

**Elizabeth Maloney, Louisa Degenhardt, Shane  
Darke, Richard Mattick and Elliot Nelson**

**The prevalence and associated risk factors of  
suicidal behaviour among opioid dependent  
persons: A case-control study**

**NDARC Technical Report No. 283**



# **THE PREVALENCE AND ASSOCIATED RISK FACTORS OF SUICIDAL BEHAVIOUR AMONG OPIOID DEPENDENT PERSONS: A CASE-CONTROL STUDY**

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Richard Mattick and Elliot Nelson**

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# TABLE OF CONTENTS

List of tables.....	ii
List of figures .....	iii
Acknowledgements.....	iii
Executive summary .....	iv
<b>1.0 INTRODUCTION .....</b>	<b>1</b>
1.1 Epidemiology of suicide.....	1
1.2 Epidemiology of suicide among opioid dependent individuals.....	2
1.3 Risk factors for suicide.....	5
1.4 Risk factors specific to opioid dependence.....	5
1.5 Study aims .....	6
<b>2.0 METHOD.....</b>	<b>7</b>
2.1 Research design .....	7
2.2 Structured interview.....	9
2.3 Statistical analysis.....	13
2.4 Sample characteristics .....	13
<b>3.0 RESULTS.....</b>	<b>16</b>
3.1 Prevalence of suicidal behaviour.....	16
3.2 Characteristics of the sample according to suicidality .....	18
3.3 Characteristics of most serious attempt reported.....	24
3.4 Risk factors associated with suicide attempts .....	30
<b>4.0 DISCUSSION .....</b>	<b>31</b>
4.1 Major findings.....	31
4.2 Prevalence of suicidal behaviour.....	32
4.3 Sex differences and suicidal behaviour .....	34
4.4 Risk factors for suicidal behaviour .....	36
4.5 Methods used and intent for suicidal behaviour .....	37
4.6 Comorbidity and suicidality .....	39
4.7 Conclusions.....	40
<b>5.0 REFERENCES.....</b>	<b>42</b>
<b>Appendix A: Risk factors for suicidal behaviour.....</b>	<b>48</b>
<b>Appendix B: Participant screening questionnaire .....</b>	<b>49</b>
<b>Appendix C: DSM-IV criteria for substance use dependence .....</b>	<b>50</b>
<b>Appendix D: DSM-IV criteria for PTSD .....</b>	<b>51</b>
<b>Appendix E: DSM-IV criteria for ASPD.....</b>	<b>52</b>
<b>Appendix F: DSM-IV criteria for panic disorder.....</b>	<b>53</b>
<b>Appendix G: DSM-IV criteria for major depressive episode.....</b>	<b>54</b>

## LIST OF TABLES

Table 1: Demographics of whole sample .....	14
Table 2: Mental health characteristics of whole sample .....	15
Table 3: Prevalence of suicidal behaviour .....	16
Table 4: Prevalence of suicidal behaviour by sex.....	17
Table 5: Demographics of those reporting a suicide attempt.....	20
Table 6: Mental health characteristics of those reporting a suicide attempt.....	22
Table 7: Method of most serious attempt.....	25
Table 8: Seriousness of the attempt.....	26
Table 9: The type of psychological treatment sought .....	26
Table 10: Intent of attempt reported by cases and controls .....	27
Table 11: Characteristics surrounding the attempt .....	27
Table 12: Types of stressful life events reported.....	29
Table 13: Risk factors for suicide attempts.....	30
Table 14: Comparing the prevalence of suicidal behaviour .....	32

## LIST OF FIGURES

Figure 1: A conceptual model indicating the domains of risk factors for suicide and suicide attempts (From Beautrais <sup>36:429</sup> ) .....	48
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## **EXECUTIVE SUMMARY**

### **Background**

Suicide is a major public health issue, both among the general population and also among those suffering from a drug use disorder. The prevalence of lifetime suicide attempts is estimated at around 3.6% among community samples. In comparison, the prevalence of lifetime suicide attempts for individuals suffering from heroin dependence is around 30%.

A number of risk factors have been identified as contributing to increasing an individual's risk of suicidal behaviour both among the general population and those with a drug use disorder. Generally the risk factors identified have been similar. Additional risk factors however, have been identified as unique among opioid dependent individuals. Furthermore, opioid dependent individuals typically suffer an increased number of risks. Some of the risk factors identified in the literature include social and demographic factors (such as sex and unemployment status), family characteristics and childhood experiences (such as parental loss or abuse as a child), personality traits (such as impulsivity), environmental factors (such as stressful life events), and psychiatric morbidity (such as depression or post-traumatic stress disorder (PTSD)).

To date, only one study has compared the prevalence and risk factors associated with suicidal behaviour among opioid dependent individuals and a control group; however, the control group participants did not suffer from any mental health disorders.

### **Aims**

The current study aimed to examine the prevalence of suicidal behaviour and the risk factors associated with such behaviour among an opioid dependent case group, and a non-opioid dependent control group, matched in terms of age, sex and employment status. The design allowed a comparison to be made while controlling for opioid dependence, correlates of suicidal behaviour, and disadvantage.



The specific aims of the current study were:

1. to determine the prevalence of suicidal thoughts and behaviour among opioid dependent cases and non-opioid dependent controls;
2. to compare the characteristics of the most serious suicide attempt reported among opioid dependent cases and non-opioid dependent controls; and
3. to examine the risk factors associated with suicide attempts among opioid dependent cases and non-opioid dependent controls.

## **Method**

This study utilised data collected as part of a large retrospective case-control study examining possible genetic influences upon opioid dependence and childhood trauma and their contribution to the development of opioid dependence. The study used a structured diagnostic interview.

The study employed a case-control design whereby opioid dependent cases were matched to non-opioid dependent controls in terms of age, sex and employment status, allowing a comparison of suicidal risk to be made and to control for opioid dependence. Eligibility criteria allowed the two groups to remain similar on some demographic characteristics but differing in terms of opioid exposure (cases were required to be dependent on opioids, whereas controls were required to have used opioids less than five times in their life).

Cases were recruited from opioid maintenance treatment clinics in New South Wales, Australia. Controls were recruited from employment centres, letterbox drops, medical centres, centrelink offices, libraries, street shopping malls, and local press, all of which serviced the same area as the treatment clinics to minimise the effects of population stratification.

## **Results**

Cases had significantly higher lifetime prevalence of suicidal ideation, suicide plans and suicide attempts compared to controls. Cases were also significantly more likely to have made multiple attempts over their lifetime compared to controls. Cases were significantly more likely to indicate a more severe intent to die compared to controls, which was

interesting considering no differences were identified among the types of methods used or the seriousness (in terms of medical treatment sought) reported by either group.

Female cases were found to be significantly more likely to report suicidal ideation and suicide attempts compared to male cases. Additionally, female cases were significantly more likely to make multiple attempts compared to male cases. No differences between males and females were found among controls.

Both cases and controls that had attempted suicide were significantly more likely than others to meet criteria for other substance use and psychological disorders. They were more likely to report childhood maltreatment, which included emotional abuse, neglect, physical abuse, and sexual abuse.

Multivariate analyses suggested that the risk factors that predicted suicide attempts were similar for cases and controls, namely: post-traumatic stress disorder (PTSD), screening positive for borderline personality disorder (BPD), and persistent suicidal thoughts. Additionally, sedative dependence was significant among cases, and unemployment plus stimulant dependence were significant among controls. Additional analyses, however, showed that opioid dependence did not make a unique contribution to suicidal risk.

## **Discussion**

Although the prevalence of suicidal behaviour was high among the controls compared to community samples, opioid dependence appeared to substantially increase an individual's risk of suicidal behaviour. Opioid dependence, however, did not make a unique contribution to suicidal risk over and above the other risk factors identified, which include BPD and PTSD. Despite differing levels of suicidal behaviour among cases and controls, the current study identified that the risk factors for suicide attempts remain essentially the same.

## 1.0 INTRODUCTION

Suicidal ideation is cognitively-based and refers to thoughts that life is not worth living. It can vary, however, from these general thoughts to concrete well-thought-out plans, and even progress into intense delusions linked to self-destructive behaviour.<sup>1</sup> On the other hand, 'suicide attempts' refer to any deliberate act of self-harm with the intention of causing death but does not result in a fatal outcome.<sup>1</sup>

### 1.1 Epidemiology of suicide

The lifetime reported prevalence of suicidal ideation among the general population has ranged from 5-18%.<sup>2-10</sup> An Australian study found that previous 12-month and lifetime cumulative incidence of suicidal ideation was 3.4% and 16%, respectively<sup>(2)</sup>. This study also estimated that over the course of an individual's lifetime around one in seven individuals will consider suicide.<sup>2</sup>

The National Comorbidity Survey (NCS) conducted in the United States between 1990 and 1992 found the lifetime prevalence of suicide attempts was 4.6%.<sup>11</sup> Similar prevalence estimates have been identified among a number of other general population surveys.<sup>6, 7, 10</sup> Pirkis et al.<sup>2</sup> found that 12-month and lifetime cumulative incidence of suicide attempts among Australian adults was 0.4% and 3.6%, respectively: in other words, over the course of an individual's lifetime around one in 32 individuals will make a suicide attempt.<sup>2</sup> An identical 12-month prevalence of attempted suicide was identified in another, more recent, Australian study.<sup>5</sup>

A number of studies have identified that attempted suicide is a strong risk factor for later suicide attempts, with over 40% of individuals reporting that they had attempted suicide more than once over their lifetime.<sup>5, 12</sup> Sex differences appear to distinguish attempted from completed suicides, with females three times more likely to *attempt* suicide, but with males three times more likely to *complete* suicide.<sup>13</sup>

Rates of suicidal behaviours are often criticised because of their reliance on self-report measures, and whilst there are some limitations to the extent to which self-report can gauge behaviours, self-report has also been shown to be a useful way of assessing behaviour among drug users.<sup>14</sup>

### ***Characteristics of attempts***

The age of first and most recent attempt has seldom been asked in studies of suicidal behaviour. One study did find that the median age of onset for all outcomes assessed, including suicidal ideation, plans and attempts, was mid-20s.<sup>4</sup> Another study found the age of most serious attempt was around 30 years old.<sup>15</sup> The method used for attempted suicide among the general population is another issue which has been relatively unexplored. Among the studies examining the methods used for attempted suicide, the majority have involved overdose or poisoning.<sup>12, 15</sup>

Relatively few studies have addressed the issue of seriousness when exploring suicide attempts; however, Kessler et al.<sup>4</sup> found that around 40% of participants indicated the attempt was “serious and it was only luck they didn’t die”. A few other studies have addressed the issue of medical and or psychological treatment in order to assess seriousness, with around 40-45% of participants reporting they sought some type of formal help following an attempt.<sup>5, 12</sup> The presence of a suicide note can also be a way of assessing the seriousness or intent involved in an attempt; however, most studies asking about suicide notes have been based on completed suicides rather than attempted suicides.<sup>16</sup>

Many studies have examined the triggers for suicidal behaviour, but again this has typically been explored among completed suicides rather among those who attempted suicide. One Australian study found that, among those who had attempted suicide, mental illness, addiction, legal problems, and financial problems were found to be contributing factors to suicidal behaviour.<sup>5</sup>

## **1.2 Epidemiology of suicide among opioid dependent individuals**

Although heroin dependence is rare, the problems associated with both use and dependence are clinically significant and extensive.<sup>17</sup> Mortality rates of heroin users were estimated to range from 1% to 3%, representing a rate 13 times that of the general population.<sup>18, 19</sup> In addition to this, research has identified a range of serious harms associated with heroin use including overdose, trauma, disease, psychopathology, and suicide, which all contribute to a significant burden on the healthcare system.<sup>13, 20-22</sup>

Heroin use also presents a significant social burden through its association with crime to support drug use.<sup>20, 21, 23</sup>

Lifetime prevalence estimates of suicidal ideation are rarely reported among studies of opioid users or even drug users in general. Among studies which have reported such rates, however, the lifetime prevalence rates for suicidal ideation have varied from 52% to 60%.<sup>24, 25</sup> Other studies have examined rates of current suicidal ideation, which have been reported as around 23% at baseline.<sup>26, 27</sup>

High rates of attempted suicide among opioid users have been reported in a number of recent studies<sup>13, 28-31</sup>, with around 30% of participants reporting a lifetime attempt. One study found that 13% of participants had attempted suicide in the preceding year and 5% had done so in the previous month, with females much more likely to have such a history<sup>26</sup>.

The main strength of this study, over and above the research previously conducted, is that by using a case-control design it is possible to examine the effect of opioid dependence specifically, and compare it to individuals suffering other factors of disadvantage such as unemployment, which may have confounded these associations in past research. It will be possible to examine the strength of association between opioid dependence and associated harms, such as suicidal behaviour, whilst controlling for other variables such as age, sex and employment status. In addition to this, most past research has focused on one group, whether that is illicit drug users or the general population, making comparisons across studies difficult.

To date, only one Turkish study has used a case-control method to compare a sample of heroin dependent patients with 'healthy' matched controls.<sup>32</sup> The authors found that the heroin dependent patient group had significantly higher rates of each type of suicidal behaviour assessed – namely ideation, planning and attempts.<sup>32</sup> It is difficult to know, however, if the differences observed were attributable to heroin dependence per se or if they were associated with social disadvantage in general related to a drug dependent lifestyle.

### ***Characteristics of attempts***

Research has identified that female heroin users have an increased prevalence of attempted suicide, similar to the differences between males and females observed among the general population.<sup>13</sup> Recent research has identified that the mean number of suicide attempts among heroin users is two, with around half of all those who had made an attempt indicating they had made multiple attempts.<sup>27, 28, 33</sup> Studies which have examined the characteristics of suicide attempts among heroin users have found participants' first attempt was around the age of 20.<sup>27, 33, 34</sup> A limited number of studies have reported an earlier onset of suicide attempt history for females compared to males, from 2 years to 6 years younger.<sup>27, 33</sup> One study suggested that, in over 50% of cases, the first suicide attempt preceded initiation of heroin use, with females 18 times more likely than males to have first attempted suicide prior to onset of heroin use.<sup>33</sup>

The research conducted on heroin users to assess the seriousness of attempts generally relates to issues of intent and the need for subsequent medical treatment, similar to those used in studies of general population samples. Murphy et al.<sup>29</sup> found that 25% of participants reported making a "serious" attempt in which death was clearly intended. More recently, Darke and Ross<sup>33</sup> found that 87% of participants in their sample regarded their most recent suicide attempt as serious. Around 60% of participants reported some type of medical intervention following their attempt.<sup>33, 34</sup>

Studies conducted with heroin users have found the majority (around 80%) reported a major life event preceded their attempt, with the most commonly identified triggers for a suicide attempt being the death of a loved one, relationship split, or incarceration.<sup>33, 34</sup>

### ***Methods used***

The research in this area has consistently found that, among heroin users, a drug overdose (non-opiates) is the most common method chosen for attempted suicide.<sup>13, 33, 34</sup> Research has shown that heroin users rarely use heroin in attempting suicide.<sup>25, 33</sup>

Data specific to males and females about the methods employed for suicidal behaviour is rarely reported in studies examining heroin users, making comparisons to the general population difficult.<sup>13</sup> Some work has found that heroin users who *complete* suicide are

largely male, and those who *attempt* suicide are largely female, similar to the general population.<sup>13</sup> The use of drugs appears to be over-represented among heroin users who attempt or complete suicide; however, non-opioid prescription drugs, not heroin, appear to be the method of choice for suicide among heroin users.<sup>13,25</sup>

### **1.3 Risk factors for suicide**

Suicide is a relatively rare event in society and is therefore very difficult to predict. However, research has considered risk factors for suicide and identified which factors contribute to an individual's likelihood to commit suicide. 'Risk factors' increase the probability of a suicidal act occurring; the more risk factors an individual is confronted with at any point in time, the higher their probability of acting in a suicidal way.<sup>35</sup> Risk factors can be associated with the individual themselves (biological or psychological) or with his/her environment (sociological, cultural or family).<sup>35</sup> Beautrais<sup>36:429</sup> provides a model (see Appendix A) which outlines the factors identified as contributing to an individual's risk of suicidal behaviour, and, although only approximate, provides a good overview of an extensive literature base. The model proposes that a broad set of factors (including genetics, social/demographic, family characteristics/experiences and personality traits) contribute to an individual's risk of suicidal behaviour. These factors also increase an individual's risk of developing mental illness and increase their risk of being exposed to adverse life events.<sup>36</sup> Taken together, these factors can increase an individual's risk of suicidal behaviour, either directly or indirectly.<sup>36</sup>

### **1.4 Risk factors specific to opioid dependence**

It was mentioned above that it was estimated that an individual suffering from a drug use disorder is more than twice as likely as those not suffering from a drug use disorder to attempt suicide. Drug use disorders can therefore be considered a significant risk factor for suicidal behaviour and indeed present an elevated risk for the individuals involved. Many risk factors for suicidal behaviour identified above, which occur in the general population, have also been identified among opioid dependent individuals, including: social and demographic factors, family characteristics, and psychiatric morbidity (affective disorders, anxiety disorders, personality disorders, and co-occurring mental disorders). A number of other risk factors, such as polydrug use and drug-related risks,

have been identified as additional risk factors for suicidal behaviour among opioid dependent individuals.

## **1.5 Study aims**

The current study aimed to examine the prevalence of suicidal behaviour and the risk factors associated with such behaviour among an opioid dependent case group, and a non-opioid dependent control group, matched in terms of age, sex and employment status. The design of the current study enabled a comparison to be made while controlling for opioid dependence, correlates of suicidal behaviour, and disadvantage. To our knowledge, this is the first study of this kind to examine the prevalence and risks of suicidal behaviour among an opioid dependent case group and a non-opioid dependent control group.

The specific aims of the current study were:

1. to determine the prevalence of suicidal behaviour (both ideation and attempts) among opioid dependent cases and non-opioid dependent controls;
2. to compare the characteristics of the most serious suicide attempt reported among opioid dependent cases and non-opioid dependent controls; and
3. to examine the risk factors associated with suicide attempts among opioid dependent cases and non-opioid dependent controls.



## **2.0 METHOD**

### **2.1 Research design**

This study utilised data collected as part of an ongoing, large retrospective case-control study examining genetic and environmental factors (e.g. childhood trauma) contributing to opioid dependence liability. The study was funded by the National Institute on Drug Abuse (NIDA), and was run in collaboration with Washington University, Queensland Institute of Medical Research (QIMR) and the National Drug and Alcohol Research Centre (NDARC). Blood samples and interview data were collected by NDARC researchers (see method below), blood samples were processed by Prince of Wales Hospital, and the genetic and blood analysis were completed at Washington University and QIMR.

#### **2.1.1 Subject recruitment**

Cases were recruited from both public and private opioid maintenance treatment clinics in New South Wales, Australia. This population was chosen for the following reasons:

- Its relative size – there are more than 15,000 individuals receiving pharmacotherapy maintenance treatment for opioid dependence in NSW, Australia.<sup>37</sup>
- Stability – heroin has been relatively inexpensive and available in Australia for most of the past two decades, indicating this population is likely to have had wide exposure to heroin, resulting in a greater expression of the underlying genetic vulnerability to opioid dependence.
- Accessibility – the relative ease with which participants were recruited for the pilot study, and their willingness to complete the interview and provide a blood sample, offered support for the feasibility of conducting a larger study among this sample. The pilot project was conducted with 50 participants from October to December in 2002.

Controls were recruited from employment centres, letterbox drops, medical centres, word of mouth, centrelink offices, libraries, community organisations, street shopping

malls, and local press servicing the same area as the maintenance treatment clinics to minimise the effects of population stratification.

Prior to recruitment commencement, ethics approval was obtained from Washington University, QIMR, UNSW and the appropriate area health services responsible for the clinics used in this study\* .

Interviews were conducted at some clinics or community centres if appropriate facilities were available.

### **2.1.3 Screening of participants**

Potential participants who were interested in participating in the study were screened for eligibility. There was a genuine need to ensure that the cases and controls were two completely different groups on the basis of opioid dependence.

Cases were eligible on the following criteria:

- aged 18 years or over;
- had an adequate understanding of English (essential for informed consent and the long interview schedule); and
- had participated in pharmacotherapy maintenance treatment.

Controls were eligible on the following criteria:

- aged 18 years or over;
- had an adequate understanding of English (essential for informed consent and the long interview schedule); and
- had used opioids illicitly less than 5 times over their lifetime.

Potential participants were also screened for eligibility using a wide range of dummy questions to limit the extent to which participants were able to pick the eligibility criteria. If a subject was not eligible they were told there was “no group to fit them into at the

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\* Ethics approvals obtained from Washington University Medical Centre (WUMC) Human Studies Committee (HSC) (02-0442), University of NSW (UNSW) Human Research Ethics Committee (HREC) (02124), The Queensland Institute of Medical Research Human Research Ethics Committee (QIMR-HREC) (H0309-060), Sydney South West Area Health Service (X04-0303), South Eastern Sydney Area Health Service (02/135), Northern Sydney Central Coast Area Health Service (0501-036M) and Sydney West Area Health Service (06/059).

present time, but if a group became available they would be called back". Participants were not explicitly told they were ineligible, to help minimise the chance of participants ringing numerous times and altering answers in order to 'become' eligible. The screening questionnaire appears in Appendix B.

## **2.2 Structured interview**

This research study used a structured interview as the primary research instrument. The interviews were conducted in person using a computer-administered diagnostic interview (CADI) on a one-on-one basis. Friends or partners were not allowed to be interviewed simultaneously, or to sit in on a partner's interview. Interviews were also not allowed to be conducted in a public space, like a café, due to the extremely personal nature of the interview, its length, and the need for computer equipment to be used.

Interviews took on average one and a half hours to two and a half hours to complete. Once the interview and the blood sample were completed, all participants were paid \$50 for out of pocket expenses. Respondents were not forced to answer any questions they did not know about or did not feel comfortable answering. Interviewers asked respondents to give them their best estimate, and were reminded of the confidentiality of the study.

All interviewers were required to complete training, and quality control checks were also conducted to ensure specific standards were upheld by all interviewers and to limit any interviewer bias. All blood samples were taken by either a registered nurse or trained venepuncturist.

### ***Demographics***

Information on demographics and ancestral origin were obtained using a section from SSAGA-OZ (modified from the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) for use in Australian populations for ongoing genetic studies) and the COGA SSAGA-II (Collaborative Study on the Genetics of Alcoholism).<sup>38, 39</sup>

### ***Drug use***

Respondents were asked questions relating to their use of five drug categories: cannabis, opioids, sedatives, stimulants and cocaine. This section of the interview is from the COGA SSAGA-II<sup>38, 39</sup> and assesses an individual's abuse and dependence, for both DSM-III-R<sup>40</sup> and DSM-IV.<sup>41</sup> The DSM-IV criteria for Substance Use Dependence appear in Appendix C.

### ***Heroin use***

Questions related to the age of the respondent and circumstances surrounding when they first saw someone else using heroin, were first offered heroin, first used heroin regularly and first sought treatment for heroin dependence. The questions in this section were adapted from parts of the SSAGA-II.<sup>38, 39</sup>

### ***Family and other relationships***

This section is derived from a part of the Christchurch Trauma Assessment, used in the Christchurch Health and Development Study<sup>42</sup> and contains detailed information on any physical abuse the respondent may have experienced before and after turning 18, as well as violence between parents. Minor additions were made to the instrument for the current study to enable assessment of parental abuse by a non-parent adult in the household, physical revictimisation after age 18 years old, reduced child presence in the home, external support-seeking, and adult physical aggression.

There is also a series of questions within this section which accounts for emotional abuse and neglect. This section aims to assess the way the respondent was made to feel during their childhood in terms of lack of support, self-worth, and being wanted in the family, for example. These questions were derived from various sources within the child maltreatment literature.

### ***Sexual abuse (before 18)***

This section is derived from a part of the Christchurch Trauma Assessment, used in the Christchurch Health and Development Study<sup>42</sup> and contains detailed information on any sexual abuse that the respondent may have experienced before the age of 18.

### ***Unwanted sexual activity after 18***

This section is also from the Christchurch Trauma Assessment, used in the Christchurch Health and Development Study<sup>42</sup>, and focuses on any unwanted threats, attempts or sexual activity that the respondent may have experienced after the age of 18.

### ***Post-traumatic stress disorder (PTSD)***

This section is adapted from the COGA SSAGA-II<sup>38, 39</sup> and generates a DSM-IV diagnosis of PTSD, examining 10 life events. The DSM-IV criteria for PTSD appear in Appendix D.

### ***Borderline personality disorder (BPD)***

This section uses a screener for BPD that has been adapted from the International Personality Disorder Examination (IPDE)<sup>43</sup> for use in the Australian National Survey of Mental Health and Well-being<sup>44</sup>, the criteria for which are taken from emotionally unstable personality disorder ICD-10 criteria (F60.3).<sup>45</sup> This screener has also been used previously in other studies of heroin users.<sup>46</sup>

### ***Anti-social personality disorder (ASPD)***

This section is diagnostic according to the DSM-IV classification; however, it is possible that in some cases it was not ruled out that the behaviour was not exclusively during the course of a manic episode or schizophrenia.<sup>41</sup> A diagnosis of conduct disorder can also be made from this section. This assessment of ASPD was derived from the COGA SSAGA-II.<sup>38, 39</sup> The DSM-IV criteria for ASPD appear in Appendix E.

### ***Alcohol use disorders***

The alcohol section was taken from the COGA SSAGA-II<sup>38, 39</sup> and permits a diagnosis of alcohol dependence according to DSM-III-R and DSM-IV.<sup>41</sup>

### ***Nicotine use disorders***

This section was taken from the COGA SSAGA-II<sup>38, 39</sup> and allows a diagnosis for nicotine dependence according to the DSM-III-R and DSM-IV.<sup>41</sup>

### ***Panic disorder***

The panic disorder section is diagnostic for DSM-IV<sup>41</sup> and has been taken from the COGA SSAGA-II.<sup>38, 39</sup> The DSM-IV criteria for panic disorder appear in Appendix F.

### ***Experience of a depressive episode***

This section was taken from the COGA SSAGA-II<sup>38, 39</sup> and is diagnostic for major depressive episode.<sup>41</sup> The presence of a depressive episode is assessed by experiencing either a depressed mood, or loss of interest or pleasure in most activities, or irritability if less than 18 (at the time of the depressive episode), nearly every day for a period of at least two weeks. A measure of severity was also assessed in terms of whether the participant sought help from a doctor or was unable to function for at least two days in a row. The DSM-IV criteria for major depressive episode appear in Appendix G. Note that it is possible that in the case of some individuals the presence of a mixed episode was not accounted for.

### ***Suicidal and self-mutilating behaviours***

Suicidal behaviour is a non-diagnostic section that assesses suicidal ideation and attempts, as well as deliberate self-injury by cutting or burning. This section, taken from the COGA SSAGA-II<sup>38, 39</sup>, also focuses on the respondents' most serious attempt and various questions relating to intent, treatment, methods used, triggers and degree of seriousness. Additional questions from this section were compiled from various sources within the suicide literature.

Attempted suicide was defined as deliberate self-harm with the intention of causing death. Persistent suicidal thoughts were defined as those lasting seven days or longer. Deliberate self-injury or self-mutilation, e.g. slashing a limb or burning oneself with no intention of causing death, was assessed as a separate behaviour and was not included in the definition of attempted suicide. Motives for acts of self-mutilation were not pursued.

### ***Family history assessment***

This section begins with a brief screening instrument, from the Family History Screen (FHS) and relates only to biological family members.<sup>47</sup> The interview asks respondents to complete the appropriate module from the Family History Assessment Module (FHAM) for each family member about whom an FHS alcohol or drug screening question was

endorsed. The screener also asks about biological family members who have attempted suicide. The FHAM<sup>48</sup> has been extensively used in the COGA Study, a multi-site genetic study on alcoholism.

### **2.3 Statistical analysis**

T-tests were used for continuous variables, while chi-square statistics were reported for non-dichotomous categorical variables, with odds ratios and 95% confidence intervals reported. Logistic regressions using backwards elimination were performed in order to determine the risk factors for attempting suicide, with the following variables included: age, gender, unemployment, persistent suicidal thoughts, cannabis dependence, sedative dependence, stimulant dependence, cocaine dependence, alcohol dependence, screening positive for BPD, experiencing a depressive episode, PTSD diagnosis, ASPD diagnosis, panic disorder diagnosis, and childhood maltreatment. All statistical analyses were conducted using SPSS for Windows, version 14.0.<sup>49</sup>

### **2.4 Sample characteristics**

Opioid dependent cases were more likely to be male, older, have a prison history, be less educated, and be either divorced/separated or never married, compared to non-opioid dependent controls (Table 1).

**Table 1: Demographics of whole sample**

	Case (n=726)	Control (n=399)	Comparisons
Male	60%	44%	OR 1.94 (1.52-2.48) **
Mean age (in years)	37%	33%	$t_{682}=-5.55$ **
Prison history	53%	5%	OR 23.27 (14.19-38.17) **
Unemployed	80%	44%	OR 5.35 (4.08-7.03) **
<b>Highest education level completed</b>			
7 years or less	6%	1%	X <sup>2</sup> 4df=196.86 **
8-10 years	40%	10%	
11-12 years	19%	23%	
Technical training	28%	33%	
University training	7%	33%	
<b>Marital status</b>			
Married/Widowed	4%	9%	X <sup>2</sup> 2df=14.59 **
Separated/Divorced	19%	13%	
Never married	77%	78%	

\* p&lt;0.05

\*\* p&lt;0.001

Cases were more likely to be dependent on any of the drug classes examined (Table 2). Cases were also significantly more likely to screen positive for BPD and to receive a PTSD, major depressive episode or ASPD diagnosis, compared to controls. Cases were significantly more likely to report the experience of childhood physical and sexual maltreatment, as well as neglect. There were no significant group differences for a depressive episode, panic disorder diagnosis, experiencing emotional maltreatment as a child, or for whether they had a biological family member with a history of attempted suicide.



**Table 2: Mental health characteristics of whole sample**

	Case (n = 726)	Control (n = 399)	Comparisons OR and 95% CI <sup>^</sup>
<b>Lifetime Drug Dependence</b>			
Cannabis	56%	28%	OR 3.22 (2.38-4.35) **
Sedative	38%	2%	OR 32.34 (14.11-74.12) **
Stimulants	49%	17%	OR 4.78 (3.43-6.65) **
Cocaine	36%	3%	OR 18.22 (9.66-34.37) **
Alcohol	40%	26%	OR 1.51 (1.12-2.02) *
Mean number drug classes ever #	2	0	$t_{1043} = -20.79$ **
Tobacco	63%	38%	OR 2.34 (1.78-3.09) **
<b>Psychopathology</b>			
BPD	59%	31%	OR 2.61 (1.96-3.46) **
Major depressive episode	59%	51%	ns
PTSD	35%	19%	OR 2.12 (1.53-2.93) **
Panic Disorder	23%	24%	ns
ASPD	46%	17%	OR 3.60 (2.58-5.00) **
Family member suicide attempt	16%	17%	ns
<b>Childhood maltreatment</b>			
Physical	59%	38%	OR 1.93 (1.47-2.55) **
Emotional	74%	68%	ns
Sexual	52%	45%	OR 1.49 (1.12-2.00) *
Neglect	43%	29%	OR 1.57 (1.12-2.21) *
Any maltreatment type	88%	86%	ns

# Includes alcohol; does not include opioid dependence

<sup>^</sup> Adjusted for age, gender and employment status

\* p<0.05

\*\* p<0.001

## 3.0 RESULTS

### 3.1 Prevalence of suicidal behaviour

Cases were significantly more likely to report suicidal thoughts, a suicide plan and a suicide attempt over their lifetime compared to controls (Table 3). Cases were just over 1.5 times more likely to think about suicide, and just under twice as likely to report a suicide attempt over their lifetime, compared to controls. Cases were also more likely to report multiple attempts over their lifetime. There were no significant differences between cases and controls for lifetime persistent suicidal thoughts and suicide attempts in the 12-months prior to interview.

**Table 3: Prevalence of suicidal behaviour**

	Case (n=726)	Control (n=399)	Comparisons OR and 95% CI <sup>^</sup>
<b>Suicidal thoughts (lifetime)</b>	66%	55%	OR 1.40 (1.06-1.85) *
<b>Persistent thoughts (lifetime)</b>	24%	19%	ns
<b>Suicide plan (lifetime)</b>	41%	32%	OR 1.40 (1.06-1.87) *
<b>Suicide attempt (lifetime)</b>	31%	20%	OR 1.65 (1.20-2.29) *
<b>Multiple attempts (lifetime)</b>	19%	11%	OR 1.56 (1.05-2.31) *
<b>Suicide attempt (12-month)</b>	3%	3%	ns

<sup>^</sup> Adjusted for age, gender and employment status

\* p<0.05

\*\* p<0.001

The frequency of suicidal behaviour for cases and controls was also examined by sex (Table 4). Female cases were significantly more likely to report suicidal thoughts, a suicide attempt, and multiple attempts over their lifetime compared to male cases. No sex differences were found among controls.

**Table 4: Prevalence of suicidal behaviour by sex**

	Case (n=726)		Comparisons	Control (n=399)		Comparisons
	Males (n=436)	Females (n=290)		Males (n=175)	Females (n=224)	
<b>Suicidal thoughts (lifetime)</b>	62%	71%	OR 1.50 (1.09-2.08) *	53%	57%	ns
<b>Persistent thoughts (lifetime)</b>	20%	30%	OR 1.67 (1.19-2.35) *	22%	17%	ns
<b>Suicide plan (lifetime)</b>	39%	44%	ns	29%	34%	ns
<b>Suicide attempt (lifetime)</b>	26%	39%	OR 1.77 (1.28-2.44) **	19%	21%	ns
<b>Multiple attempts (lifetime)</b>	14%	27%	OR 2.18 (1.50-3.17) **	13%	10%	ns
<b>Suicide attempt (12-month)</b>	3%	5%	ns	2%	3%	ns

\* p<0.05

\*\* p<0.001

### **3.1.1 Age of suicidal behaviour**

No significant differences were found between cases and controls for age of first suicide attempt (19 years old v. 20 years old), after controlling for respondents' age and sex. Female cases attempted suicide, on average, 4 years earlier than male cases (17 years old v. 21 years old,  $t_{110}=2.768$ ,  $p<0.05$ ). There were no significant sex differences among controls (both 20 years old).

No significant differences were found between cases and controls for age of most recent suicide attempt (29 years old v. 26 years old respectively), after controlling for respondents' age and sex. There were no significant sex differences within either the case (30 years old for males; 29 years old for females) or control group (28 years old for males; 24 years old for females).

No significant differences were found between cases and controls for median time since last attempt (7 years old v. 8 years old). No significant sex differences were found for either cases (6 years old for males; 7 years old for females) or controls (8 years old for males; 8 years old for females).

Females cases were significantly more likely to attempt suicide prior to the onset of heroin use compared to male cases (68% versus 46%,  $p<0.05$ , OR 2.47, 95% CI 1.25-4.89).

## **3.2 Characteristics of the sample according to suicidality**

### **3.2.1 Demographics**

The demographic characteristics of those individuals who did and did not attempt suicide were examined, by case and control status (Table 5). Among cases, females were significantly more likely to attempt suicide, whereas among controls there was no significant difference between males and females. No significant age differences were found in either the case or control group. Similarly, there were no significant differences between those who did and did not attempt suicide in terms of prison history for either cases or controls. For cases there was no significant difference in terms of employment. For controls, however, those who attempted suicide were significantly more likely to be

unemployed. Educational level was also not significant for cases; however, controls who attempted suicide were significantly less educated. No significant difference was found for marital status of cases; however, controls who attempted suicide were significantly more likely to be never married.

**Table 5: Demographics of those reporting a suicide attempt**

	Case (n=726)		Comparisons	Control (n=399)		Comparisons
	Attempted Suicide (n=223)	No Suicide Attempt (n=503)		Attempted Suicide (n=77)	No Suicide Attempt (n=322)	
<b>Sex</b>						
<b>Female</b>	39%	61%	OR 1.77 (1.28-2.44) **	21%	79%	ns
<b>Male</b>	26%	74%		19%	81%	
<b>Mean age (in years)</b>	37%	37%	ns	33%	35%	ns
<b>Prison history</b>	49%	54%	ns	7%	4%	ns
<b>Unemployed</b>	81%	80%	ns	62%	38%	OR 2.71 (1.62-4.54) **
<b>Highest educational level completed</b>						
7 years or less	8%	5%	ns	0%	1%	X <sup>2</sup> 4df=15.38 *
8-10 years	35%	42%		18%	7%	
11-12 years	18%	19%		16%	26%	
Technical training	32%	26%		42%	31%	
University	8%	7%		25%	35%	
<b>Marital status</b>						
Married/Widowed	5%	4%	ns	0%	11%	X <sup>2</sup> 2df=9.76 *
Separated/Divorced	21%	18%		13%	13%	
Never married	74%	78%		87%	76%	

\* p<0.05

\*\* p<0.001

### **3.2.2 Mental health**

Cases who attempted suicide were significantly more likely to be cannabis-, sedative-, stimulant-, cocaine- and/or alcohol-dependent, and to have been dependent on more drug classes over their lifetime (Table 6). Cases who attempted suicide were significantly more likely to screen positive for BPD, have experienced a depressive episode, and have suffered PTSD, ASPD and panic disorder (Table 6). Cases who attempted suicide were also significantly more likely to report childhood physical, sexual and emotional abuse, as well as neglect (Table 6).

Controls who attempted suicide were significantly more likely to be cannabis-, sedative-, stimulant- and/or alcohol-dependent, and to have been dependent on more drug classes over their lifetime (Table 6). Controls who had reported a suicide attempt were significantly more likely to screen positive for BPD, have experienced a depressive episode, and have suffered PTSD and panic disorder (Table 6). Controls who reported a suicide attempt were also significantly more likely to report experiencing physical, sexual and emotional abuse, as well as neglect during their childhood (Table 6).

Both cases and controls that had a biological family member with a history of at least one suicide attempt were significantly more likely to also report a lifetime suicide attempt (Table 6).

**Table 6: Mental health characteristics of those reporting a suicide attempt**

	Case (n=726)		Comparisons (Adjusted OR and 95% CI)^	Control (n=399)		Comparisons (Adjusted OR and 95% CI)^
	Attempted Suicide (n = 223)	No Suicide Attempt (n=503)		Attempted Suicide (n = 77)	No Suicide Attempt (n=322)	
<b>Lifetime Drug Dependence</b>						
<b>Cannabis</b>	62%	53%	OR 1.60 (1.41-2.24) *	46%	24%	OR 3.03 (1.73-5.31) **
<b>Sedative</b>	51%	32%	OR 2.26 (1.62-3.14) **	4%	0%	OR 7.14 (1.09-46.80) *
<b>Stimulant</b>	59%	44%	OR 2.01 (1.45-2.80) **	27%	15%	OR 3.01 (1.57-5.75) *
<b>Cocaine</b>	42%	34%	OR 1.49 (1.07-2.08) *	5%	2%	Not Significant
<b>Alcohol</b>	49%	36%	OR 1.82 (1.30-2.53) **	36%	24%	OR 1.75 (1.01-3.06) *
<b>Mean number drug classes #</b>	2	1	$t_{711}=-5.94$ **	1	0	$t_{382}=-4.11$ *

# Includes alcohol; does not include opioid dependence

^ Adjusted for age, gender and employment status

\* p<0.05

\*\* p<0.001



Table 6: Continued

	Case (n=726)		Comparisons (Adjusted OR and 95% CI)^	Control (n=399)		Comparisons (Adjusted OR and 95% CI)^
	Attempted Suicide (n = 223)	No Suicide Attempt (n=503)		Attempted Suicide (n = 77)	No Suicide Attempt (n=322)	
<b>Psychopathology</b>						
Screening positively for borderline personality disorder	76%	51%	OR 2.98 (2.08-4.27) **	61%	24%	OR 4.49 (2.61-7.73) **
Depressive episode	76%	54%	OR 2.60 (1.82-3.72) **	78%	46%	OR 3.85 (2.13-6.95) **
Post-traumatic stress disorder	51%	28%	OR 2.45 (1.75-3.42) **	40%	14%	OR 3.62 (2.03-6.46) **
Panic disorder	34%	18%	OR 2.16 (1.50-3.12) **	42%	21%	OR 2.68 (1.55-4.62) **
Anti-social personality disorder	52%	43%	OR 1.59 (1.14-2.21) *	33%	13%	OR 3.39 (1.83-6.27) **
Family member suicide attempt	24%	13%	OR 2.08 (1.34-3.23) *	28%	14%	OR 2.39 (1.13-5.06) *
<b>Childhood maltreatment</b>						
Physical maltreatment	66%	55%	OR 1.62 (1.16-2.26) *	58%	32%	OR 2.69 (1.59-4.54) **
Sexual maltreatment	67%	46%	OR 2.25 (1.58-3.20) **	63%	41%	OR 2.43 (1.42-4.16) *
Emotional maltreatment	84%	70%	OR 2.11 (1.37-3.26) **	88%	62%	OR 3.77 (1.60-8.90) *
Neglect	55%	37%	OR 2.09 (1.47-2.97) **	50%	22%	OR 2.90 (1.52-5.51) *
Any childhood maltreatment	95%	85%	OR 3.53 (1.78-7.02) **	94%	83%	ns

^ Adjusted for age, gender and employment status

\* p<0.05

\*\* p<0.001

### **3.3 Characteristics of most serious attempt reported**

If a respondent had reported making more than one suicide attempt over their lifetime, they were asked to nominate their most serious attempt. All respondents were asked about the characteristics of this most serious or only attempt.

The mean age of most serious attempt reported among cases was 25 years old and 23 years old for controls; however, this difference was not statistically significant after controlling for respondents' age and sex.

The most common method reported among both cases and controls, when asked about their most serious attempt, was taking prescription medication (non-opiates), with female cases significantly more likely to choose an overdose of pills compared to male cases (Table 7). Cutting wrists or stabbing self was the next most commonly chosen method for cases and controls, with no differences between males and females. Eighteen per cent of cases reported using heroin in their most serious suicide attempt, with no differences between males and females (Table 7). Overall, cases were significantly ( $p < 0.000$ ,  $X^2_{1df} = 15.71$ ) more likely to report overdosing on heroin, and the controls were significantly ( $p < 0.05$ ,  $X^2_{1df} = 9.39$ ) more likely to report overdosing on prescription medication.

**Table 7: Method of most serious attempt**

	Cases (n=223)			Comparisons between sex	Controls (n=77)			Comparisons between sex
	Males (n=112)	Females (n=111)	Total		Males (n=32)	Females (n=45)	Total	
<b>Took pills (non-opiates)</b>	24%	36%	30%	OR 1.85 (1.03-3.32) *	44%	53%	49%	ns
<b>Cut wrists or stab self</b>	21%	22%	21%	ns	16%	24%	21%	ns
<b>Overdose on heroin</b>	18%	17%	18%	ns	0%	0%	0%	n/a
<b>Strangulation, choking, hanging, suffocation</b>	14%	10%	12%	ns	16%	4%	9%	ns
<b>Other ^</b>	24%	15%	19%	ns	25%	18%	21%	ns

^Includes fire gun, crash car, carbon monoxide poisoning, jump from height, jump in front of car/train etc., overdose on other opiates, combination

\*p<0.05

Respondents were asked a number of questions which related to the seriousness of the suicide attempt reported (Table 8). No significant differences existed between cases and controls, with around 50% reporting that they required some form of medical treatment, around 40% reporting that they were admitted to hospital and around a half of all respondents reporting that they sought some type of psychological treatment or help following their attempt.

**Table 8: Seriousness of the attempt**

	<b>Cases (n=223)</b>	<b>Controls (n=77)</b>	<b>Comparisons</b>
<b>Required medical treatment</b>	58%	54%	ns
<b>Admitted to a hospital</b>	46%	39%	ns
<b>Sought psychological help</b>	50%	56%	ns

A hospital psychiatrist was the most common form of help identified by both cases and controls, when the specific type of psychological treatment or help was nominated (Table 9).

**Table 9: The type of psychological treatment sought**

	<b>Cases (n=96)</b>	<b>Controls (n=32)</b>
<b>Hospital psychiatrist</b>	48%	50%
<b>Psychiatrist</b>	24%	22%
<b>Psychologist/Counsellor</b>	21%	25%
<b>General practitioner</b>	3%	0%
<b>Crisis team</b>	4%	3%

When they were asked about their intent, cases were significantly more likely to report wanting to die, feeling sorry they didn't die following the attempt, thinking they would die from their attempt, and to report a severe intent to die (Table 10). The writing of a suicide note was relatively uncommon among both cases and controls, and did not differ statistically (Table 10). No differences were found between males and females among either cases or controls on any of the questions assessing intent.

**Table 10: Intent of attempt reported by cases and controls**

	Case (n=223)	Control (n=77)	Comparisons
Really wanted to die	76%	57%	OR 2.34 (1.26-4.32) *
Reports remorse they didn't die	58%	43%	OR 1.81 (1.00-3.27) *
Thought would die from attempt	74%	48%	OR 3.06 (1.67-5.63) **
Reports very severe intent	63%	43%	OR 2.22 (1.31-3.77) *
Wrote a suicide note	18%	21%	ns

\* p&lt;0.05

\*\* p&lt;0.001

The characteristics surrounding the most serious attempt reported were examined (Table 11). The overwhelming majority of both cases and controls indicated that the attempt occurred when they were feeling depressed. Around a quarter of both cases and controls indicated that the attempt had occurred after they had been drinking alcohol. Almost double the proportion of cases compared to controls indicated that the attempt had occurred after they had been using drugs, a statistically significant difference. A large majority of both cases and controls reported that the suicide attempt followed a disturbing or stressful life event; however, this difference was not statistically significant (Table 11). The nature of the events differed, however, with cases more likely to have experienced the death of someone close; and controls more likely to report diagnoses of a physical or mental health condition as contributing to their attempt.

**Table 11: Characteristics surrounding the attempt**

	Case (n=223)	Control (n=77)	Comparisons
While feeling depressed	95%	91%	ns
Following alcohol use	23%	26%	ns
Following drug use	50%	27%	OR 2.69 (1.53-4.74) **
Following disturbing life event	66%	53%	ns
Death of someone close	23%	3%	OR 8.60 (1.12-66.12) *
Jail/financial problems	14%	7%	ns
Relationship problems	21%	30%	ns
Family problems	17%	17%	ns
Physical/sexual abuse	11%	10%	ns
Physical or mental health problem diagnosed	5%	17%	OR 0.27 (0.08-0.95) *

\* p&lt;0.05

\*\* p&lt;0.001

Female cases were significantly more likely to report family problems (including loss of children) or being physically or sexually assaulted as the event preceding their most serious suicide attempt (Table 12). There were no differences between males and females for controls in terms of the event preceding their most serious suicide attempt (Table 12).

**Table 12: Types of stressful life events reported**

	Case (n=118) <sup>^</sup>		Comparisons	Control (n=30) <sup>^</sup>		Comparisons
	Male (n=59)	Female (n=59)		Male (n=14)	Female (n=16)	
Death of someone close	27%	19%	ns	7%	0%	ns
Jail/financial problems	19%	9%	ns	7%	6%	ns
Relationship problems	22%	21%	ns	29%	31%	ns
Family problems (including loss of children)	9%	25%	OR 3.68 (1.24-10.92) *	14%	19%	ns
Physically or sexually assaulted	5%	17%	OR 3.81 (0.99-14.64) *	7%	13%	ns
<b>Physical or mental health problems</b>	7%	3%	ns	14%	19%	ns

<sup>^</sup> Note some respondents did not report the type of stressful life event preceding attempt

\* p<0.05

\*\* p<0.001

### 3.4 Risk factors associated with suicide attempts

Two logistic regression analyses were conducted to determine if the risk factors for suicide attempts differed among cases and controls. The variables entered into each of these models included: age, gender, employment status, major depressive episode, screening positively for BPD, PTSD, panic disorder, ASPD, experience of any childhood maltreatment (including physical, emotional and sexual abuse, as well as neglect), family history of suicidal behaviour, alcohol dependence, cocaine dependence, stimulant dependence, sedative dependence, cannabis dependence and persistent suicidal thoughts. The results of these two regression models are presented in the first two columns of Table 13.

The results show that three variables consistently remained significant among both groups: screening positively for BPD, persistent suicidal thoughts, and PTSD. In addition to these three variables, sedative dependence remained significant among cases, and stimulant dependence and unemployment remained significant among controls.

An additional regression model was run to determine if opioid dependence made a unique contribution to suicidal risk, over and above the other risk factors (third column). Opioid dependence was not a significant risk factor for suicide attempts over and above the other risk factors identified (Table 13).

**Table 13: Risk factors for suicide attempts**

	Case	Control	Whole sample <sup>^</sup>
<b>Screening positively for BPD</b>	OR 1.86 (1.25-2.78) *	OR 2.39 (1.25-4.55) *	OR 2.06 (1.47-2.90) **
<b>Persistent suicidal thoughts</b>	OR 6.10 (4.11-9.06) **	OR 7.81 (3.93-15.53) **	OR 6.24 (4.44-8.79) **
<b>Lifetime PTSD diagnosis</b>	OR 1.81 (1.24-2.63) *	OR 2.32 (1.15-4.67) *	OR 1.89 (1.36-2.62) **
<b>Lifetime sedative dependence</b>	OR 1.85 (1.27-2.68) *	ns	OR 1.68 (1.17-2.40) *
<b>Unemployment</b>	ns	OR 3.07 (1.57-6.01) *	ns
<b>Lifetime stimulant dependence</b>	ns	OR 2.40 (1.12-5.16) *	OR 1.44 (1.03-2.01) *
<b>Opioid dependence</b>	N/A	N/A	ns

\* p<0.05

\*\* p<0.001

<sup>^</sup>With opioid dependence added as an additional variable



## 4.0 DISCUSSION

The study aimed to examine the prevalence of suicidal behaviour and the risk factors associated with such behaviour among an opioid dependent case group, and a non-opioid dependent control group, matched by age, sex and employment status. Given the lack of data on the extent of the risk factors faced by opioid dependent individuals, this study was the first of its kind. By its design, the main strength of the study was the ability to control for opioid dependence, correlates of suicidal behaviour, and disadvantage.

### 4.1 Major findings

The major findings of the current study were:

1. Cases had significantly higher lifetime prevalence of suicidal ideation, planning and attempts compared to controls, and were more likely to make multiple attempts.
2. Female cases were significantly more likely to report suicidal ideation and suicide attempts compared to male cases. Additionally, female cases were significantly more likely to make multiple attempts.
3. Both cases and controls that had attempted suicide were significantly more likely than others to suffer from substance use and psychological disorders, as well as childhood maltreatment.
4. Cases were significantly more likely to indicate a more severe intent to die compared to controls, despite no differences being identified among the methods used or the seriousness reported.
5. The risk factors which predicted suicide attempts were similar among both cases and controls, with some additional risks identified for each group. Additionally, opioid dependence was not identified as a significant risk factor for suicide attempts over and above the other risk factors identified.

## 4.2 Prevalence of suicidal behaviour

Table 14 summarises the prevalence rates of suicidal behaviour identified within the current study for both cases and controls, and compares these rates with those identified within the literature on opioid dependent samples, as well as community samples.

**Table 14: Comparing the prevalence of suicidal behaviour**

	Current study (Cases)	Opioid dependent samples	Current study (Controls)	Community samples
<b>Ideation (lifetime)</b>	46%	52-60% ^	37%	5-18% ^
<b>Suicide attempts (lifetime)</b>	31%	17-47% ^	20%	3-5% ^
<b>Suicide attempts (12-month)</b>	3%	8-17% ^	3%	0.4-2.2% ^
<b>Multiple attempts</b>	19%	7-22% ^	11%	6% ^

^ See text for references

Cases compared to controls had a significantly higher prevalence on most forms of suicidal expression assessed, including suicidal thoughts, planning and attempts. These results are consistent with the only other case-control study conducted using heroin dependent cases; however, this study uses ‘healthy controls’.<sup>32</sup> The controls in the current study were chosen to reflect similar characteristics to the cases in terms of age, sex and employment status, indicating that opioid dependence increases an individual’s risk for suicidal behaviour. The prevalence of substance use disorders and psychiatric disorders among our control group were elevated above that which is seen in the general population, indicating they were a good match to our cases in order to be able to control for the effects of opioid dependence.

The prevalence of lifetime suicidal ideation among the cases was found to be slightly lower than previous estimates among opioid dependent individuals within the literature.<sup>24,</sup>  
<sup>25</sup> This is an area lacking in research, requiring specific attention to heroin dependent individuals, especially considering there is evidence to suggest ideation is predictive of attempts.<sup>2, 4</sup> The prevalence of lifetime attempts among cases was within the range provided by literature examining both heroin dependent individuals specifically and drug users in general.<sup>24-26, 29-31, 33, 50</sup>

The prevalence of lifetime suicidal ideation among the controls, however, was just over double the highest estimate seen among community samples, while the prevalence of suicide attempts was four times that seen among community samples.<sup>2-9</sup> The high prevalence of such suicidal thinking and behaviour among the control group is alarming, especially if one considers that this is a group not usually targeted for research or treatment. Considering the severe clinical profile of the control group, compared to the general population, it is not surprising that their rates of suicidal ideation and behaviour are much higher. It does, however, flag the need for suicide prevention to be implemented more widely and target individuals suffering other characteristics of disadvantage such as unemployment and psychological disorders.

The prevalence of suicide attempts within the 12 months prior to interview was much lower among the opioid dependent cases compared to the literature.<sup>27, 30, 33</sup> One could speculate that the 12-month prevalence of suicide attempts might be lower in the current study than among those not in treatments. The overwhelming majority (85%) of cases in the current study reported currently receiving treatment, with no differences in 12-month prevalence of suicide attempts among those currently in or not in treatment. Perhaps treatment acts as a protective factor for the development of depression and suicidal behaviour. Participation in pharmacotherapy maintenance treatment at some point in their life was a requirement for participation in the current study, and most case participants were recruited and interviewed through maintenance treatment centres. Therefore, our case sample may have an over-representation of individuals currently receiving treatment.

The prevalence of suicide attempts within the 12 months prior to interview for the control sample was only slightly higher than that seen among general population samples.<sup>2, 5, 51, 52</sup> Examining 12-month prevalence of suicide attempts has been neglected in the research, particularly among heroin dependent individuals, and requires more attention, as knowledge of current suicidal thoughts or behaviours is essential in preventing future acts of suicidal behaviour.

The prevalence of multiple attempts for cases was within the range seen in the literature<sup>27, 29, 31</sup>; however, for controls the prevalence of multiple attempts was almost double that seen among a community sample.<sup>5</sup> Although it is known that the repetition

of attempts increases an individual's risk of subsequently dying from suicide<sup>53</sup>, the prevalence of multiple attempts is rarely investigated. A question assessing multiple attempts should be included in all studies of suicidal behaviour, both among drug users and community samples, in order to assess the possible implications involved in making multiple attempts, and to help prevent future suicidal behaviour.

Cases had significantly higher rates of suicidal behaviour despite being matched to a group equally disadvantaged in other respects, which suggests that opioid dependence plays a major role in increasing an individual's risk of suicidal behaviour. Additionally, the findings provide an insight into the prevalence of suicidal behaviour among a group suffering other factors of disadvantage, but without dependence upon opioids. Although opioid dependence did appear to increase an individual's risk of suicidal behaviour it was not identified as a unique risk factor over and above the other factors identified. These results suggest a group suffering from other clinical problems is also at an increased risk of suicidal behaviour compared to the general population. This indicates the clinical significance of these findings by highlighting how important it is to address suicidal behaviour among both those presenting with opioid dependence as a primary issue and also groups presenting with other clinical problems.

### **4.3 Sex differences and suicidal behaviour**

Female cases were significantly more likely to report thinking about suicide, have persistent suicidal thoughts, to have attempted suicide and to have done so multiple times, compared to male cases. Female cases attempted suicide, on average, four years earlier than male cases. These differences are consistent with those identified in the literature among heroin dependent individuals.<sup>13, 26, 27, 29, 30, 33, 50</sup>

What remains unclear is the finding of no sex differences among the controls, despite research suggesting females have an increased prevalence of suicide attempts compared to males within the general population.<sup>13</sup> It is possible that this lack of difference is in part due to the control group having an increased prevalence of suicidal behaviour above those seen in the general population. The relevance of sex of respondent among a slightly disadvantaged group may become less pronounced. This issue remains questionable, however, and requires further attention.

Female cases were also found to be significantly more likely to attempt suicide prior to the onset of heroin use, a finding consistent with the literature.<sup>33</sup> As others have suggested<sup>33</sup>, this finding may indicate that initial acts of suicidal behaviour among opioid dependent females may be a response to earlier life experiences, such as childhood maltreatment or PTSD, the prevalence of which are high among drug using females.<sup>54, 55</sup> It appears on the other hand that the initial acts of suicidal behaviour among opioid dependent males may be in general a response to drug use or the consequences of a drug using lifestyle, such as incarceration.<sup>33</sup>

As highlighted by Darke and Ross<sup>33</sup>, data for the methods used by males and females in suicide attempts are rarely reported among studies of heroin dependent individuals. The only difference detected was that female cases were significantly more likely to report overdosing on pills (non-opiates) as a means of attempting suicide, a finding supported by the results of Darke and Ross.<sup>33</sup> Data specifically assessing the methods used by males and females in suicide attempts should be routinely assessed, particularly among drug users.

Additionally, it has been suggested in the literature that the sex differences which exist for suicidal behaviour can be explained by the fact that women use less violent methods and they have a lesser intent compared to males.<sup>56</sup> The findings of the current study do not support either of these hypotheses in that there were no differences between males and females, particularly among controls, in terms of the methods used or suicidal intent expressed. It is important to note that a number of other studies have supported the finding that men and women report equal degrees of suicidal intent, even among the general population.<sup>15, 57-59</sup> It could be suggested, however, that the findings of the current study reflect the fact that our case and control groups are both disadvantaged in some respects and therefore differences in sex of respondent are no longer as important as they appear to be among the general population.

The issues of sex differences highlighted in the current study require further attention, particularly among disadvantaged groups or specific clinical samples.

#### 4.4 Risk factors for suicidal behaviour

There were a number of risk factors for suicidal behaviour among both cases and controls. Among the control group, a number of demographic characteristics were found to increase an individual's risk of developing suicidal behaviour, including unemployment, lower educational training, and never being married. These characteristics are consistently identified in the literature among the general population.<sup>2, 4, 9, 51, 60</sup> Of particular significance is the fact that unemployment remained a significant risk factor for suicidal behaviour among controls. Previous research has identified that unemployment may be linked to increases in suicidal behaviour in two ways: firstly, that the consequences which result from unemployment can lead to an increased risk of suicidal behaviour, such as drug and alcohol problems; and secondly, that those suffering from psychological problems are more likely to exhibit suicidal behaviours and are therefore more likely to be unemployed as a result.<sup>61</sup> This finding highlights the need for suicide prevention strategies to target groups of unemployed individuals likely to be suffering from other mental health problems, such as the controls in the current study. It is likely that the demographic characteristics assessed did not increase an individual's risk of suicidal behaviour among the case group because such characteristics are relatively common among this group – for example, unemployment and lower educational level.

A number of other risk factors for suicidal behaviour identified among both the cases and controls included substance use disorders, psychiatric disorders (PTSD, panic disorder, BPD, depressive episode), family members with a history of attempting suicide, and childhood maltreatment. All these are known risk factors for suicidal behaviour among both the general population<sup>36</sup> and heroin dependent individuals.<sup>13</sup> In addition to these risks, polydrug dependence was found to increase the risk of suicidal behaviour among cases; however, as lifetime prevalence was assessed it was not possible to determine if the individuals were using the different drug categories during the same period. Again this additional risk factor for suicidal behaviour is consistent with the literature.<sup>13</sup>

The findings suggest that the risk factors for suicidal behaviour are consistent across different groups within the community, but whilst they are experienced by others, opioid dependent individuals experience the risks at a much higher rate which in turn increases their prevalence of suicidal behaviour. The extent of the risk factors associated with

suicidal behaviour highlight the need for prevention strategies to be implemented in a variety of treatment settings.

It was surprising that depression did not make a unique contribution to the risk of attempting suicide among either the cases or the controls. This could be because persistent suicidal thoughts are more proximal to the act of attempting suicide. Suicidal thoughts have been identified within the literature as a stronger predictor of suicide attempts than depression, both among the general population and among heroin dependent individuals.<sup>4, 62</sup> It is important to note the probable high correlation between persistent suicidal thoughts and depression, given suicidal thoughts are a symptom criterion for depression. When persistent suicidal thoughts were removed from the model, with the addition of depression, the risk factors for suicide attempts remained essentially the same.

As highlighted previously, although opioid dependence was found to be associated with suicide attempts, it did not make a unique contribution over and above the other risk factors identified here. This is an important finding for a number of reasons. Firstly, no previous studies have examined the unique contribution of opioid dependence, which may have misrepresented the contribution of opioid dependence to the risk of attempting suicide. This study found that opioid dependent cases had higher rates of other risk factors, including PTSD and BPD, which were related to higher rates of attempted suicide. It is important for clinicians to take other risk factors into account when assessing suicidal risk among opioid dependent individuals, even if opioid use is their primary concern. These other risk factors along with opioid use need to be addressed in order for suicidal risk to decrease.

#### **4.5 Methods used and intent for suicidal behaviour**

Less than a quarter of cases reported using heroin as a means of attempting suicide. This finding is consistent with the literature, which indicates that heroin users rarely choose heroin as a means of attempting suicide (estimates range from 7-20%).<sup>25, 33, 34</sup> It is important to explore why dependent heroin users, a group aware of the lethal consequences of heroin use, choose not to use heroin in attempting suicide. Perhaps it is due to the fact that – to such users – heroin is their drug of choice, associated with

positive feelings and they do not want these to be confused or tainted by the negative feelings associated with suicide. One could also argue that these users were not intending to kill themselves – perhaps it was more a cry for help – and hence they chose a method seen as less lethal. This, however, is not a plausible explanation in the current study considering a large percentage of our cases reported wanting to die and believed they would die as a result of their attempt, an issue explored in further detail below. Why heroin users do not choose heroin as a means of attempting suicide when they clearly have access to it requires specific attention and further exploration.

There were no major differences between cases and controls in terms of the methods they used for attempting suicide and the consequences which followed in terms of the types of medical intervention sought, indicating no differences in the seriousness of their attempt. If no differences existed in terms of the seriousness of the attempt, it is interesting to note that cases were significantly more likely to have a more severe intent to die than controls.

It is difficult, however, to compare this finding to past research, either general population surveys or studies of heroin dependent individuals, because issues of intent are rarely assessed. What is clear is that intent is a clinically significant issue, requiring further attention and targeted research. Clinicians need to assess suicidal behaviour, both past and current, focusing not only on the methods used but on issues of intent. Opioid dependence per se may increase an individual's subsequent risk of dying from suicide due to the presence of a higher degree of intent. All forms of suicidal behaviour need to be taken seriously among this group when such high levels of intent are expressed. The issue of intent is often difficult to operationalise, however, ideally requiring the development of uniform questions or scales to assess intent.

A relatively low proportion of individuals within the current study indicated that they wrote a suicide note prior to their attempt, indicating that their decision to attempt suicide may have been quick or impulsive. Although other factors may be involved in why individuals choose not to write a suicide note, this is an issue which requires further attention. Research needs to determine what role (if any) impulsivity plays in suicidal behaviour.



## 4.6 Comorbidity and suicidality

The results of the current study indicate that comorbidity plays an important role in increasing an individual's risk of suicidal behaviour. On their own, and in combination, PTSD and BPD have been shown to increase an individual's risk of suicidal behaviour.

A diagnosis of PTSD has been linked to suicidal behaviour in the literature among heroin dependent individuals<sup>26, 63</sup> and also among the general population.<sup>64, 65</sup> The links to suicidal behaviour, however, in relation to the types of PTSD events that increase an individual's risk of suicidal behaviour, for example, need to be explored further. Similarly, a diagnosis of BPD has been linked to suicidal behaviour in the literature among heroin dependent individuals<sup>66</sup> and also among the general population.<sup>67</sup> The relationship between BPD and suicidal behaviour among disadvantaged individuals, such as this control group, needs to be explored further. The issue of impulsive behaviour as a personality trait has also been linked to BPD and suicidal behaviour<sup>68, 69</sup> but requires further investigation as it was beyond the scope of the current study.

Both PTSD and BPD remained significant risk factors among both cases and controls. In multiple ways the results indicate that comorbidity of Axis I (PTSD for example) and Axis II disorders (BPD for example), contribute to increasing an individuals' risk of suicide attempts. This finding has some support in the literature.<sup>70</sup> Hawton et al.<sup>70</sup> found that patients with comorbid personality and psychiatric disorders were more likely to report suicide attempts. The findings suggest it is important for clinicians to assess for both Axes I and II disorders, with treatment targeted at assessing both the drug use disorder and any underlying psychiatric disorder. Each risk factor needs to be addressed, as well as any interaction effects, if the prevalence of suicidal ideation and suicidal behaviour are to be reduced. The combination of risk factors for suicidal behaviour is of further clinical significance among the cases in the current study, as opioid dependence adds an additional layer of risk. Although it is clear that a combination of risk factors may increase an individual's risk of suicide attempts, the types of comorbid disorders which lead to an increased risk of suicidal behaviour need to be explored further.

## 4.7 Conclusions

Although more research is emerging in the suicide literature, very few studies have examined suicidal behaviour among a group of interest with a carefully matched control group. The current study is novel in terms of comparing an opioid dependent case group to a control group matched in terms of age, sex and employment status. The control group allowed for the presence of opioid dependence to be examined by controlling for other factors of disadvantage.

The controls in the current study were found to have much higher rates of suicidal behaviour than community samples, indicating some cause for concern and clinical intervention. Also troubling, however, was the finding that despite suffering from similar levels of disadvantage, cases still had much higher rates of suicidal behaviour than controls. Opioid dependence, however, did not make a unique contribution to the risk of suicide attempts over and above the other risk factors identified.

Despite differing levels of suicidal behaviour among cases and controls, the current study found the risk factors for suicidal behaviour remained essentially the same. The findings suggest that when individuals suffer from drug use disorders, psychiatric disorders, and comorbidity, the risk for suicidal behaviour increases, and when one group experiences these risk factors at a significantly higher rate (such as the cases in the current study), then the prevalence of suicidal behaviours also increases among this group. The results highlight the need for suicide prevention strategies to target both opioid dependent individuals and individuals suffering from a range of other clinical issues and levels of disadvantage.

Another main finding of the current study was that female cases were significantly more likely to think about and attempt suicide (including multiple times) compared to male cases. Additionally, cases were significantly more likely to indicate a more severe intent to die compared to controls, despite no differences being identified among the methods used or the seriousness reported.

A number of limitations of the current study need to be kept in mind whilst assessing the impact of the results presented. The case and control groups were not balanced entirely in terms of age, sex and employment status, with some significant differences being

detected. This was overcome, however, by statistically controlling for these factors in any regression analyses conducted. It should also be noted that it is clear from the prevalence of drug use and mental health characteristics that our control group was sufficiently disadvantaged compared to the prevalence of these disorders in the general population, which allowed for the effect of heroin dependence to be controlled for. Additionally, the employment status matching criteria used is not ideal but is indicative of disadvantage, and considering this the first study of this kind, it provides a good starting point for future research. It is also important to note that our selection of cases based on their receiving treatment may limit generalisability to heroin dependent individuals as a whole.

A number of limitations exist in terms of the study relying on self-report and the amount of recall bias introduced in assessing lifetime prevalence; however, these measures are commonly used in studies on illicit drug users and have been shown to be adequately valid and reliable.<sup>14, 71</sup> Additionally, it has been suggested that under-reporting may exist when assessing sensitive issues such as childhood abuse, but studies have shown developmental outcomes are not affected by such under-reporting.<sup>42</sup> Further, the BPD section is limited in not providing a diagnosis for BPD but only screening for a potential ICD-10 diagnosis, which may in fact over-predict prevalence rates. Despite this, many studies have used this screener among a variety of population types.<sup>46, 72-75</sup>

The study has highlighted a number of areas where future research can be targeted towards. Sex differences in suicidal behaviour need to be examined further, especially among other disadvantaged groups (such as our control group), as it is unclear why sex differences become less pronounced among such groups compared to the general population. The relationship of suicide attempts to both PTSD and BPD needs to be explored further, in addition to impulsive behaviour and its relationship to suicidal behaviour. The issue of intent also requires further attention to determine the specific mechanisms involved in predicting outcomes from stated intent, for example. Comorbidity and its relationship to suicidal behaviour need to be examined further in terms of the specific types of comorbid disorders which increase suicidal behaviour.

## 5.0 REFERENCES

1. Diekstra RFW, Kienhorst CWM, de Wilde EJ. Suicide and suicidal behaviour among adolescents. In: Rutter M, Smith DJ, eds. *Psychosocial Disorders in Young People*. Chichester: John Wiley & Sons; 1995. p. 686-761.
2. Pirkis J, Burgess P, Dunt D. Suicidal ideation and suicide attempts among Australian adults. *Crisis* 2000; 21(1):16-24.
3. Hintikka J, Pesonen T, Saarinen P, Tanskanen A, Lehtonen J, Viinamaki H. Suicidal ideation in the Finnish general population. A 12 month follow-up study. *Social Psychiatry and Psychiatric Epidemiology* 2001; 36:590-594.
4. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Archives of General Psychiatry* 1999; 56(7):617-626.
5. De Leo D, Cerin E, Spathonis K, Burgis S. Lifetime risk of suicide ideation and attempts in an Australian community: Prevalence, suicidal process, and help-seeking behaviour. *Journal of Affective Disorders* 2005; 86:215-224.
6. Bronisch T, Wittchen HU. Suicidal ideation and suicide attempts: comorbidity with depression, anxiety disorders, and substance abuse disorder. *European Archives of Psychiatry and Clinical Neuroscience* 1994; 244:93-98.
7. Weissman MM, Bland RC, Canino GJ, Greenwald S, Hwu HG, Joyce PR, et al. Prevalence of suicide ideation and suicide attempts in nine countries. *Psychological Medicine* 1999; 29:9-17.
8. Goldney RD, Wilson D, Dal Grande E, Fisher LJ, McFarlane AC. Suicidal ideation in a random community sample: attributable risk due to depression and psychosocial and traumatic events. *Australian and New Zealand Journal of Psychiatry* 2000; 34:98-106.
9. Moscicki EK, O'Carroll P, Rae DS, Locke BZ, Roy A, Regier DA. Suicide attempts in the epidemiologic catchment area study. *Yale Journal of Biology and Medicine* 1988; 61:259-268.
10. Ramsay R, Bagley C. The prevalence of suicidal behaviors, attitudes and associated social experiences in an urban population. *Suicide & Life-Threatening Behavior* 1985; 15(3):151-167.
11. Borges G, Walters EE, Kessler RC. Associations of substance use, abuse, and dependence with subsequent suicidal behavior. *American Journal of Epidemiology* 2000; 151(8):781-789.
12. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow M, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide & Life-Threatening Behavior* 2001; 32(Supplement):49-59.

13. Darke S, Ross J. Suicide among heroin users: Rates, risk factors and methods. *Addiction* 2002; 97:1383-1394.
14. Darke S. Self-report among injecting drug users: A review. *Drug and Alcohol Dependence* 1998; 51:253-263.
15. Beautrais AL, Joyce PR, Mulder RT, Fergusson DM, Deavoll BJ, Nightingale SK. Prevalence and comorbidity of mental disorders in persons making serious suicide attempts: A case-control study. *American Journal of Psychiatry* 1996; 153(8):1009-1014.
16. Henriksson MM, Aro HM, Marttunen MJ, Heikkinen ME, Isometsa ET, Kuoppasalmi KI, et al. Mental disorders and comorbidity in suicide. *The American Journal of Psychiatry* 1993; 150(6):935-940.
17. Hall WD, Ross JE, Lynskey MT, Law MG, Degenhardt LJ. How many dependent heroin users are there in Australia? *Medical Journal of Australia* 2000; 173:528-531.
18. Degenhardt L, Hall W, Warner-Smith M, Lynskey M. Illicit drug use. In: Ezzati M, Lopez AD, Rodgers A, Murray CJL, eds. *Comparative quantification of health risks: Global and regional burden of disease attributable to selected major risk factors*. Geneva: World Health Organisation; 2004. p. 1109-1175.
19. Hulse GK, English DR, Milne E, Holman CDJ. The quantification of mortality resulting from the regular use of illicit opiates. *Addiction* 1999; 94(2):221-229.
20. Darke S, Ross J, Teesson M, Ali R, Cooke R, Ritter A, et al. Factors associated with 12 months continuous heroin abstinence: Findings from the Australian Treatment Outcome Study (ATOS). *Journal of Substance Abuse Treatment* 2005; 28:255-263.
21. Hser YI, Hoffman V, Grella CE, Anglin D. A 33-year follow-up of narcotics addicts. *Archives of General Psychiatry* 2001; 58:503-508.
22. Darke S, Degenhardt L, Mattick R. *Mortality among illicit drug users: Epidemiology, causes and intervention*. Cambridge: Cambridge University Press; 2006.
23. Flynn PM, Joe GW, Broome KM, Simpson DD, Brown BS. Recovery from opioid addiction in DATOS. *Journal of Substance Abuse Treatment* 2003; 25:177-186.
24. Cottler LB, Campbell W, Krishna AS, Cunningham-Williams RM, Abdallah AB. Predictors of high rates of suicidal ideation among drug users. *Journal of Nervous and Mental Disease* 2005; 193(7):431-437.
25. Vingoe L, Welch S, Farrell M, Strang J. Heroin overdose among a treatment sample of injecting drug misusers: Accident or suicidal behaviour? *Journal of Substance Use* 1999; 4:88-91.
26. Darke S, Ross J, Lynskey MT, Teesson M. Attempted suicide among entrants to three treatment modalities for heroin dependence in the Australian Treatment

- Outcome Study (ATOS): Prevalence and risk factors. *Drug and Alcohol Dependence* 2004; 73:1-10.
27. Darke S, Williamson A, Ross J, Teesson M. Attempted suicide among heroin users: 12-month outcomes from the Australian Treatment Outcome Study (ATOS). *Drug and Alcohol Dependence* 2005; 78:177-186.
  28. Rossow I, Lauritzen G. Balancing on the edge of death: suicide attempts and life-threatening overdoses among drug addicts. *Addiction* 1999; 94(2):209-219.
  29. Murphy SL, Rounsaville BJ, Eyre S, Kleber HD. Suicide attempts in treated opiate addicts. *Comprehensive Psychiatry* 1983; 24(1):79-89.
  30. Mills KL, Teesson M, Darke S, Ross J, Lynskey M. Young people with heroin dependence: Findings from the Australian Treatment Outcome Study (ATOS). *Journal of Substance Abuse Treatment* 2004; 27:67-73.
  31. Rossow I, Lauritzen G. Shattered childhood: a key issue in suicidal behavior among drug addicts? *Addiction* 2001; 96:227-240.
  32. Koyuncu A, Mirsal H, Yavuz FM, Kalyoncu AO, Beyazyurek M. Suicide ideation, planning and attempt of heroin dependent patients. *Journal of Dependence* 2003; 4(3):101-104.
  33. Darke S, Ross J. The relationship between suicide and heroin overdose among methadone maintenance patients in Sydney, Australia. *Addiction* 2001; 96:1443-1453.
  34. Johnsson E, Fridell M. Suicide attempts in a cohort of drug abusers: A 5-year follow-up study. *Acta Psychiatrica Scandinavica* 1997; 96:362-366.
  35. Botsis AJ. Suicidal behavior: risk and protective factors. In: Botsis AJ, Soldatos CR, Stefanis CN, eds. *Suicide: Biopsychosocial Approaches*. Amsterdam: Elsevier; 1997. p. 129-146.
  36. Beautrais AL. Risk factors for suicide and attempted suicide among young people. *Australian and New Zealand Journal of Psychiatry* 2000; 34:420-436.
  37. Black E, Degenhardt L, Stafford J. *New South Wales Drug Trends 2005: Findings from the Illicit Drug Reporting System (IDRS)*. Sydney: National Drug and Alcohol Research Centre; 2006. Technical Report No. 248.
  38. Hesselbrock M, Easton C, Bucholz KK, Schuckit M, Hesselbrock V. A validity study of the SSAGA – a comparison with the SCAN. *Addiction* 1999; 94(9):1361-1370.
  39. Bucholz KK, Cadoret R, Cloninger RC, Dinwiddie SH, Hesselbrock VM, Nurnberger JI, et al. A new, semi-structured psychiatric interview for use in genetic linkage studies: A report on the reliability of SSAGA. *Journal of Studies on Alcohol* 1994; 55:149-158.

40. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders Third Edition Revised DSM-III-R. Washington, DC: American Psychiatric Association; 1987.
41. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders Fourth Edition Text Revised DSM-IV-TR. Washington, DC: American Psychiatric Association; 2000.
42. Fergusson DM, Horwood LJ, Woodward LJ. The stability of child abuse reports: A longitudinal study of the reporting behaviour of young adults. *Psychological Medicine* 2000; 30(3):529-544.
43. Loranger AW, Sartorius N, Andreoli A, Berger P, Buchheim P, Channabasavanna SM, et al. The International Personality Disorder Examination: The World Health Organization/Alcohol, Drug Abuse, and Mental Health Administration International Pilot Study of Personality Disorders. *Archives of General Psychiatry* 1994; 51(3):215-224.
44. Jackson HJ, Burgess PM. Personality disorders in the community: A report from the Australian National Survey of Mental Health and Wellbeing. *Social Psychiatry and Psychiatric Epidemiology* 2000; 35:531-538.
45. World Health Organization. The ICD-10 classification of mental and behavioural disorders: Diagnostic criteria for research. Geneva: World Health Organization; 1993.
46. Ross J, Teesson M, Darke S, Lynskey M, Hetherington K, Mills K, et al. Characteristics of heroin users entering three treatment modalities in New South Wales: Baseline findings from the Australian Treatment Outcome Study (ATOS). Sydney: National Drug and Alcohol Research Centre, University of New South Wales; 2003. Technical Report No.139.
47. Weissman MM, Wickramaratne P, Adams P, Wolk S, Verdelli H, Olfson M. Brief screening for family psychiatric history: The Family History Screen. *Archives of General Psychiatry* 2000; 57(7):675-682.
48. Rice JP, Reich T, Bucholz KK, Neuman RJ, Fishman R, Rochberg N, et al. Comparison of direct interview and family history diagnoses of alcohol dependence. *Alcoholism: Clinical and Experimental Research* 1995; 19(4):1018-1023.
49. SPSS Inc. SPSS for Windows, version 14.0. Chicago; 2005.
50. Ravndal E, Vaglum P. Overdoses and suicide attempts: Different relations to psychopathology and substance abuse? A 5-year prospective study of drug abusers. *European Addiction Research* 1999; 5:63-70.
51. Crosby AE, Cheltenham MP, Sacks JJ. Incidence of suicidal ideation and behavior in the United States, 1994. *Suicide & Life-Threatening Behavior* 1999; 29(2):131-140.

52. Madianos MG, Gefou-Madianou D, Stefanis CN. Symptoms of depression, suicidal behaviour and use of substances in Greece: A nationwide general population survey. *Acta Psychiatrica Scandinavica* 1994; 89:159-166.
53. Hawton K. *Attempted suicide: A practical guide to its nature and management*. 2nd edition. Oxford: Oxford University Press; 1987.
54. Medrano MA, Zule WA, Hatch J, Desmond DP. Prevalence of childhood trauma in a community sample of substance-abusing women. *American Journal of Drug and Alcohol Abuse* 1999; 25(3):449-462.
55. Mills K, Lynskey M, Teesson M, Ross J, Darke S. Post-traumatic stress disorder among people with heroin dependence in the Australian treatment outcome study (ATOS): Prevalence and correlates. *Drug and Alcohol Dependence* 2005; 77:243-249.
56. Rich CL, Ricketts JE, Fowler RC, Young D. Some differences between men and women who commit suicide. *The American Journal of Psychiatry* 1988; 145(6):718-724.
57. Canetto SS, Sakinofsky I. The gender paradox in suicide. *Suicide & Life-Threatening Behavior* 1998; 28(1):1-23.
58. Denning DG, Conwell Y, King D, Cox C. Method choice, intent, and gender in completed suicide. *Suicide & Life-Threatening Behavior* 2000; 30(3):282-288.
59. Brent DA, Baugher M, Bridge J, Chen T, Chiappetta L. Age- and sex-related risk factors for adolescent suicide. *Journal of the American Academy of Child and Adolescent Psychiatry* 1999; 38(12):1497-1505.
60. Schmidtke A, Bille-Brahe U, De Leo D, Kerkhof A, eds. *Suicidal behaviour in Europe: Results from the WHO/EURO Multicentre Study on Suicidal Behaviour*. Cambridge: Hogrefe & Huber; 2004.
61. Hawton K, Fagg J, Simkin S. Female unemployment and attempted suicide. *British Journal of Psychiatry* 1988; 152:632-637.
62. Darke S, Ross J, Williamson A, Mills KL, Havard A, Teesson M. Patterns and correlates of attempted suicide by heroin users over a 3-year period: Findings from the Australian treatment outcome study. *Drug and Alcohol Dependence* 2007; 87:146-152.
63. Clark WH, Masson CL, Delucchi KL, Hall SM, Sees KL. Violent traumatic events and drug abuse severity. *Journal of Substance Abuse Treatment* 2001; 20:121-127.
64. Oquendo M, Brent DA, Birmaher B, Greenhill L, Kolko D, Stanley B, et al. Posttraumatic stress disorder comorbid with major depression: Factors mediating the association with suicidal behavior. *American Journal of Psychiatry* 2005; 162(3):560-566.
65. Tarrier N, Gregg L. Suicide risk in civilian PTSD patients. *Social Psychiatry and Psychiatric Epidemiology* 2004; 39:655-661.



66. Darke S, Williamson A, Ross J, Teesson M, Lynskey M. Borderline personality disorder, antisocial personality disorder and risk-taking among heroin users: findings from the Australian Treatment Outcome Study (ATOS). *Drug and Alcohol Dependence* 2004; 74:77-83.
67. Suominen K, Henriksson M, Suokas J, Isometsa E, Ostamo A, Lonnqvist J. Mental disorders and comorbidity in attempted suicide. *Acta Psychiatrica Scandinavica* 1996; 94:234-240.
68. Baca-Garcia E, Diaz-Sastre C, Garcia-Resa E, Blasco H, Braquehais-Conesa D, Oquendo MA, et al. Suicide attempts and impulsivity. *European Archives of Psychiatry and Clinical Neuroscience* 2005; 255:152-156.
69. Links PS, Heslegrave R, van Reekum R. Impulsivity: Core aspect of borderline personality disorder. *Journal of Personality Disorders* 1999; 13(1):1-9.
70. Hawton K, Houston K, Haw C, Townsend E, Harriss L. Comorbidity of Axis I and Axis II disorders in patients who attempted suicide. *American Journal of Psychiatry* 2003; 160(8):1494-1500.
71. Dougherty DM, Mathias CW, Marsh DM, Moeller GF, Swann AC. Suicidal behaviors and drug abuse: impulsivity and its assessment. *Drug and Alcohol Dependence* 2004; 76(Supplement 1):s93-s105.
72. Slade T, Peters L, Schneiden V, Andrews G. The International Personality Disorder Examination Questionnaire (IPDEQ): Preliminary data on its utility as a screener for anxious personality disorder. *International Journal of Methods in Psychiatric Research* 1998; 7(2):84-88.
73. Lenzenweger MF, Loranger AW, Kornfine L, Neff C. Detecting personality disorders in a non-clinical population: application of a two-stage procedure for case identification. *Archives of General Psychiatry* 1997; 54:345-351.
74. Loranger AW, Janca A, Sartorius N. Assessment and diagnosis of personality disorders: The ICD-10 international personality disorder examination (IPDE). Cambridge: Cambridge University Press; 1997.
75. Lewin TJ, Slade T, Andrews G, Carr VJ, Hornabrook CW. Assessing personality disorders in a national mental health survey. *Social Psychiatry and Psychiatric Epidemiology* 2005; 40:87-98.

## APPENDIX A: RISK FACTORS FOR SUICIDAL BEHAVIOUR

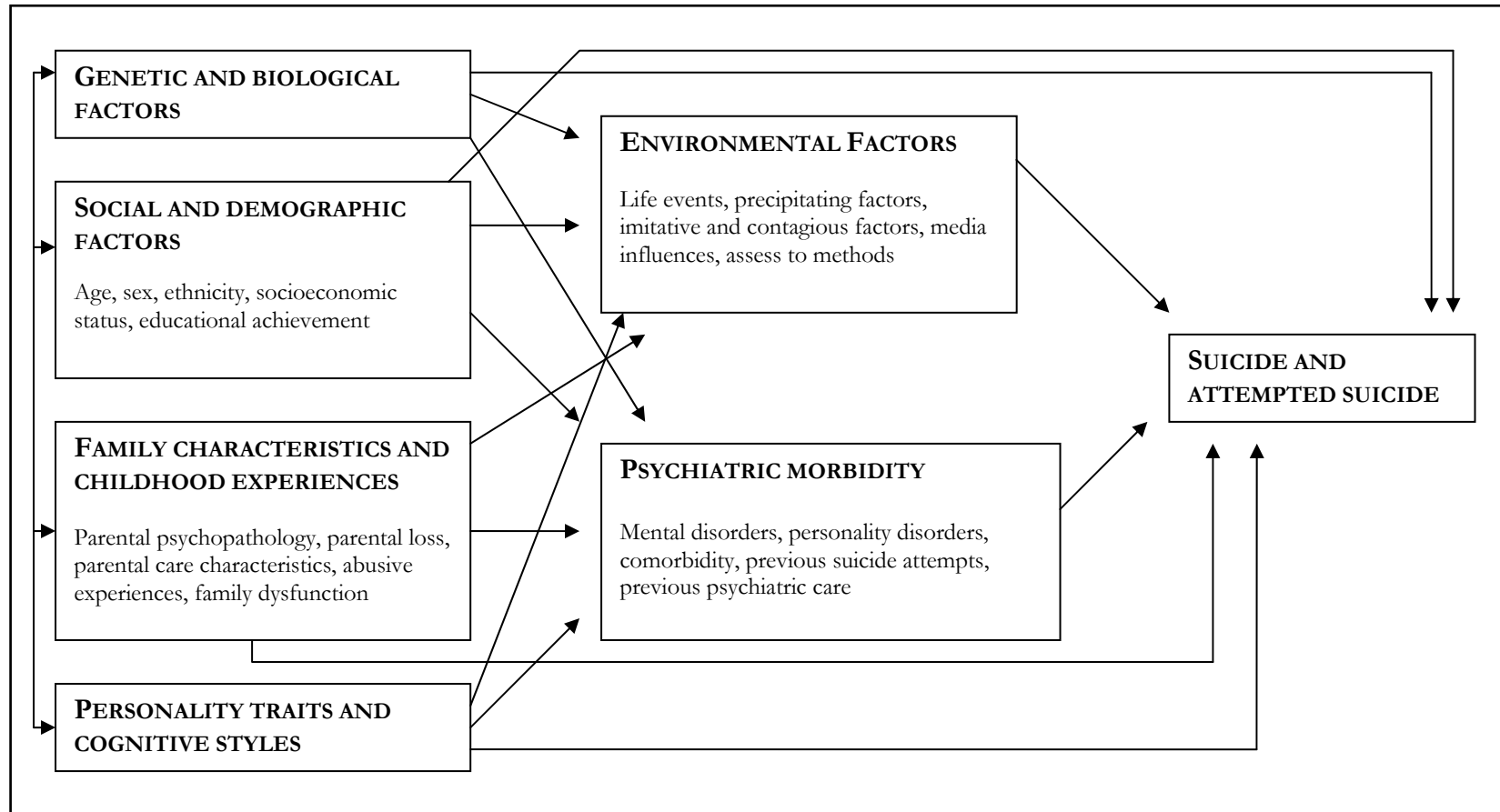


Figure 1: A conceptual model indicating the domains of risk factors for suicide and suicide attempts (From Beautrais<sup>36:429</sup>)

## APPENDIX B: PARTICIPANT SCREENING QUESTIONNAIRE

1. How old are you?
2. What is your date of birth?
3. Sex – Male or Female
4. What suburb do you live in? How long have you lived in Sydney for?
5. Where did you find out about the study?
6. In the past 4 weeks, about how often did you feel so sad that nothing could cheer you up? (Circle one)
  - None of the time
  - A little of the time
  - Some of the time
  - Most of the time
  - All the time
7. In the past 4 weeks, about how often did you feel so nervous that nothing could cheer you up? (Circle one)
  - None of the time
  - A little of the time
  - Some of the time
  - Most of the time
  - All the time
8. On how many days in the last month did you have a drink of alcohol?
9. About how many times would you have used the following drugs in your whole life? (not counting use for medicinal purposes):
  - Cannabis
  - Morphine or Pethidine
  - Codeine or Panadeine
  - Heroin or opium
  - Methadone
10. Have you ever been on methadone or buprenorphine treatment?
11. Have you ever been under a guardianship order? Is the order still current?
12. Are you currently employed?

Code silently – Does the participant have an adequate grasp of English

## **APPENDIX C: DSM-IV CRITERIA FOR SUBSTANCE USE DEPENDENCE**

CRITERION A – maladaptive pattern of substance use, leading to clinically significant impairment or distress, as manifested by three (or more) of the following, occurring at any time in the same 12-month period:

- (1) tolerance, as defined by either of the following:
  - (a) a need for markedly increased amounts of the substance to achieve intoxication or desired effect
  - (b) markedly diminished effect with continued use of the same amount of the substance
- (2) withdrawal, as manifested by either of the following:
  - (a) the characteristic withdrawal symptoms for the substance (refer to Criteria A and B of the criteria sets for Withdrawal from the specific substances)
  - (b) the same (or closely related) substance is taken to relieve or avoid withdrawal symptoms
- (3) the substance is often taken in larger amounts or over a longer period than was intended
- (4) there is a persistent desire or unsuccessful efforts to cut down or control substance use
- (5) a great deal of time is spent in activities necessary to obtain the substance (e.g., visiting multiple doctors or driving long distances), use the substance (e.g., chain smoking), or recover from its effects
- (6) important social, occupational, or recreational activities are given up or reduced because of substance use
- (7) the substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance (e.g., current cocaine use despite recognition of cocaine-induced depression, or continued drinking despite recognition that an ulcer was made worse by alcohol consumption)

## **APPENDIX D: DSM-IV CRITERIA FOR PTSD**

CRITERION A – The person has been exposed to a traumatic event in which both of the following were present:

- (1) the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others;
- (2) the person's response involved intense fear, helplessness, or horror.

CRITERION B – The traumatic event is persistently re-experienced in one (or more) of the following ways:

- 1) recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions;
- (2) recurrent distressing dreams of the event;
- (3) acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experiences, illusions, hallucinations, dissociative, flashback episodes);
- (4) intense psychological distress at exposure to internal or external cues that symbolise or resemble an aspect of the traumatic event;
- (5) physiological reactivity on exposure to internal or external cues that symbolise or resemble an aspect of the traumatic event.

CRITERION C – Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness, as indicated by three (or more) of the following:

- (1) effects of avoid thoughts, feelings or conversations associated with the trauma;
- (2) effects to avoid activities, places, or people that arouse recollections of the trauma;
- (3) inability to recall an important aspect of the trauma;
- (4) markedly diminished interest or participation in significant activities;
- (5) feeling of detachment or estrangement from others;
- (6) restricted range of affect (e.g., unable to have loving feelings);
- (7) sense of foreshortened future.

CRITERION D – Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:

- (1) difficulty falling or staying asleep;
- (2) irritability or outbursts of anger;
- (3) difficulty concentrating;
- (4) hypervigilance;
- (5) exaggerated startle response.

CRITERION E – Duration of the disturbance (symptoms in Criteria B, C and D) is more than 1 month.

CRITERION F – The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

## **APPENDIX E: DSM-IV CRITERIA FOR ASPD**

CRITERION A – There is a pervasive pattern of disregard for and violation of the rights of others occurring since age 15 years, as indicated by three (or more) of the following:

- (1) failure to conform to social norms with respect to lawful behaviors as indicated by repeatedly performing acts that are grounds for arrest
- (2) deceitfulness, as indicated by repeated lying, use of aliases, or conning others for personal profit or pleasure
- (3) impulsivity or failure to plan ahead
- (4) irritability and aggressiveness, as indicated by repeated physical fights or assaults
- (5) reckless disregard for safety of self or others
- (6) consistent irresponsibility, as indicated by repeated failure to sustain consistent work behavior or honour financial obligations
- (7) lack of remorse, as indicated by being indifferent to or rationalising having hurt, mistreated, or stolen from another.

CRITERION B – The individual is at least 18 years.

CRITERION C – There is evidence of Conduct Disorder with onset before age 15 years.

CRITERION D – The occurrence of antisocial behavior is not exclusively during the course of Schizophrenia or a Manic Episode (not assessed in the current study).

## **APPENDIX F: DSM-IV CRITERIA FOR PANIC DISORDER**

CRITERION A – Both (1) and (2):

- (1) recurrent unexpected Panic Attacks
- (2) at least one of the attacks has been followed by 1 month (or more) of one (or more) of the following:
  - (a) persistent concern about having additional attacks
  - (b) worry about the implications of the attack or its consequences (e.g., losing control, having a heart attack, “going crazy”)
  - (c) a significant change in behavior related to the attacks.

CRITERION B – Absence of agoraphobia.

CRITERION C – The panic attacks are not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a general medical condition (e.g., hyperthyroidism).

CRITERION D – The panic attacks are not better accounted for by another mental disorder, such as Social Phobia (e.g., occurring on exposure to feared social situations), Specific Phobia (e.g., on exposure to a specific phobic situation), Obsessive-Compulsive Disorder (e.g., on exposure to dirt in someone with an obsession about contamination), Posttraumatic Stress Disorder (e.g., in response to stimuli associated with a severe stressor), or Separation Anxiety Disorder (e.g., in response to being away from home or close relatives).

## **APPENDIX G: DSM-IV CRITERIA FOR MAJOR DEPRESSIVE EPISODE**

CRITERION A. Five (or more) of the following symptoms have been present during the same 2 week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure:

- (a) depressed mood most of the day, nearly every day, as indicated by either subjective report or observation made by others;
- (b) markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day;
- (c) significant weight loss when not dieting or weight gain, or decrease or increase in appetite nearly every day;
- (d) insomnia or hypersomnia near every day;
- (e) psychomotor agitation or retardation nearly everyday;
- (f) fatigue or loss of energy nearly every day;
- (g) feelings of worthlessness or excessive or inappropriate guilt nearly every day;
- (h) diminished ability to think or concentrate, or indecisiveness nearly every day;
- (i) recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.

CRITERION B – The symptoms do not meet criteria for a mixed episode (not assessed in the current study).

CRITERION C – The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

CRITERION D – The symptoms are not due to the direct physiological effects of a substance or a general medical condition.

CRITERION E – The symptoms are not better accounted for by bereavement or are characterised by marked functional impairment, morbid preoccupation with worthlessness, suicidal ideation, psychotic symptoms, or psychomotor retardation.