

Suicide among heroin users: rates, risk factors and methods

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ABSTRACT

The current paper examines critically the literature on suicide rates, suicide risk factors and methods employed for suicide among heroin users, and compares these to those of the general population. Heroin users have a death rate 13 times that of their peers, and deaths among heroin users attributed to suicide range from 3–35%. Overall, heroin users are 14 times more likely than peers to die from suicide. The prevalence of attempted suicide is also many orders of magnitude greater than that of community samples. The major general population risk factors for suicide also apply to heroin users (gender, psychopathology, family dysfunction and social isolation). Heroin users, however, have extremely wide exposure to these factors. They also carry additional risks specifically associated with heroin and other drug use. Drugs as a method of suicide play a larger role in suicide among heroin users than in the general population. Heroin, however, appears to play a relatively small role in suicide among this group. Overall, suicide is a major clinical issue among heroin users. It is concluded that suicide is a major problem that treatment agencies face, and which requires targeted intervention if the rates of suicide among this group are to decline.

KEYWORDS Depression, heroin, mortality, suicide.

INTRODUCTION

The issue of suicide among heroin users has begun to receive a great deal of attention in recent years, due to interest in co-morbidity and its impact upon services (Appleby 2000), and because of the perceived relationship between suicide and overdose (Farrell *et al.* 1996). While much is known about suicide and associated risks in the general population, substantially less is known about suicide among heroin users, and how these behaviours relate to those in the broader population. In particular, to date no authors have reviewed rates of completed suicide, attempted suicide, suicide risk factors and methods employed for suicide among heroin users and contrasted these to the general population. The current review examines mortality among heroin users, focusing upon the role of suicide as a cause of death among this group, and examines the extent and nature of attempted suicide among heroin users. Specifically, the current review aimed to:

- 1 examine mortality among heroin users compared to the general population;
- 2 compare the completed suicide and attempted suicide rates, and associated risk factors, of heroin users and the general population, and
- 3 examine methods of suicide among heroin users and the general population.

MORTALITY AMONG HEROIN USERS

Heroin users have substantially higher rates of mortality than peers matched for age and gender, as indicated by high standardized mortality ratios (SMRs) (Bewley, Ben-Arie & James 1968; Gardner 1970; Cherubin *et al.* 1972; Vaillant 1973; Watterson, Simpson & Sells 1975; Cottrell, Childs-Clarke & Ghodse 1985; Bucknall & Robertson 1986; Joe & Simpson 1987; Haarstrup & Jepson 1988; Tunving 1988; Gronbladh, Ohland & Gunne 1990; Segest, Mygind & Bay 1990; Zador & Sunjic

2000; Engstrom *et al.* 1991; Perucci *et al.* 1991; Dukes, Robinson & Robinson 1992; Eskild *et al.* 1993; Marx, Schick & Minder 1994; Oppenheimer *et al.* 1994; Rossow 1994; Goldstein & Herrera 1995; McAnulty, Tesselar & Fleming 1995; Bentley & Busutil 1996; Davoli *et al.* 1997; Frischer *et al.* 1997; Fugelstad *et al.* 1997; O'Doherty & Farrington 1997; Zanis & Woody 1998; Oyefeso *et al.* 1999; Sanchez-Carbonell & Seus 2000; Bargagli *et al.* 2001; Hser *et al.* 2001; Quaglio *et al.* 2001; Gossop *et al.* 2002) (Table 1). Annual mortality rates reported by longitudinal studies of opiate users range from 0.5% (Frischer *et al.* 1997) to 7% (Cherubin

et al. 1972), with most studies reporting rates in the order of 1–3%. The SMRs in these studies have ranged from 2.4 times (Dukes *et al.* 1992) that of the general population to 55 times (Gronbladh *et al.* 1990). A meta-analysis of mortality rates reported by longitudinal studies of opiate users conducted by Hulse *et al.* (1999) reported a SMR of 13 times that of their peers. The cumulative risk of death among opiate users illustrates further the excess mortality associated with opiate use: by age 40, the cumulative risk of death for heroin users in the Davoli *et al.* (1997) sample was 29% and by age 50 it was 53%. Similarly, 38% of the Oppenheimer cohort (Oppenheimer *et al.*

Table 1 Mortality rates among heroin users and suicide as a cause of death.

| Study | Country/period | Annual mortality rate % | SMR ^a | Proportion of suicides among deaths (%) |
|----------------------------------|-----------------------|-----------------------------|---------------------------|---|
| Bargagli <i>et al.</i> (2001) | Italy 1980–1997 | – | 15.4 | – |
| Bentley & Busutil (1996) | UK 1989–1994 | – | – | 9 |
| Bewley <i>et al.</i> (1968) | UK 1947–1966 | 2.7 | 28.0 | 23 |
| Bucknall & Robertson (1986) | UK 1981–1985 | 1 | 11.6 | 14 |
| Cherubin <i>et al.</i> (1972) | US 1964–1968 | 7 | – | – |
| Cotrell <i>et al.</i> (1985) | UK 1971–1982 | 1.9 | – | – |
| Davoli <i>et al.</i> (1997) | Italy 1980–1992 | 0.8–2.8 | M 9.3–21.2 F 18.1–38.6 | – |
| Dukes <i>et al.</i> (1992) | New Zealand 1971–1989 | – | 2.4 | 12 |
| Engstrom <i>et al.</i> (1991) | Sweden 1973–1984 | 2.3 | 18.3 | 35 |
| Eskild <i>et al.</i> (1993) | Norway 1985–1991 | 2.7 | 31.0 | 10 |
| Frischer <i>et al.</i> (1997) | UK 1982–1994 | 0.5 | 22.0 | 4 |
| Fugelstad <i>et al.</i> (1997) | Sweden 1981–1992 | 2.2 | – | 14 |
| Gardner (1970) | UK 1965–1969 | – | – | 14 |
| Goldstein & Herrera (1995) | US 1979–1993 | – | M 4.0 F 6.8 | 5 |
| Gossop <i>et al.</i> (2002) | UK 1995–1999 | 1.2 | 6.0 | 6 |
| Gronbladh <i>et al.</i> (1990) | Sweden 1967–1988 | 1.4% (MM), 7.2% (Non-Rx) | 8.4(MM) 55.3 (Non-Rx) | – |
| Haarstrep & Jepsen (1988) | Denmark 1973–1984 | 2 | – | – |
| Hser <i>et al.</i> (2001) | US 1962–1997 | – | – | 19.5 (suicide/homicide) |
| Joe & Simpson (1987) | US 1978–1984 | 1.4 | 6.9 | – |
| Marx <i>et al.</i> (1994) | Switzerland 1987–1989 | – | – | 6 |
| McAnulty <i>et al.</i> (1995) | US 1989–1991 | 1.1 | 8.3 | – |
| O'Doherty & Farrington (1997) | UK 1986–1991 | – | – | 3 |
| Oppenheimer <i>et al.</i> (1994) | UK 1969–1991 | 1.8 | 11.9 | 5 |
| Oyefeso <i>et al.</i> (1999) | UK 1974–1993 | 0.05 | M 10.7, F 21.2 | 3 (teenagers 11) |
| Perucci <i>et al.</i> (1991) | Italy 1980–1988 | – | 10.1, M10 F 20 | 5 |
| Quaglio <i>et al.</i> (2001) | Italy 1985–1998 | – | 13 | 6 |
| Rossow (1994) | Norway 1968–1992 | 2.3 | – | 15 |
| Sanchez-Carbonell & Seus (2000) | Spain 1985–1995 | 3.4 | 28.6 | – |
| Segest <i>et al.</i> (1990) | Denmark 1978–1986 | 3.3 | – | – |
| Tunving (1988) | Sweden 1970–1984 | 2.1 | M 5.4 F 8.0 | 31 |
| Vaillant (1973) | US 1952–1970 | 1.0 | – | 17 (suicide/homicide) |
| Watterson <i>et al.</i> (1975) | US 1970–1974 | 1.3 | – | – |
| Zador & Sunjic (2000) | Australia 1990–1995 | – | – | 8 |
| Zanis & Woody (1998) | US 1993–1994 | 8.2 | – | – |

^aStandardized mortality rate.

1994) were dead at 22 years follow-up. While deaths in these studies have been predominantly among males (Perucci *et al.* 1991; Eskild *et al.* 1993; Bargagli *et al.* 2001; Quaglio *et al.* 2001; Gossop *et al.* 2002), females have substantially higher SMRs than males (Perucci *et al.* 1991; Eskild *et al.* 1993; Bargagli *et al.* 2001; Quaglio *et al.* 2001), indicating that female heroin users are at greater risk compared to non-using female peers than males are compared to their peers.

The major causes of death among heroin users in the studies cited above are reported consistently as overdose, disease, trauma and suicide. The relative contribution of these causes has varied from study to study, and over time. For instance, AIDS overtook overdose as the major cause of death among heroin users in Italy in the late 1980s, but has declined in relative contribution since the early 1990s (Davoli *et al.* 1997; Bargagli *et al.* 2001). The proportion of deaths among heroin users attributed to suicide ranges from 3% to 35%, with most studies lying in the 3–10% range (Table 1). It is clear from these studies that a significant component of the mortality seen among heroin users is attributable to suicide.

PREVALENCE OF COMPLETED SUICIDE

Rates of completed suicide in the general population vary greatly from country to country (Diekstra & Gulbinat 1993; Hassan 1995; Lynskey, Degenhardt & Hall 2000): rates higher than 30 per 10⁵ are reported in Finland, Hungary and Sri Lanka; 20–30 per 10⁵ in Germany, Austria and France; 10–15 per 10⁵ in the United States, United Kingdom and Australia (Diekstra & Gulbinat 1993). Despite these differences a consistent trend in Europe, the Americas, Asia and Australia is of sharp increases in the rates of completed suicide (Diekstra & Gulbinat 1993; Hassan 1995; Lynskey *et al.* 2000), these increases being attributable mainly to increases among adolescent males (Diekstra & Gulbinat 1993; Lynskey *et al.* 2000). This is of relevance, as males represent the majority of heroin users, and heroin use commences typically in the adolescent years (Darke & Ross 1997; Bennett & Higgins 1999).

While suicide rates vary across countries, all studies that have examined specifically the relative risk of completed suicide among heroin users have reported significantly higher SMRs compared to the general population rates (Harris & Barraclough 1997). Studies that have reported the suicide specific SMR for opiate users have reported excess mortality of 6.3 times (Perucci *et al.* 1991) to 8.4 times (Pokorny 1983) that expected among matched peers. Harris & Barraclough (1997) calculated suicide-specific SMRs for longitudinal studies in which these were not reported, and revealed suicide rates

between 3.3 (Vaillant 1973) and 37.5 (Bewley *et al.* 1968) times the expected suicide rate. Overall, Harris & Barraclough (1997) report a suicide-specific SMR for heroin users 14 times that expected of matched peers. Suicide thus clearly represents a significant contribution to the overall excess mortality seen among heroin users.

PREVALENCE OF ATTEMPTED SUICIDE

The incidence of attempted suicide is estimated to be 10–20 times that of completed suicide (Diekstra & Gulbinat 1993). Large-scale representative community surveys in the United States, Europe and Australia have indicated the life-time prevalence of attempted suicide to be in the range of 3–5% (Brosnich & Wittchen 1994; Cooper-Patrick, Crum & Ford 1994; Borges, Walters & Kessler 2000; Madianos, Gefou-Madianou & Stefanis 1994; Pirkis *et al.* 2002), with 12-month prevalence having been estimated at 0.4–2.2% (Madianos *et al.* 1994; Pirkis, Burgess & Dunt 2002) (Table 2).

The prevalence of attempted suicide among heroin users stands in sharp contrast to those reported in the general community (Murphy *et al.* 1983; Allison, Hubbard & Ginzberg 1985; Kosten & Rounsaville 1988; Dinwiddie, Reich & Cloninger 1992; Johnsson & Fridell 1997; Gossop *et al.* 1998; Ravndal & Vaglum 1999; Rossow & Lauritzen 1999; Vingoe *et al.* 1999; Darke & Ross 2001; Rossow & Lauritzen 2001) (Table 2). There are difficulties in making direct comparisons between studies of drug users, due primarily to differences in sampling. Some studies have examined treatment entrants, others treatment samples, while others have mixed samples of heroin users and other illicit drug users (Table 2). Despite this, in all studies the prevalence of attempted suicide is many orders of magnitude greater than those of the community samples. Vingoe *et al.* (1999) and Darke & Ross (2001) examined heroin users enrolled in treatment, and reported a life-time prevalence of attempted suicide of 35% and 40%, respectively. A lower life-time prevalence (17%) was reported by Murphy *et al.* (1983) among a mixed US sample of opiate treatment entrants and enrolled patients, although this figure is still many times that of the broader community, as noted by the authors. Figures from studies of treatment entrants in Scandinavia (Harris & Barraclough 1997; Ravndal & Vaglum 1999; Rossow & Lauritzen 1999; Rossow & Lauritzen 2001) are broadly similar to those reported in the United Kingdom (Vingoe *et al.* 1999) and Australia (Darke & Ross 2001).

A history of attempted suicide has been shown to be a predictor of subsequent attempts (Pokorny 1983; Buckstein *et al.* 1993). Heroin users would appear to be no exception to this observation, with large proportions

Table 2 Attempted suicide and suicidal ideation among heroin users and the general population.

| Study | Sample | Attempted suicide | | Suicidal ideation | |
|-------------------------------------|----------------------------|-------------------|------------------|-------------------|-----------------|
| | | Life-time % | 12 months % | Life-time % | 12 months % |
| Community epidemiology | | | | | |
| Borges <i>et al.</i> (2000) | US | 4.6 | – | – | – |
| Brosnich & Wittchen (1994) | Germany | 4.1 | – | 14.7 | – |
| Cooper-Patrick <i>et al.</i> (1994) | US | – | – | – | 2.6 |
| Madianos <i>et al.</i> (1994) | Greece | – | 2.2 | – | 11.3 |
| Pirkis <i>et al.</i> (2002) | Australia | 3.6 | 0.4 | 16.0 | 3.4 |
| Heroin users | | | | | |
| Allison <i>et al.</i> (1985) | US, MMT entrants | – | 6 | – | 23 |
| Darke <i>et al.</i> (2001) | Australia, MMT | 40 | 10 | – | 44 |
| Dinwiddie <i>et al.</i> (1992) | US, mixed IDU | 24 | – | – | – |
| Johnsson & Fridell (1997) | Sweden, treatment entrants | 45 | – | – | – |
| Gossop <i>et al.</i> (1998) | UK, treatment entrants | – | – | – | 29 |
| Kosten & Rounsaville (1988) | US, treatment entrants | 17 | 5.5 ^a | – | 21 ^a |
| Murphy <i>et al.</i> (1983) | US, entering/ in treatment | 17 | – | – | – |
| Ravndal & Vaglum (1999) | Norway, treatment entrants | 47 | 27 ^b | – | – |
| Rossow & Lauritzen (1999) | Norway, treatment entrants | 33 | – | – | – |
| Rossow & Lauritzen (2001) | Norway, treatment entrants | 38 | – | – | 42 Temp.† |
| Vingoe <i>et al.</i> (1999) | UK, in treatment | 35 | 8 | 60 | 55 |

^a2.5 years, ^b5 years, †1 month.

of heroin users having histories of multiple suicide attempts: Rossow & Lauritzen (1999) 56%, Darke & Ross (2001) 21%, Johnsson & Fridell (1997) 17%. Ravndal & Vaglum (1999) reported that 94% of suicide attempts during follow-up were by patients who had a history of previous attempts. Buckstein *et al.* (1993) reported a higher proportion of previous attempts among completed suicides compared to matched controls.

Few studies, either of the general population or of drug users have examined recent suicidal behaviours. The two population studies that reported 12-month prevalence of attempted suicide found a prevalence of 0.4% (Pirkis *et al.* 2002) and 2.2% (Madianos *et al.* 1994). In contrast, the prevalence of attempted suicide among heroin users enrolled in treatment has been reported as 6% (Allison *et al.* 1985), 8% (Vingoe *et al.* 1999) and 10% (Darke & Ross 2001).

As would be expected from the high prevalence of suicide among heroin users, the prevalence of suicidal ideation is also far in excess of community samples (Table 2). Studies of heroin users specifically examining 12-month suicidal ideation report a prevalence of between 23% and 55% (Allison *et al.* 1985; Gossop *et al.* 1998; Vingoe *et al.* 1999; Darke & Ross 2001). The importance of these figures is illustrated by the finding by Pirkis *et al.* (Pirkis *et al.* 2002), that 12% of current suicidal ideators in a general population sample went on to make a suicide attempt within 12 months.

RISK FACTORS FOR SUICIDE

The risk factors for suicide in the general population have been researched extensively (Frederick, Resnik & Wittlin 1973; Miles 1977; Pokorny 1983; Casey 1989; Buckstein *et al.* 1993; Fergusson & Lynskey 1995; Hassan 1995; Beautrais *et al.* 1996; Harris & Barraclough 1997; Appleby *et al.* 1999; Foster *et al.* 1999). With the exception of gender, the risk factors for attempted and completed suicide are essentially the same (Pokorny 1983; Beautrais *et al.* 1996). In the case of gender, studies from Europe, the Americas, Asia and Australia indicate that while females are three times more likely than males to attempt suicide, males are three times more likely to complete suicide (Diekstra & Gulbinat 1993; Lynskey *et al.* 2000).

Not surprisingly, depression has repeatedly been related to an elevated risk of suicide (Miles 1977; Pokorny 1983; Fergusson & Lynskey 1995; Hassan 1995; Beautrais *et al.* 1996; Harris & Barraclough 1997; Foster *et al.* 1999). Harris & Barraclough (1997) estimate that a diagnosis of major depression is associated with a 20-fold increased risk of suicide. Personality disorder has also been related to completed and attempted suicide (Harris & Barraclough 1997). In particular, diagnoses of childhood conduct disorder and adult antisocial personality disorder (ASPD) are associated with elevated risk (Miles 1977; Casey 1989; Brent *et al.* 1993; Fergusson &

Lynskey 1995; Beautrais *et al.* 1996; Shaffer *et al.* 1996). Childhood conduct disorder has been associated with a 13-fold increase in the odds of attempted suicide (Fergusson & Lynskey 1995) and a three- (Shaffer *et al.* 1996) to six (Brent *et al.* 1993)-fold increase in the odds of dying by suicide.

A history of family dysfunction or disadvantage has also been associated with suicidal behaviours. Specifically, a history of parental separation, family disadvantage and parental psychopathology have all been associated with suicidal behaviours (Garfinkel, Froese & Hood 1982; Smith & Crawford 1986; Spirito *et al.* 1989; Buckstein *et al.* 1993; Fergusson & Lynskey 1995). In addition, there is evidence of an inherited genetic predisposition to suicide (Glowinski *et al.* 2001; Turecki 2001). Related to these factors, childhood sexual and physical abuse is a significant predictor of later suicidal behaviours (Shafiq *et al.* 1985; Brent *et al.* 1994; Beautrais *et al.* 1996; Garnefski & Diekstra 1997). Indices of social isolation and disadvantage, including unemployment and homelessness, are also associated with heightened risk of suicide (Shepherd & Barraclough 1980; Hassan 1995; Beautrais *et al.* 1996; Appleby *et al.* 1999).

Of particular relevance to this review is the fact that substance dependence has been a constant predictor of suicide (Miles 1977; Pokorny 1983; Harris & Barraclough 1997; Borges *et al.* 2000). The risk associated with opiates is discussed below. Of particular interest here, however, is the increased risk associated with drugs other than opiates. Alcohol dependence, benzodiazepine dependence and mixed drug dependence have all been related independently to an increased risk of suicide (Miles 1977; Pokorny 1983; Harris & Barraclough 1997; Borges *et al.* 2000). This is particularly relevant to the primary heroin-using population, as polydrug use is the norm among this group (Darke & Ross 1997). In particular, the use of benzodiazepines and alcohol is common among this group, as are diagnoses of benzodiazepine and alcohol dependence (Darke & Ross 1997).

HEROIN USE AND SUICIDE RISK FACTORS

As noted above, risk factors for suicide fall into five broad areas: gender, psychopathology, family dysfunction, social isolation/dysfunction and drug dependence.

Studies on mortality among heroin users that report suicide-specific gender figures consistently report a significantly higher prevalence of completed suicide among males (Bewley *et al.* 1968; Tunving 1988; Perucci *et al.* 1991; Dukes *et al.* 1992; Rossow 1994; Goldstein & Herrera 1995; Oyefeso *et al.* 1999; Quaglio *et al.* 2001). In contrast, being female is strongly associated with a his-

tory of attempted suicide among heroin users (Murphy *et al.* 1983; Allison *et al.* 1985; Kosten & Rounsaville 1988; Johnsson & Fridell 1997; Ravndal & Vaglum 1999; Rossow & Lauritzen 1999; Borges *et al.* 2000; Darke & Ross 2001; Rossow & Lauritzen 2001). In all studies of heroin users in which prevalence and gender have been reported, females have a higher prevalence of attempted suicide than males (Ravndal & Vaglum 1999; Rossow & Lauritzen 1999; Darke & Ross 2001; Rossow & Lauritzen 2001).

Depression as a risk factor for suicide has particular salience for heroin users. Studies have shown consistently that between a quarter and a third of heroin users meet the criteria for a life-time diagnosis of major depression, many magnitudes greater than levels seen in the general population (Dinwiddie *et al.* 1992; Darke & Ross 1997). Depression among this group presents a risk factor of considerable importance. Few studies of mortality or suicide among heroin users have reported on psychopathology (Buckstein *et al.* 1993; Kjelsberg, Winther & Dahl 1995; Oyefeso *et al.* 1999; Gossop *et al.* 2002), presumably due to a paucity of data at baseline. Higher levels of anxiety have been associated in one study with mortality (Gossop *et al.* 2002). Both Buckstein *et al.* (1993) and Kjelsberg *et al.* (1995) reported higher levels of depression and suicidal ideation among those who subsequently completed suicide. While not measuring depression *per se*, Oyefeso *et al.* (1999) reported that antidepressants were present in 24% of drug overdose suicides among heroin users. Given that abuse of these drugs is rare among heroin users (Darke & Ross 2000), it is probable that this reflects a high degree of underlying depression among these cases. The data on attempted suicide is more extensive. Studies have repeatedly shown those with a history of attempted suicide to have a higher prevalence of major depression and/or higher levels of depression as measured on instruments such as the BDI (Murphy *et al.* 1983; Allison *et al.* 1985; Kosten & Rounsaville 1988; Chatham *et al.* 1995; Johnsson & Fridell 1997; Ravndal & Vaglum 1999; Rossow & Lauritzen 1999; Best *et al.* 2000; Darke & Ross 2001). The higher levels of depression seen among those with a history of suicide appear to persist after an attempt has been made. Both Darke & Ross (2001) and Best *et al.* (2000) reported significantly higher levels of current depression among those with a history of attempted suicide, even though the median time since most recent attempt were 54 months and 34 months, respectively.

As noted above, a diagnoses of conduct disorder of childhood, and its adult equivalent ASPD, have been associated with suicide. ASPD is a rare diagnosis in the general community (4%), but occurs at rates of 50% or more in heroin-using samples (Darke *et al.* 1998). As with depression, ASPD is a diagnosis of great salience for

heroin users. Few studies that have examined this specifically in relation to heroin or injecting drug users (Murphy *et al.* 1983; Harlow 1990; Dinwiddie *et al.* 1992; Buckstein *et al.* 1993; Darke & Ross 2001). Those that have, however, have failed to find significantly elevated rates of conduct disorder or ASPD in completed suicides (Buckstein *et al.* 1993; Kjelsberg *et al.* 1995) or those with a history of attempted suicide (Darke & Ross 2001; Murphy *et al.* 1983; Dinwiddie *et al.* 1992). It is important to note that there are specific problems in making the diagnosis among heroin users, as the criminal behaviours engendered by drug dependence means that the odds of receiving a diagnosis that is based primarily upon criminal behaviours is high. As such, many diagnosis of ASPD for this group are artefacts of the heroin-using life-style, rather than true diagnoses of psychopathy.

No study of heroin fatalities has reported specifically on indices of social isolation and dysfunction as a predictor of completed suicide. Several studies have, however, reported on these factors in predicting overall mortality. Factors associated with mortality included unemployment (Segest *et al.* 1990), homelessness (Gossop *et al.* 2002), lower income (Harlow 1990), lower educational status (Davoli *et al.* 1993), arrests and impending imprisonment (Joe, Lehman & Simpson 1982; Buckstein *et al.* 1993; Marx *et al.* 1994), unstable social groupings (Segest *et al.* 1990) and physical disability (Hser *et al.* 2001). Social isolation and dysfunction have, however, been related specifically to attempted suicide among heroin users (Kosten & Rounsaville 1988; Chatham *et al.* 1995; Rossow & Lauritzen 1999; Borges *et al.* 2000; Darke & Ross 2001). Heroin users who attempted suicide in the 2.5 years follow-up period of the Kosten & Rounsaville (1988) study had poorer social functioning. Poorer current social functioning has also been found among methadone maintenance patients (Darke & Ross 2001) and treatment entrants who have attempted suicide (Rossow & Lauritzen 1999). In both these studies, these patients were more likely to be socially isolated, with few or no friends. Chatham *et al.* (1995) reported higher levels of hostility and interpersonal conflict among methadone clients with suicidal ideation compared to matched controls.

Related to social functioning are adverse events in childhood, what Rossow & Lauritzen (2001) refer to as 'shattered childhood'. Few studies of mortality and/or suicide among heroin users address this issue (Tunving 1988; Segest *et al.* 1990; Buckstein *et al.* 1993; Marx *et al.* 1994). Elevated rates of parental psychopathology has been associated with completed suicide among heroin users (Tunving 1988; Segest *et al.* 1990; Buckstein *et al.* 1993), as has parental drug and alcohol problems (Buckstein *et al.* 1993). General mortality among this

group has also been associated with parental drug and alcohol problems and loss of parents (Marx *et al.* 1994). Childhood factors have been associated strongly with future suicide attempts among heroin users (Murphy *et al.* 1983; Chatham *et al.* 1995; Johnsson & Fridell 1997; Darke & Ross 2001; Rossow & Lauritzen 2001). In particular, parental factors appear to be crucial. The absence of parents during childhood (Murphy *et al.* 1983; Chatham *et al.* 1995; Darke & Ross 2001; Rossow & Lauritzen 2001) and parental drug and alcohol problems (Murphy *et al.* 1983; Johnsson & Fridell 1997; Darke & Ross 2001; Rossow & Lauritzen 2001) have been related to suicide attempts among heroin users. No study to date has examined genetic predisposition to suicide specifically among heroin users. Sexual and physical abuse during childhood have been related strongly to suicide (Murphy *et al.* 1983; Rossow & Lauritzen 2001). Finally, a history of psychiatric treatment in childhood has been associated with later suicide attempts among heroin users (Murphy *et al.* 1983; Johnsson & Fridell 1997; Rossow & Lauritzen 2001). There is some suggestion that the number of childhood problems *per se* is related to future suicide attempts. The sole study that has examined the relationship between the number of adverse childhood events and later suicide attempts found that the more adverse childhood events the greater risk of attempted suicide (Rossow & Lauritzen 2001).

Among heroin users, however, there appear to be specific risk factors that relate to drug use. Studies of mortality have related longer heroin-using careers to risk of death (Eskild *et al.* 1993; Marx *et al.* 1994; McAnulty *et al.* 1995; Hser *et al.* 2001), and of suicide in particular (Tunving 1988). Borges *et al.* (2000) indicate that while heroin use *per se* was a risk factor for attempted suicide, a diagnosis of heroin dependence increased the risk of attempted suicide, unlike cocaine and amphetamines.

Higher levels of polydrug use have also been associated both with mortality (Gossop *et al.* 2002) and attempted suicide (Murphy *et al.* 1983; Rossow & Lauritzen 1999; Borges *et al.* 2000; Darke & Ross 2001). Borges *et al.* (2000) noted that the number of drug classes used was a stronger predictor of suicidal behaviour than any individual drug class. This is of concern, as polydrug use is widespread among heroin users (Darke & Ross 2001). While being primary heroin users, large proportions of heroin users also meet criteria for alcohol and benzodiazepine dependence (Darke & Ross 1997). Heavier use of alcohol has been related to mortality (Joe *et al.* 1982; Gossop *et al.* 2002; Hser *et al.* 2001), completed suicide (Tunving 1988) and attempted suicide (Murphy *et al.* 1983; Ravndal & Vaglum 1999; Borges *et al.* 2000) among heroin users. Benzodiazepine use has been associated with increased mortality (Gossop *et al.* 2002) and risk of attempted suicide among heroin users

(Murphy *et al.* 1983; Ravndal & Vaglum 1999; Rossow & Lauritzen 1999; Best *et al.* 2000). Thus, a large proportion of heroin users are polydrug users and, depending on the extent of polydrug use, the data suggest that they are at further suicide risk than the risk associated with heroin use *per se*.

In addition to drug use, HIV infection, for which injecting drug use is a known risk factor, has been related to suicide and overdose among heroin users (Eskild *et al.* 1993; Van Haarrecht *et al.* 1994, 1996; Van Ameijden *et al.* 1999).

Overall, it would appear that, with the exception of drug use issues and ASPD, the suicide risk factors reported in general population studies parallel those reported among heroin users. What should be borne in mind, however, is the extremely high prevalence of these risk factors among heroin users. The prevalence of major depression among heroin users is many orders of magnitude that of the general population (Rounsaville *et al.* 1982; Limbeek *et al.* 1992; Darke & Ross 1997). Similarly, the social profile of heroin users has been shown repeatedly to be one of predominant unemployment, low educational levels, social isolation, repeated incarceration, high rates of parental alcoholism and psychopathology and divorce (Murphy *et al.* 1983; Harlow 1990; Segest *et al.* 1990; Marx *et al.* 1994; Johnsson & Fridell 1997; Tunving 1998; Rossow & Lauritzen 1999, 2001; Darke & Ross 2001; Gossop *et al.* 2002). Heroin users, and female heroin users in particular, also have high levels of childhood physical and sexual abuse (Dansky *et al.* 1995; Jarvis & Copeland 1997; Medrano *et al.* 1999). In addition, the polydrug use of heroin users means that they are using a variety of drugs such as alcohol and benzodiazepines, each of which has been independently associated with increased suicide risk. The data on polydrug use and risk indicate that there is a cumulative effect of these risks among the polydrug using heroin population. Given their widespread exposure to suicide risk factors, it is not surprising that the rates of both completed and attempted suicide are many times those observed in the general community.

HEROIN USE AND METHODS OF SUICIDE

Studies of the general population have shown repeatedly that there are significant gender differences in methods employed for suicide, with males more likely to employ violent methods such as shooting and hanging, and females more likely to employ non-violent methods such as poisoning with drugs or carbon monoxide (CO) (Stengel 1975; Taylor & Wicks 1980; Moscicki & Santos 1982; Rich *et al.* 1988; Cantor & Lewin 1990; Hassan 1995; Beautrais *et al.* 1996; Canetto & Sakinofsky 1998;

Denning *et al.* 2001). Of particular interest here, poisoning with substances such as drugs constitutes a small minority of male fatalities, but as much as a half of female deaths (Stengel 1975; Taylor & Wicks 1980; Moscicki & Santos 1982; Rich *et al.* 1988; Cantor & Lewin 1990; Hassan 1995; Beautrais *et al.* 1996; Canetto & Sakinofsky 1998; Denning *et al.* 2001). Overall, poisoning, hanging and gunshot wounds constitute the bulk of suicide fatalities (Stengel 1975; Taylor & Wicks 1980; Moscicki & Santos 1982; Rich *et al.* 1988; Cantor & Lewin 1990; Hassan 1995; Beautrais *et al.* 1996; Canetto & Sakinofsky 1998; Denning *et al.* 2001). Due to the preponderance of males among fatalities, violent methods are the most commonly reported means of suicide (Stengel 1975; Taylor & Wicks 1980; Moscicki & Santos 1982; Rich *et al.* 1988; Cantor & Lewin 1990; Hassan 1995; Beautrais *et al.* 1996; Canetto & Sakinofsky 1998; Denning *et al.* 2001).

Unfortunately, studies of suicide among heroin users have rarely reported gender specific data in methods employed for suicide. However, in interpreting data on methods among this group it should be borne in mind that, as in the general population, heroin users who complete suicide are predominantly male (Bewley *et al.* 1968; Tunving 1988; Perucci *et al.* 1991; Dukes *et al.* 1992; Frischer *et al.* 1993; Rossow 1994; Goldstein & Herrara 1995; Quaglio *et al.* 2001), and those who attempt suicide are predominantly female (Murphy *et al.* 1983; Allison *et al.* 1985; Kosten & Rounsaville 1988; Johnsson & Fridell 1997; Ravndal & Vaglum 1999; Rossow & Lauritzen 1999; Borges *et al.* 2000; Darke & Ross 2001; Rossow & Lauritzen 2001). Studies reporting methods employed in cases of fatal suicide among heroin users indicate a substantially higher proportion of substance poisoning deaths than would be expected in the general population (Table 3). In the studies of fatalities reported in Table 3, drug overdose was the means of suicide in approximately half or more of cases (Gardner 1970; Bucknall & Robertson 1986; Tunving 1988; Engstrom *et al.* 1991; Dukes *et al.* 1992; Marx *et al.* 1994; Rossow 1994; Oyefeso *et al.* 1999). In contrast, a recent study of completed suicides in New York reported only 17% of cases being due to drug poisoning (Denning *et al.* 2001). As in the general population, violent deaths are common among heroin-using suicides but do not occur at the rate seen in broader samples. This is particularly evident when it is considered that, among heroin users, the overwhelming majority of suicide fatalities are male. Overall, the use of drugs as a means of completed suicide appears over-represented among heroin users.

The predominance of drug overdose as a means of completed suicide among heroin users is also seen in the few studies that have reported means of attempted suicide (Table 3). What is interesting are the extremely high rates

Table 3 Methods employed by heroin users for completed and attempted suicide.

| Study | Country | Methods employed |
|-------------------------------|-------------|---|
| Completed suicide | | |
| Bucknall & Robertson (1986) | UK | <i>n</i> = 1: non-opioid overdose (100%) |
| Dukes <i>et al.</i> (1992) | New Zealand | <i>n</i> = 8: non-opioid overdose (51%), violent (39%: hang, gun, jump), opioid overdose (13%) |
| Engstrom <i>et al.</i> (1991) | Sweden | <i>n</i> = 446: overdose not specified (68%), other causes not specified (32%) |
| Gardner (1970) | UK | <i>n</i> = 16: overdose not specified (56%), violent (37%: hang, gun) CO 6% |
| Marx <i>et al.</i> (1994) | Switzerland | <i>n</i> = 9: overdose not specified (44%), unspecified (56%) |
| Oyefeso <i>et al.</i> (1999) | UK | <i>n</i> = 298: violent (49%: hanging, cut, stab, electrocution, injuries, gun, drown), overdose drug not specified (45%), CO (11%) |
| Oyefeso <i>et al.</i> (1999) | UK | <i>n</i> = 8: violent (64%: hang, drown, jump), opioid overdose (38%) |
| Rossow (1994) | Norway | <i>n</i> = 71: benzodiazepine/antidepressant overdose (33%), opioid overdose (15%), unspecified (52%) |
| Tunving (1988) | Sweden | <i>n</i> = 19: violent (47%: hang, cut, exposure), non-opioid overdose (42%), CO (11%) |
| Attempted suicide | | |
| Darke <i>et al.</i> (2001) | Australia | <i>n</i> = 89: non-opioid overdose (44%), violent (36%: hang, poison, jump, electrocute, swallow objects), opioid overdose (20%) |
| Johnsson & Fridell (1997) | Sweden | <i>n</i> = 41: non-opioid overdose (50%), violent (37%: cut, hang), opioid overdose (7%), unspecified (6%) |
| Vingoe <i>et al.</i> (1999) | UK | <i>n</i> = 17: non-opioid overdose (71%), violent (19%: cut, jump, hang), opioid overdose (12%) |

of drug poisonings, which is consistent with the picture for fatalities presented above. Overall, poisoning with drugs represents a major means of completed and attempted suicide among heroin users.

The relatively low proportions of suicide deaths attributed to heroin overdose is the most interesting aspect of suicide in this group. As noted above, while drug overdose is a leading means of completed and attempted suicide among this group, it is non-opioid prescription pharmaceuticals that constitute the bulk of these cases in studies where it has been reported (Bucknall & Robertson 1986; Tunving 1988; Dukes *et al.* 1992; Rossow 1994; Johnsson & Fridell 1997; Vingoe *et al.* 1999; Darke & Ross 2001). There is no reason to believe that studies which have merely reported overdose substance not specified (Gardner 1970; Engstrom *et al.* 1991; Marx *et al.* 1994; Oyefeso *et al.* 1999) would vary greatly from this pattern.

It is intriguing that heroin, a drug that results in so many deaths through accidental overdose, does not appear to be the method of choice for heroin users attempting suicide. As noted in the introduction to this review, however, the relationship between heroin overdose and suicide is controversial. Differentiating deliberate and accidental heroin overdose can be problematic, due to ambiguous circumstantial information and unclear intent (Cantor *et al.* 2001). Several authors have noted an overall association between heroin overdose and suicide (Murphy *et al.* 1983; Rossow & Lauritzen 1999;

Vingoe *et al.* 1999; Best *et al.* 2000; Neale 2000), and suicidal intent is argued to occur in a large proportion of overdose cases (Best *et al.* 2000; Neale 2000). However, other studies cast doubt upon the relationship between overdose and suicide (Kosten & Rounsaville 1988; Rossow 1994; Johnsson & Fridell 1997; Ravndal & Vaglund 1999; Vingoe *et al.* 1999; Best *et al.* 2000; Darke *et al.* 2000; Darke & Ross 2001). In a recent study of 953 overdose that occurred over a five year period, only 5% were classified as suicides (Darke *et al.* 2000). Even if this figure is conservative, deliberate heroin overdose clearly was unusual. Conversely, heroin overdoses constitute only a small proportion of completed and attempted suicides (Bucknall & Robertson 1986; Tunving 1988; Dukes *et al.* 1992; Rossow 1994; Johnsson & Fridell 1997; Vingoe *et al.* 1999; Darke & Ross 2001). Even given problems in differentiating deliberate and accidental overdose, it would appear that most overdoses are accidental, and that most suicidal behaviour among heroin users employs means other than heroin.

SUMMARY

We now return to the questions posed at the beginning of this review. First, mortality among heroin users is in the order of 13 times that of matched peers (Hulse *et al.* 1999). While there are many causes of this excess mortality, suicide makes a substantial contribution. Studies of

heroin users reporting suicide as a cause of death range between 3% and 35% of cases, and the suicide rate among this group is estimated at 14 times that of the general population (Harris & Barraclough 1997). Not surprisingly, given the rates of completed suicide, attempted suicide also occurs at a rate well in excess of the general population, as does suicidal ideation. Suicide represents a major risk for heroin users, and a major problem for drug treatment agencies that deal with this population.

Identifying those at risk is thus clearly a matter of importance. The major risk factors for suicide seen in the general population also appear to apply to this particularly at risk group. Thus, gender, psychopathology, family dysfunction and social isolation are all associated with suicide and attempted suicide among heroin users, as they are in the general population. What is different with heroin users is the extremely wide exposure to these factors. A description of a high suicide risk individual as a depressed, socially isolated individual from a dysfunctional family background is also a stereotypical picture of a long-term heroin user. The risks are the same, but large proportions of heroin users are likely to have many of these factors. Heroin users also carry additional risks associated with their drug use. Polydrug use is linked to an increased risk of suicide, and heroin users are overwhelmingly polydrug users. The sheer number of risk factors heroin users carry places the rates of completed and attempted suicide among this group into perspective.

The salience of overdose as a means of completed and attempted suicide is consistent with the polydrug use of heroin users. Drugs would appear to play a larger role in suicide among heroin users compared to the general population, as they do in their everyday life. What is extraordinary, however, is the role that drugs other than heroin play in these deaths and near-deaths. Heroin is a drug that can easily cause death, and plays a large role in the excess fatalities of heroin users through accidental overdose. Heroin, however, appears to play a relatively small role in suicide among this group. Why this should be so is unclear, and requires specific attention. The data certainly indicate caution in prescribing practices for this group, particularly with respect to benzodiazepines and antidepressants.

Overall, suicide is a major clinical issue among heroin users. The rates of completed and attempted suicide among this group, and the extensive risk factors present among them, indicate that routine screening and clinical attention needs to be given to the risk of suicide. In addition to the risks that heroin use represents in terms of dependence, overdose, disease and criminality, suicide is a major problem that clinics and agencies face, and which will require targeted intervention if the rates of suicide among this group are to decline.

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