nutrition, Brisbane, Australia.

Levine, B., Green, B., & Smialek, J. (1995). The Role of Ethanol in Heroin Deaths. *Journal of Forensic Sciences, 40* (5, September, 1995), 808–810.

Loxley, W., Carruthers, S., & Bevan, J. (1995). In The Same Vein. First Report of the Australian Study of HIV and Injecting Drug Use (ASHIDU), *National Centre for Research Into the Prevention of Drug Abuse* . Perth: Curtin University of Technology, Perth, Western Australia.

Loxley, W., & Davidson, *P*. (1998). Forgetting to breathe: opioid overdose and young injecting drug users in Perth, *National Centre for Research into the Prevention of Drug Abuse* (Vol. February, 1988,). Perth: Curtin University of Technology.

Loxley, W., McDonald, C., & Marsh, A. (1992). The Australian National AIDS and Injecting Drug Use Study: Perth 1990, *National Centre for Research into the Prevention of Drug Abuse* . Perth: Curtin University of Technology.

Lynskey, M., & Hall, W. (1998). Jurisdictional Trends in Opioid Overdose Deaths, 1988–1996, *National Drug and Alcohol Research Centre, Technical Report No. 54* . Sydney, Australia.

Perucci, C. A., Davoli, M., Rapitii, E., Abeni, D. D., & Forstieri, F. (1991). Mortality of intravenous drug users in Rome: a cohort study. *American Journal of Public Health, 81*, 1307–1310.

Power, R., Hunter, G., & Ward, J. (1996). Guidelines for peer intervention. *Druglink* (July/August), 18–19.

Puschel, K. (1993). Drug-related death-an update. *Forensic Science International, 62* (1–2), 121–128.

Risser, D., & Schneider, B. (1994). Drug-related deaths between 1985 and 1992 examined at the Institute of Forensic Medicine in Vienna, Austria. *Addiction, 89*, 851–857.

Ross, J., Darke, S., & Hall, W. (1996). Benzodiazepine Use Among Heroin Users in Sydney: transitions between routes of administration, *National Drug and Alcohol Research Centre, Technical Report No. 35* . Sydney, Australia.

San, L., Tato, J., Torrens, M., Castillo, C., Farre, M., & Cami, J. (1993). Flunitrazepam consumption among heroin addicts admitted for in-patient detoxification. *Drug and Alcohol Dependence, 32*, 281–286.

Strang, J., Darke, S., Hall, W., Farrell, M., & Ali, R. (1996). Heroin overdose: the case for take-home naloxone. *British Medical Journal, 312* (8 June 1996), 1435.

Swensen, G. (1988). Opioid drug deaths in Western Australia: 1974–1984. *Australian Drug and Alcohol Review, 7*, 181–185.

Swensen, G. (1996). Mortality caused by opioids - Western Australia 1995, *Task Force on Drug Abuse,* Perth: Ministry of Premier and Cabinet.

Walsh, R. A. (1991). Opioid drug accidental deaths in the Newcastle area of New South Wales, 1970–1987. *Drug and Alcohol Review, 10*, 79–83.

Ward, J., Mattick, R., & Hall, W. (1992). *Key Issues in Methadone Maintenance Treatment*. Sydney: University of New South Wales Press.

Zador, D., Sunjic, S., & Darke, S. (1996). Heroin-related deaths in New South Wales, 1992: toxicological findings and circumstances. *The Medical Journal of Australia, 164* (19 February, 1995), 204–207.