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**Prevalence and correlates of Post Traumatic
Stress Disorder (PTSD) among people
with heroin dependence:
Findings from the Australian Treatment
Outcome Study (NSW)**

NDARC Technical Report No. 169

**PREVALENCE AND CORRELATES OF POST TRAUMATIC
STRESS DISORDER (PTSD) AMONG PEOPLE
WITH HEROIN DEPENDENCE:
FINDINGS FROM THE AUSTRALIAN TREATMENT
OUTCOME STUDY (NSW)**

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EXECUTIVE SUMMARY

Introduction

Post traumatic stress disorder (PTSD) and substance use disorder (SUD) often co-occur, yet little is known of the relationship between heroin dependence and PTSD. With increasing rates of heroin dependence it is important that the prevalence and correlates of PTSD are examined. The present study is the first to examine PTSD in a large sample of heroin users in Australia.

Method

The current study utilises data collected as part of the New South Wales (NSW) component of the Australian Treatment Outcome Study (ATOS). ATOS is a 12 month longitudinal study of entrants to treatment for heroin dependence. Participants were recruited from 19 treatment agencies randomly selected from within three main treatment modalities (methadone/buprenorphine maintenance, detoxification, and residential rehabilitation) stratified by area health service. Five hundred and thirty five individuals entering treatment and 80 heroin users not seeking treatment were recruited into the study and interviewed by trained researchers using a structured questionnaire. Valid and reliable instruments including the Opiate Treatment Index (OTI), Short Form-12 (SF-12) and the Composite International Diagnostic Interview (CIDI) were used to measure drug use, health, criminal activity, PTSD and other psychiatric comorbidity.

Results

Prevalence of trauma exposure and PTSD

Almost all (92%) of the sample had experienced at least one traumatic event during their lives with the majority experiencing multiple traumas. PTSD was highly prevalent among this group of heroin users (41%), with women being more likely to develop PTSD than men following exposure to trauma. Those with PTSD were presented across all treatment modalities. The highest proportion was in the residential rehabilitation group and the lowest in the non-treatment group.

Most upsetting trauma and conditional risk of developing PTSD

A higher prevalence of PTSD was found among those who had been raped or sexually molested. Importantly, it is apparent from this analysis that gender differences in the lifetime prevalence of PTSD arise from gender differences in responses to trauma exposure rather than from differences between the genders in rates of exposure to traumatic events.

PTSD and heroin use: order of onset

There was no clear temporal sequence of PTSD and heroin use.

Drug use and heroin use history

Those with PTSD had a more extensive history of polydrug use, having used a greater number of drug classes in their lifetime and in the preceding 6 months compared to those without PTSD. Although the frequency of current heroin use was similar for those with and without PTSD, those with PTSD were more likely to have experienced heroin overdose.

Criminal activity

Those with PTSD were more likely to have committed violent crime in the preceding month.

Physical and mental health

Of major clinical importance are the high rates of comorbidity found among those with PTSD. Those with PTSD had poorer general physical and mental health, and were more likely to have current Major Depression, have attempted suicide, and screen positive for Borderline Personality Disorder.

Patterns of treatment seeking and health service utilisation

Those with PTSD had a greater number of previous treatment attempts for heroin dependence than those without PTSD. They were also more likely to have consulted a social worker or counsellor and a General Practitioner, and to have been prescribed anti-depressants or other psychotropic medications (i.e., narcotic analgesics and antipsychotics) in the preceding month.

Independent factors associated with PTSD

Screening positive for BPD, being female, nominating sexual molestation as the most stressful event, having experienced a greater number of traumatic events, and being older were significant predictors of a positive PTSD diagnosis.

Conclusion

Given that PTSD and its related psychiatric comorbidity may be associated with poorer substance abuse treatment outcomes it is important that clinicians are aware of the high prevalence of the disorder among heroin users. As the first large scale longitudinal study to examine PTSD among people with heroin dependence, future reports from ATOS will present data on the impact of PTSD on treatment outcomes 3 and 12 months post treatment entry.

1. INTRODUCTION

It has been well documented that heroin users have high rates of psychiatric comorbidity, most commonly mood disorders, anxiety disorders, and anti-social personality disorder (ASPD) (Brooner et al., 1997, Darke et al., 1994, Darke and Ross, 1997, Krausz et al., 1998, Rounsaville et al., 1982, Swift et al., 1990, Woody et al., 1983). Despite the high prevalence of trauma exposure among this group (72%; Clark et al., 2001), very few studies have examined the prevalence of post traumatic stress disorder (PTSD) among people who are heroin dependent.

PTSD is an anxiety disorder that may develop after an individual has experienced, witnessed, or been confronted with an event involving actual (or threatened) serious injury or death or a threat to the physical integrity of the self or others. Such events include combat, natural disasters, life threatening accidents, witnessing serious injury or death, rape, sexual molestation, being threatened with a weapon, tortured or the victim of terrorists. The experience of such an event is the first of several diagnostic criteria that must be met for a diagnosis of PTSD. A summary of the criteria is presented in Appendix A. In approximately half of cases, a complete recovery may occur within 3 months. For many others symptoms persist for longer than 12 months forming a chronic, debilitating condition (American Psychiatric Association, 1994).

Heroin use and the lifestyle associated with it may increase the risk of exposure to trauma, indirectly increasing the likelihood of subsequent PTSD. The prevalence of PTSD in the United States (US) general population is estimated to be 1-9%. The few studies that have been conducted on heroin users undergoing methadone maintenance treatment (MMT) report much higher rates of PTSD, between 14-31% (Clark et al., 2001, Hien et al, 2000, Milby et al, 1996, Villagomez et al, 1995). As in the general population, heroin using women are more likely to be diagnosed with PTSD than men and a diagnosis has been associated with high levels of comorbidity. Preliminary research also suggests PTSD may adversely affect treatment outcomes for heroin dependence. At 3 month follow up, Hien et al. (2000) found that those with PTSD had more ongoing drug use than those without PTSD.

Although the few studies of PTSD among heroin users have raised concerns about the prevalence of the disorder among this group, the generalisability of their findings is limited as their samples are confined to those enrolled in MMT in the US. Thus, the rates of PTSD among treatment seeking heroin users generally, and from countries other than the US remains unclear. As there is no published data concerning the prevalence of PTSD among Australian heroin users, it is pertinent that such research is undertaken.

1.1 Aims

Using data collected as part of the New South Wales (NSW) component of the Australian Treatment Outcome Study (ATOS) (Ross et al., 2002), the present study aims to:

- determine the prevalence of trauma exposure and PTSD among heroin users;
- identify correlates and independent predictors of PTSD among heroin users.

2. METHODS

2.1 Procedure

The data presented in this report were collected between February 2001 and August 2002 as part of the New South Wales (NSW) component of Australian Treatment Outcome Study (ATOS). ATOS is the first large scale naturalistic longitudinal study of treatment outcome for heroin dependence to be conducted in Australia. A detailed account of the method used may be found in Ross et al (2002)

Participants were recruited from 19 agencies treating heroin dependence in the greater Sydney region. Agencies were randomly selected from within treatment modality and stratified by regional health area. The agencies comprised ten methadone/buprenorphine maintenance agencies (MT), four drug free residential rehabilitation agencies (RR) and nine detoxification facilities (DTX). Four agencies provided both maintenance and detoxification services. In addition a comparison group of heroin users not currently in treatment (NT) were recruited from needle and syringe programs in the regional health areas from which treatment entrants were recruited.

2.2 Eligibility criteria and participation rate

Eligibility criteria were: i) no treatment for heroin dependence in the preceding month, ii) no imprisonment in the preceding month, iii) aged 18 years or over, iv) agreed to give contact details for follow-up interviews; and v) have a good understanding of English. A total of 1530 clients entering treatment were approached to participate in ATOS, of whom 535 (35%) were enrolled in the study: 836 (55%) did not meet eligibility criteria, 97 (6%) repeatedly failed to attend the baseline interview (“passive refusal”) and 62 (4%) directly refused to enter the study. Of the 836 clients who did not meet eligibility criteria for ATOS, the majority were excluded because they had been in treatment (65%) or had been in prison (17%) in the preceding month. A further 9% of clients were excluded because they had already participated in ATOS, and the remaining 9% for other reasons (unwilling to give contact details, under 18, or insufficient English to complete the interview).

Similarly, in order to obtain the NT group, 434 individuals attending needle and syringe programs were approached, of whom 80 (18%) were enrolled in the study: 213 (49%) were ineligible, 129 (30%) refused to be screened, and 11 (3%) refused to participate. Of the 213 clients who did not

meet eligibility criteria for ATOS, the overwhelming majority (82%) were excluded because they were currently in treatment or they had been in treatment in the preceding month. The next most common reasons for exclusion were that the person had not used heroin in the preceding month (13%), or had been in prison during that period (4%). The remaining 2% were excluded for other reasons (unwilling to give contact details, under 18, or insufficient English to complete the interview).

The total sample consisted of 615 heroin users: 201 entering maintenance therapy (methadone or buprenorphine), 201 entering detoxification, 133 entering residential rehabilitation and 80 non-treatment subjects. All participants were paid A\$20 for completing the baseline interview, which took approximately 60-90 minutes to complete. Participants in ATOS are re-interviewed at 3, 12, and 24 months post-treatment entrance. All interviews were conducted by trained Research Officers employed by NDARC and independent of the treatment agencies. The mean length of time participants had been in treatment at the time of interview was 5.1 days (SD 3.5, 1-21).

2.3 Structured interview

A structured interview was developed that examined demographic characteristics, treatment history, drug use history, heroin overdose history, injection-related risk taking behaviour, general health, criminal activity, current Major Depression, Antisocial Personality Disorder, Post Traumatic Stress Disorder, Borderline Personality Disorder, health service utilisation, and locator information. These areas are covered in greater detail below.

Demographic characteristics: Details obtained included age, gender, Aboriginal/Torres Strait Islander status, country of birth, level of school and tertiary education attained, main source of income in the preceding month, number of children under their care, usual form of accommodation, whether they have a prison history, and if so their longest period of incarceration, and the length and recency of their last imprisonment.

Treatment history: Participants were asked how many times they had commenced the various treatment options for heroin dependence and how recently they had attended each type of treatment. They were also asked the first type of treatment that they had sought and what age they were at the time. Other data collected from participants entering treatment included: whether the current treatment episode was the result of a drug court order or other legal reason, how many days they had been in treatment, and what they hoped to achieve in terms of their heroin use as a result of treatment (abstinence/a break/reduction in use/no change).

Drug use history: Participants were asked which drugs they had ever used (heroin, other opiates, amphetamines, cocaine, hallucinogens, benzodiazepines, antidepressants, alcohol, cannabis, inhalants, and tobacco), which ones they had ever injected, which they had injected in the preceding six months, and the number of days they had used these drugs in the last six months. Drug use in the preceding month was assessed using the Opiate Treatment Index (OTI) (Darke et al., 1992). Other information included age at first intoxication, drug used at time of first intoxication, age at first injection, drug first injected, age at first heroin use and injection, age at first regular heroin use (i.e., at least monthly use), main route of heroin administration and number of heroin use days in the preceding month.

Heroin overdose history: Questions regarding lifetime history of non-fatal heroin overdose were based on earlier work conducted by the authors (Darke et al., 1996). Participants were asked the number of times they had experienced overdose, the recency of the last overdose, and recency of last naloxone administration.

Injection-related risk-taking behaviour: The injection sub-scale of the HIV Risk-Taking Behaviour Scale (HRBS), a component of the OTI, was used to measure injection related risk behaviour in the preceding month (Darke et al., 1992).

Injection-related health: The injection related sub-scale of the OTO health scale was used to assess injection-related health problems (Darke et al., 1992). Scores range from 0-5, with higher scores being indicative of poorer injection-related health.

General health: General physical and mental health was measured using the Short Form-12 (SF-12) (Ware et al., 1996). The Short Form-12 (SF-12) is a standardised, internationally used instrument that provides a general measure of health status. The 12 items on the SF-12 are summarised in two weighted summary scales, and generate a mental health and a physical health score. Lower scores are indicative of more severe disability.

Criminal activity: Using the criminality scale of the OTI (Darke et al., 1992), participants were asked how frequently they had committed property crime, dealing, fraud, and violent crime in the preceding month.

Current Major Depression: Past month diagnoses of DSM-IV Major Depression were assessed using a version of the Composite International Diagnostic Interview (CIDI) used in the National Survey of Mental Health and Well Being (NSMHWB) (Andrews et al., 1999).

Anti-Social Personality Disorder: A modified version of the Diagnostic Interview Schedule (Robins et al., 1981) was used to obtain DSM-IV diagnoses of Anti-Social Personality Disorder (ASPD).

Post Traumatic Stress Disorder: DSM-IV diagnoses of PTSD were obtained using a modified version of the CIDI used in the NSMHWB (Andrews et al., 1999).

Borderline Personality Disorder: Participants were screened for potential ICD-10 diagnoses of Borderline Personality Disorder (BPD) using the NSMHWB version of the CIDI (Andrews et al., 1999).

Health service utilisation: A specific section measuring health service utilisation over the month preceding interview was designed by a health economist for ATOS. Areas measured were ambulance attendances, use of hospital services, General Practitioner (GP) consultations, specialist consultations, psychiatric consultations, and prescription medications.

Locator information: To facilitate follow-up the following information was sought at baseline: full legal name, nicknames/street names, other surnames that had been used, height, distinguishing physical features, current address, name of person whose address this was, participant's phone number/s, where they expected to be living in 12 months time, name of a doctor or community health centre that would know how to reach the participant, the first person they would contact if arrested, where they would go if they could no longer stay at their current address, places where they spend time, where messages could be left for them, and the contact details of at least two friends, relatives or associates who could be contacted if necessary to assist in locating the participant for follow-up.

2.4 Statistical analyses

T-tests were used for continuous data. Where distributions were highly skewed, medians are reported and Mann Whitney U tests conducted. For dichotomous categorical variables, chi squared analyses were conducted and Odds Ratios (OR) with 95% Confidence Intervals (95% CI) reported. Logistic regression using backward stepwise elimination was used to evaluate risk factors for development of PTSD following exposure to trauma. All analyses were conducted using SPSS (release 11.0) (SPSS inc., 2001).

2.5 Sample characteristics

The mean age was 29.3 years (SD 7.8, range 18-56), and 66% were male. The sample completed a mean of 10.0 years of school education (SD 1.7, range 2-12), 29% had completed a trade/technical course, and 6% a university degree. The main sources of income reported were: government allowances (46%), criminal activity (24%) and wage/salary (18%). Over half of the participants had committed a crime in the preceding month, and 41% had a prison history. The sample was characterised by long term polydrug use. The average length of heroin using career was 9.6 years (SD 7.4, range <1-35), and the average number of drugs used was 9.0 (SD 1.7, range 2-11). The vast majority (89%) had been in a formally recognised treatment for their heroin dependence in the past. Further details on the demographics of the sample may be found in Ross et al. (2002).

3. RESULTS

3.1 Prevalence of trauma exposure

The vast majority of the sample (92%) reported having experienced at least one traumatic event, with a large number reporting multiple traumas (81%, M 3.9, SD 2.3). The mean number of traumatic events reported by men and women was 3.9 (SD 2.2) and 4.0 (SD 2.6) respectively. Table 1 shows the prevalence of exposure to 11 classes of traumatic events. The most common types of traumatic event exposure were having witnessed serious injury or death, having been threatened with a weapon, held captive or kidnapped, and having been involved in a life threatening accident.

There were significant sex differences in the prevalence of exposure to a number of traumatic events. Women were more likely to have been raped (OR 10.41 95% CI: 6.83-15.89) or sexually molested (OR 3.93 95% CI: 2.75-5.64), whereas men were more likely to have been involved in a life threatening accident (OR 2.06 95% CI: 1.46-2.90), witnessed serious injury or death (OR 1.81 95% CI: 1.28-2.57), been threatened with a weapon, held captive or kidnapped (OR 1.53 95% CI: 1.09-2.15), or had a great shock due to one of the listed events happening to someone else (OR 1.50 95% CI: 1.06-2.11).

Table 1. Lifetime prevalence of exposure to traumatic events by gender

Trauma	Men (n = 407)		Women (n = 208)		Total (n = 615)	
	%	S.E	%	S.E	%	S.E
Combat experience	4.2	1.0	1.9	1.0	3.4	0.7
Life-threatening accident **	54.8	2.5	37.0	3.3	48.8	2.0
Natural disaster	26.0	2.2	20.7	2.8	24.2	1.7
Witness injury or death **	73.0	2.2	57.7	3.4	67.8	1.9
Rape **	10.1	1.5	53.8	3.5	24.9	1.7
Sexual Molestation **	21.9	2.1	52.4	3.5	32.2	1.9
Physical Assault	56.8	2.5	55.8	3.4	56.4	2.0
Threatened *	65.8	2.4	55.8	3.4	62.4	2.0
Tortured	9.8	1.4	9.6	2.0	9.1	1.2
Other	21.1	2.0	20.2	2.8	20.8	1.6
Trauma occurred to someone else *	44.7	1.5	35.1	3.3	41.5	2.0
Any Trauma	92.9	1.5	88.9	2.2	91.5	1.1

Significant group differences exist * $p < .05$; ** $p < .001$

3.2 Prevalence of PTSD

Of the 615 people interviewed, 41% met DSM-IV criteria for a lifetime diagnosis of PTSD. Among those who had been exposed to at least one traumatic event, 45% met DSM-IV criteria for a diagnosis of PTSD. A diagnosis of PTSD was significantly more common among women than men following exposure to trauma (61% v 37%, OR 2.58 95% CI: 1.45-4.57).

While participants with PTSD presented across all treatment modalities, the highest prevalence was found among those in residential rehabilitation (see Figure 1). Interestingly, the lowest proportion of those with PTSD was found among those not in treatment. Significantly more of those with PTSD were found in the residential rehabilitation group compared with the detoxification (OR 1.8 95% CI: 1.14-2.85) and non-treatment groups (OR 2.42 95% CI: 1.33-4.42).

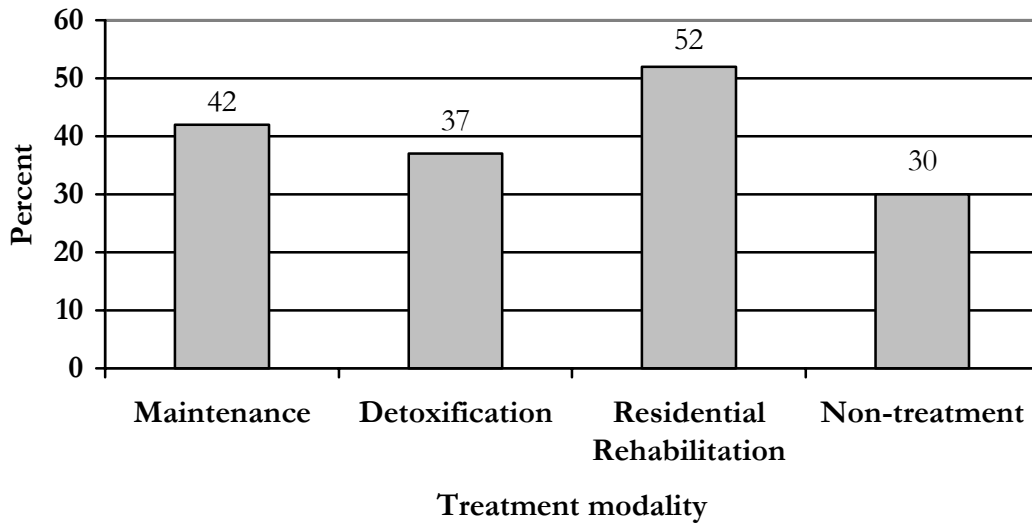


Figure 1. Proportion of participants within each treatment modality meeting criteria for PTSD

3.3 Most upsetting trauma and conditional risk of developing PTSD

Table 2 shows the proportion of men and women with PTSD who reported each most upsetting trauma type. The most common triggers to PTSD among men were witnessing injury or death, sexual molestation, being physically assaulted, rape and experiencing a life threatening accident. For women, the most common events reported to be most upsetting were rape, sexual molestation and being physically assaulted. Gender differences emerged in the proportions of people with PTSD reporting each most stressful event: men with PTSD more often reported being involved in a life threatening accident (OR 13.10 95% CI: 1.70-100.75) or witnessing injury or death (OR 2.56 95% CI: 1.15-5.72). In contrast, women more often reported rape (OR 4.92 95% CI: 2.54-9.52) as the most stressful event leading to PTSD.

Table 2. Percentage of men and women with PTSD who report each most upsetting trauma type

Trauma	Men (n = 141)		Women (n = 121)		Total (n = 253)	
	%	S.E.	%	S.E.	%	S.E.
Combat experience	2.1	1.2	-	-	1.2	0.7
Life –threatening accident **	10.6	2.6	0.9	0.9	6.3	1.5
Natural disaster	0.7	0.7	-	-	0.4	0.4
Witness injury or death *	18.4	3.3	8.1	2.6	13.8	2.2
Rape **	10.6	2.6	36.9	4.6	22.1	2.6
Sexual molestation	16.3	3.1	20.7	3.8	18.2	2.4
Physical Assault	12.1	2.7	9.9	2.8	11.1	2.0
Threatened	9.2	2.4	6.3	2.3	7.9	1.7
Tortured	2.1	1.2	2.7	1.5	2.4	1.0
Other	7.8	2.3	5.4	2.1	6.7	1.6
Trauma occurred to someone else	9.9	2.5	9	2.7	9.5	1.8

Significant differences exist * $p < .05$; ** $p < .001$

Table 3 shows: a) the proportion of people experiencing each traumatic event who nominated that event as the most stressful (i.e., as their PTSD index event) and; b) the proportion of people nominating each event as the most stressful who met full DSM-IV criteria for PTSD. Thus, for example, it can be seen that 20% of men who experienced a life-threatening accident nominated that event as the most stressful. Of these men 33% went on to develop PTSD.

The results in this Table show quite wide variation in the extent to which specific traumas were nominated as the most stressful. For example, among women only 7% of those who had experienced a life-threatening accident nominated it as their most stressful event, while 52% of those who had been raped nominated that as their most stressful event. Similarly, there was wide variation in the proportion of people nominating a specific event who developed PTSD. For example, only 20% of women who nominated a life-threatening accident as their most stressful event developed PTSD compared with 71% of those who nominated being raped as having been their most stressful event.

Comparisons were made to ascertain which PTSD index events (i.e., the event nominated as most stressful) were associated with a greater or lesser likelihood of developing PTSD, relative to having nominated any other event as most stressful. Events where individuals were less likely to develop PTSD were having been in a life threatening accident (32% v 68%; OR 0.53 95% CI: 0.29-0.99), having witnessed serious injury or death (34% v 66%; OR 0.54 95% CI: 0.35-0.85), and being threatened with a weapon, held captive or kidnapped (31% v 69%; OR 0.51 95% CI: 0.29-0.88). Events most likely to be associated with developing PTSD were rape (68% v 33%; OR 2.91 95% CI: 1.77-47), and sexual molestation (68% v 33%; OR 2.84 95% CI: 1.66-4.87).

3.4 Onset, duration, and current PTSD symptomology

For 51% of those who developed PTSD, their symptoms began on the day of their most traumatic event. Only 8% of those with PTSD had delayed onset (i.e., symptoms developed more than 6 months post trauma).

For 84% of those with PTSD, the condition lasted for more than one year. The mean duration of PTSD was 9.5 years (SD 9.4). Among those with PTSD, an average of 12.3 years (SD 9.7) had past since the most traumatic event occurred. Despite this, 75% had experienced symptoms related to that event in the previous 12 months. There were no gender differences in the onset, duration or presence of current PTSD symptomology.

3.5 PTSD and heroin use: order of onset

For 48% of those with PTSD, the condition preceded their first heroin use, for 9% both PTSD and first heroin use occurred in the same year, and for 43% heroin use preceded the onset of PTSD. The pattern was similar for the sequencing of the onset of PTSD and regular heroin use (i.e., use at least monthly): for 52% PTSD preceded regular heroin use, for 8% both PTSD and regular heroin use began in the same year, and for 40% heroin use preceded the onset of PTSD.

Table 3. Proportions of specific traumas being nominated as the PTSD index event and, once selected, being associated with a lifetime diagnosis of PTSD

Trauma	Men		Women		Total	
	% nominated as index event ^a	% developed PTSD ^b	% nominated as index event ^a	% developed PTSD ^b	% nominated as index event ^a	% developed PTSD ^b
Combat experience	24	75	25	0	24	60
Life threatening accident	20**	33	7	20	16	32
Natural disaster	4	25	0	-	3	25
Witness injury or death	26	33	22	35	25	34
Rape	51	60	52	71	52	68
Sexual molestation	43 *	61	28	77	34	68
Physical Assault	23	32 *	16	58	20	39
Threatened	18	27	14	44	17	31
Tortured	19	43	15	100	18	60
Other	28	42 *	14	100	23	53
Event occurred to someone else	24	50	26	33	24	38
Any Trauma	-	37 ***	-	61	-	45

^a proportion of those who experienced the event who nominated that event as most stressful

^b proportion of those who nominated the event as most stressful who then developed PTSD

Significant group differences exist * $p < .05$; ** $p < .01$, *** $p \leq .001$

3.6 Correlates of PTSD

3.6.1 Socio-demographic characteristics

Those with PTSD and those without PTSD were broadly similar on a range of socio-demographic characteristics, including the proportions who were Australian born (82% v 77%). Those with PTSD were slightly older than those without PTSD (30.0 v 28.8 years, $t_{613} = -2.009$, $p < .05$). Although those with PTSD had completed fewer years of schooling than those without PTSD (9.7 v 10.1, $t_{613} = 3.181$, $p < .01$), approximately one third of both groups had completed some form of tertiary education (e.g., trade/technical course, degree) (38% v 33%). Those with PTSD were significantly less likely to have derived their main source of income from employment in the previous month (10% v 23%, OR 0.39 95% CI: 0.24-0.63). Both groups had similar living arrangements in the month prior to interview, with the highest proportions living in their own residence (either rented or owned) (46% v 37%), and very few from either group having no fixed address (9% v 6%). A sizeable portion of both groups had a prison history (43% v 39%).

3.6.2 Drug use history

Those with PTSD first became intoxicated at a significantly younger age than those without PTSD ($t_{613} = 1.984$, $p < .05$) (see Table 4). They had also used a significantly greater number of drug classes in their lifetime ($t_{613} = -3.029$, $p < .01$) and in the preceding 6 months ($t_{613} = -2.951$, $p < .01$) compared to those without PTSD.

3.6.3 Heroin use, dependence and overdose

Those with and without PTSD started using heroin between the ages of 19-20 years, and using regularly (i.e., at least monthly) between the ages of 20-21 years (see Table 4). There were no differences in the number of days heroin was used in the last six months, and both those with and without PTSD were using heroin more than twice per day in the preceding month, as indicated by their OTI Q scores. Those with PTSD had significantly longer heroin using careers than those without PTSD ($t_{613} = -2.579$, $p < .01$). The overwhelming majority of both groups met DSM-IV criteria for heroin dependence (99% v 97%).

Regarding heroin overdose, those with PTSD were more likely to have experienced a non-fatal overdose in their lives (64% v 48%; OR 1.98 95% CI: 1.42-2.75), and in the preceding 12 months (31% v 21%; OR 1.70 95% CI: 1.18-2.47) compared to those without PTSD.

Table 4. Drug use and heroin use history

	PTSD (n = 253)	No PTSD (n=362)
<i>Any substance</i>		
Mean age first intoxicated (SD) *	13.4 (3.2)	14.0 (3.4)
Mean age first injecting (SD)	19.3 (5.5)	19.5 (5.0)
Mean no. of drug classes used (SD):		
Ever **	9.3 (1.6)	8.9 (1.7)
Last 6 months **	6.5 (1.9)	6.1 (2.0)
<i>Heroin use</i>		
Mean age 1 st use heroin (SD)	19.5 (5.6)	19.8 (5.0)
Mean age 1 st used heroin regularly (SD)	20.4 (5.8)	20.6 (5.3)
Means no. years using heroin (SD) **	10.6 (7.9)	9.0 (7.0)
Median days of heroin use (6 months)	135	150
Mean heroin OTI Q score	2.5 (5.0)	2.6 (4.8)

Significant group differences exist * p < .05; ** p < .01

3.6.4 Criminal activity

Participants with and without PTSD were equally likely to have been criminally active in the preceding month (58% v 53%). While there were no differences between the two groups in terms of reported involvement in property crime (40% v 38%), dealing (29% v 22%) and fraud (14% v 16%), those with PTSD were more likely to have committed violent crime than those without PTSD (12% v 6%; OR 2.07 95% CI: 1.17-3.64).

3.6.5 Physical health

Significantly poorer physical health was found among those with PTSD than those without PTSD (mean SF-12 scores: 41.8 v 45.4, $t_{613}=4.561$, $p < .001$). Participants with PTSD were more

than twice as likely as participants without PTSD to be classified as having severe physical disability according to the SF-12 (13% v 6%, OR 2.35 95% CI: 1.32-4.18).

3.6.6 Injection related health

The following analyses were conducted only on participants who had injected in the preceding month (n = 556). While both those with and without PTSD were equally as likely to have injected 4 or more times per day (34% v 27%), those with PTSD had a significantly greater number of injection related health problems in the previous month (1.7 v 1.4, $t_{564} = -3.626$, $p < .001$). There were no differences in the proportions of participants with and without PTSD who had borrowed (22% v 19%) or lent (34% v 28%) needles in the preceding month.

3.6.7 Mental health

The general mental health of those with PTSD was significantly poorer than that of those without PTSD ($t_{613} = 5.411$, $p < .001$). Almost two thirds of those with PTSD met criteria for severe mental disability according to the SF-12 (see Table 5).

Those with PTSD were more than twice as likely to meet criteria for current Major Depression, to have a lifetime history of attempted suicide, and to have attempted suicide in the last 12 months. Those with PTSD were also more likely to screen positive for BPD and to be diagnosed with ASPD.

Table 5. Mental health

	PTSD (n = 253)	No PTSD (n = 362)	OR (95% CI)
Mean SF-12 Mental Health score (SD) **	28.8 (10.3)	33.6 (11.2)	-
% Severe mental disability **	61	41	2.22 (1.60-3.09)
% Major Depression (1 month) **	32	19	2.04 (1.40-2.95)
% Attempted Suicide – Ever **	48	24	2.82 (1.99-3.98)
% Attempted Suicide – 12 months **	19	10	2.13 (1.33-3.41)
% ASPD *	78	67	1.66 (1.15-2.40)
% BPD **	62	34	3.18 (2.27-4.44)

Significant group differences exist * $p < .01$; ** $p < .001$

3.6.8 Patterns of treatment seeking and health service utilisation

Individuals who met criteria for PTSD had a significantly higher rate of previous treatment attempts for their heroin dependence (median 6 v 4; $U=39746.0$, $p < .05$). In the preceding month those with PTSD were more likely to have consulted a social worker or counsellor (OR 1.85 95% CI: 1.27-2.71) and visited a General Practitioner (GP) (OR 1.72 95% CI: 1.23-2.40) compared to those without PTSD (see Table 6). Those with PTSD were also more likely to have received prescriptions for antidepressants (OR 1.99 (1.17-3.39) and other psychotropics (i.e., narcotic analgesics and antipsychotics) (OR 2.65 95% CI: 1.52-4.61).

Table 6. Patterns of treatment seeking and health care utilisation

	PTSD (n = 253) (%)	No PTSD (n = 362) (%)
<i>Health care utilisation in preceding month</i>		
Attended by ambulance	13	9
Attending Accident & Emergency	13	9
Admitted to hospital	11	7
Attending General Practitioners **	67	54
Consulting social worker/counsellor **	29	18
Consulting psychologist/psychiatrist	13	8
<i>Prescription medications in the preceding month</i>		
Benzodiazepines	32	29
Antidepressants *	14	8
Other psychotropics ^a **	15	6
Non psychotropics	22	19

^a includes narcotic analgesics and antipsychotic medications

Significant group differences exist * $p < .01$ ** $p < .001$

3.7 Independent factors associated with PTSD

Logistic regression analysis was conducted to determine predictors of PTSD among heroin users exposed to trauma. Univariate analysis revealed that nominating having been in a life threatening accident, witnessed serious injury or death, rape, sexual molestation, and being threatened with a weapon, held captive or kidnapped as most traumatic were significantly associated with a diagnosis of PTSD. Along with age, sex, age at first intoxication, age at first heroin use, number of drug classes ever used, length of heroin using career, diagnosis of BPD, and the number of traumatic events experienced; these events were entered into a backward stepwise logistic regression with diagnosis of PTSD as the dependent variable. ASPD was not entered into the model as it was highly correlated with BPD. The final model revealed that screening positive for BPD, being female, nominating sexual molestation as the most stressful event, having experienced a greater number of traumatic events, and being older were predictors of a positive PTSD diagnosis ($R^2 = 0.203$, $p < .001$) (see Table 7).

Table 7. Predictors of PTSD

Predictors	Adjusted OR	95% CI
BPD	2.69	1.82-3.98
Female	2.65	1.76-3.98
Sexual molestation	2.52	1.39-4.55
Number of traumas	1.37	1.24-1.51
Age	1.03	1.01-1.06

4. Discussion

4.1 Major findings

A high prevalence of trauma exposure (92%) and PTSD (41%) was found among heroin users in the present sample. Although men and women were equally as likely to have experienced trauma, women were more likely to develop PTSD. This effect remained even after controlling for PTSD index event. For the large majority of those with PTSD, the condition was chronic, lasting on average 9.5 years. There was no clear temporal sequence of PTSD and heroin use.

Demographically, those with and without PTSD were broadly similar, however, those with PTSD, were slightly older and had completed fewer years of education, and were less likely to derive their main source of income from employment. While the rate of PTSD was high across all treatment modalities, it was highest among those entering residential rehabilitation, and lowest among those not in treatment.

The age of first intoxication was younger for those with PTSD, and they had used a greater number of drug classes in their lifetime and in the preceding six months compared to those without PTSD. Although those with PTSD had slightly longer heroin using careers, there were no differences in their frequency of use in the preceding six months or the preceding month. Those with PTSD were however, more likely to have a lifetime history of overdose, and to have overdosed in the preceding 12 months. Those with PTSD also had a higher rate of previous treatment attempts for their heroin dependence.

Those with PTSD had significantly poorer general physical and mental health. This group was more likely to meet criteria for current Major Depression, to have a lifetime history of attempted suicide, to have attempted suicide in the previous 12 months, to screen positive for BPD, and to be diagnosed with ASPD than the remainder of the sample.

Consistent with these findings, participants with PTSD were more likely to have consulted a social worker or counsellor, and GP in the preceding month, and received prescriptions for antidepressants and other psychotropics.

4.2 Prevalence of trauma exposure and PTSD

The prevalence of trauma exposure (92%) and lifetime PTSD in the present sample (41%) is considerably higher than that of the general population (1-9%; Breslau et al., 1991, Helzer et al., 1987; Kessler et al., 1995) and other treatment seeking samples of heroin users (14-31%; Clark et al., 2001, Hien et al., 2000, Milby et al., 1996, Villagomez et al., 1995). Participants with PTSD presented to all three treatment modalities, thus this comorbidity is not seen exclusively by any one particular service type.

In keeping with the literature (Kessler et al., 1995) the majority of those who had experienced trauma had experienced multiple traumas, and those with PTSD had experienced a greater number of traumas. These rates represent a large proportion of people in treatment for heroin dependence who may require additional treatment.

Consistent with previous research (Kessler et al., 1995; Stein et al., 2000, Breslau et al 1999) women in the present study were more likely to develop PTSD following trauma exposure. It has been suggested that the higher rates of PTSD found among women are confounded by the fact that they are more likely to experience events with a higher probability of PTSD (Fairbank et al., 2000, Kessler et al., 1995, Norris, 1992, Resick, 2001). Importantly, it is apparent from this analysis that gender differences in the lifetime prevalence of PTSD arise from gender differences in responses to trauma exposure rather than from differences between the genders in rates of exposure to traumatic events. Logistic regression analysis revealed that being female remained as one of the most significant predictors of developing PTSD even when controlling for the type of event nominated as most traumatic.

4.3 Most upsetting trauma and conditional risk of developing PTSD

The probability of developing PTSD is dependent on a number of factors, one being the nature of the traumatic experience (Fairbank et al., 2000, Hidalgo and Davidson, 2000, Kofoed et al., 1993). As in population surveys, a higher prevalence of PTSD was found among those who had been raped or sexually molested (Breslau et al., 1998, Creamer et al., 2001, Kessler et al., 1995). When entered into logistic regression analysis however, sexual molestation was the only event that significantly predicted PTSD.

4.4 Onset, duration, and current PTSD symptomology

The literature suggests that in approximately half of all PTSD cases, symptoms remit within 3 months following trauma exposure (Rothbaum and Foa, 1994). For the majority of those with PTSD in the present sample however, their condition was chronic. Eighty-four percent of the sample reported their symptoms lasting more than one year, with symptoms lasting on average 9.5 years. This is cause for concern as it is generally believed that chronic PTSD is more difficult to treat than acute PTSD (Foa et al., 2000).

4.5 PTSD and heroin use: order of onset

Contrary to the belief that substance use disorders (SUDs) are often the consequence of repeated attempts to self medicate symptoms of PTSD, the current study found no clear temporal sequence of PTSD and heroin use.

4.6 Correlates of PTSD

4.6.1 Socio-demographic characteristics

Men and women with PTSD had completed fewer years of schooling, and were less likely to nominate employment as their main source of income. These findings are consistent with the impaired functioning that is associated with PTSD (Breslau et al., 1997, Kessler and Frank, 1997).

4.6.2 Drug use and heroin use history

Those with PTSD had a more extensive history of polydrug use, having used a greater number of drug classes in their lifetime and in the preceding 6 months compared to those without PTSD. Although the frequency of heroin use was similar for participants with and without PTSD, those with PTSD were more likely to have experienced heroin overdose. These findings are consistent with those of Clark et al (2001) who found a diagnosis of PTSD to be associated with greater drug abuse severity.

4.6.3 Criminal activity

The finding that violent crime is more commonly perpetuated by those with PTSD is common in the literature, however, it is typically attributed to the need to finance comorbid SUD (Begic and Jokic-Begic, 2002, Lisak and Miller, 2003). The present findings however, suggest otherwise as there were no differences between the rates of acquisitive crime among those with or without

PTSD. Furthermore, some PTSD symptoms may make some sufferers of PTSD more susceptible to violent behaviour. Hypervigilance and hyperarousal combined with increased levels of agitation, irritability and anger indicate an increased risk for violent behaviour. This risk may be greatly enhanced when PTSD is combined with SUD (Lisak and Miller, 2003).

4.6.4 Physical and injection related health

Both men and women with PTSD have consistently been found to be in poorer physical health than those without PTSD. A higher lifetime prevalence of circulatory, digestive, musculoskeletal, nervous system, respiratory, endocrinological, and gynaecological problems have been noted among this group (Fairbank, 2000, Hidalgo and Davidson, 2000). In support of this, those with PTSD in the present sample reported significantly poorer physical health and a greater number of injection related health problems than those without PTSD.

4.6.5 Mental health

There were important differences between participants with and without PTSD in terms of their mental health. As measured by the SF-12, general mental health for those with PTSD was significantly poorer than that of those without PTSD. Those with PTSD were more likely to have current depression, have attempted suicide, screen positive for BPD and be diagnosed with ASPD. These findings are in keeping with previous research showing higher levels of comorbidity among those with comorbid PTSD+SUD compared with those with SUD alone (Brown et al., 1999), and those with PTSD compared with no PTSD (Breslau et al., 1997, Creamer et al., 2001, Kessler, 2000).

4.6.6 Patterns of treatment seeking and health service utilisation

Individuals who met criteria for PTSD had a significantly higher rate of previous treatment attempts for their heroin dependence. These findings support those of Brown et al (1999), who documented that those with PTSD+SUD used addiction treatments more extensively than those with SUD alone, despite there being no differences in drug use severity between the two groups. Despite their greater rates of psychiatric comorbidity, PTSD+SUD patients did not receive treatment for psychiatric problems at greater rates than did SUD patients. Together these findings suggest that those with PTSD+SUD are not receiving appropriate treatment for either their PTSD or SUD. It has been suggested by Brown et al. (1999) that psychiatric comorbidity be assessed and referrals made to treatments targeting co-occurring PTSD and other disorders.

The patterns of treatment seeking exhibited by those with PTSD in the preceding month were consistent with their increased physical and psychological comorbidity. Those with PTSD were more likely to have consulted a social worker or counsellor in the preceding month, and visited a General Practitioner (GP). Consistent with the higher prevalence of depression found among those with PTSD, they were more likely to be prescribed antidepressants, in addition to other psychotropic medications (i.e., narcotic analgesics and antipsychotic medications). These findings support previous research indicating the those who have experienced trauma are more likely to use both physical and mental health services, and use them with greater frequency (Hidalgo and Davidson, 2000).

4.7 Independent factors associated with PTSD

A number of factors were identified as predictors of a positive diagnosis of PTSD: screening positive for BPD, being female, nominating sexual molestation as the most stressful event, having experienced a greater number of traumatic events, and being older. These factors are frequently cited in the literature as predictors of PTSD (Hidalgo and Davidson, 2000).

4.8 Conclusion

PTSD is highly prevalent among people with heroin dependence, representing a large number of people who may require additional treatment compared to those with heroin dependence alone. Unlike PTSD among the general population, PTSD among heroin users appears to be a chronic condition, with the majority continuing to experience symptoms for many years following trauma exposure. However, more evidence is needed to ascertain the most effective treatment approach for addressing these comorbid conditions.

Consistent with the high levels of distress associated with PTSD, those with the diagnosis yielded higher rates of physical and psychological comorbidity. These findings are of major clinical significance as PTSD and the associated psychiatric comorbidity may have an adverse affect on substance abuse treatment outcome. As the first large scale longitudinal study to examine PTSD among people with heroin dependence, future reports from ATOS will present data on the impact of PTSD on treatment outcomes 3 and 12 months post treatment entry.

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APPENDIX A. DSM-IV diagnostic criteria for PTSD

- 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.
- B. The traumatic event is persistently reexperienced 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 experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated).
 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
- C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:
1. Efforts to avoid thoughts, feelings or conversations associated with the trauma
 2. Efforts 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 in 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 a foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span)
- D. Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:
1. Difficulty falling asleep or staying asleep
 2. Irritability or outburst of anger
 3. Difficulty concentrating
 4. Hypervigilance
 5. Exaggerated startle response
- E. Duration of the disturbance (symptoms in Criterion B, C, and D) is more than 1 month.
- F. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.
-