ELSEVIER

Drug and Alcohol Dependence 72 (2003) 67–74

DRUG and ALCOHOL DEPENDENCE

www.elsevier.com/locate/drugalcdep

Cause and manner of death in drug-related fatality: an analysis of drug-related deaths recorded by coroners in England and Wales in 2000

Lucy Webb *, Adenekan Oyefeso, Fabrizio Schifano, Survjit Cheeta, Mike Pollard, A. Hamid Ghodse

National Programme of Substance Abuse Deaths, St. George's Hospital Medical School, Cranmer Terrace, London SW17 0RE, UK

Received 17 April 2003; accepted 27 May 2003

Abstract

This study investigated causes and manner of drug-related fatalities recorded in 2000 in the United Kingdom, measuring the 'masked' manner of death in cases typically recorded as overdose. A retrospective cohort study was used of 1037 cases of accidental drug-related fatalities reported by coroners in England and Wales to the National Programme of Substance Abuse Deaths. Whilst 802 cases were identified as direct acute overdose, representing 77% of the total accidental deaths, 23% of 'overdose' fatalities were caused by asphyxiation (7%), drug-related medical conditions (7%), non-drug-related conditions (4%), traumatic accidents (3%) and infections (2%). Younger people show higher risk of overdose and asphyxiation; older people show higher risk from pre-existing medical conditions. This study not only confirmed the high risk of overdose associated with heroin and polydrug use, but it also identified other high fatality risk factors for heroin/morphine users such as contracting an acute infection leading to septicaemia or endocarditis, or contracting a chronic infection such as HIV, HBV or HCV. In contrast, stimulants particularly featured in traumatic accidents, with amphetamine use most associated with cardio-vascular fatality. These findings highlight the 'masked' manner of death in cases commonly recorded as overdose and demonstrate the need for a more-detailed and systematic method of recording drug-related deaths in order to inform drug education and harm reduction strategies.

Keywords: Drug mortality; Substance misuse; Drug fatality

1. Introduction

It is well established that the mortality rate of drug misusers is much higher than for the general population. Joe et al. (1982) found a mortality rate in US drug misusers of up to 14 times that of their peers. Ghodse et al. (1998) reported a sixfold excess risk of death among British injecting drug users (IDUs), with the most frequent cause of death being accidental overdose. More recently, Gossop et al. (2002) reported a 1.2% mortality rate among UK drug misusers attending treatment clinics, approximately six times that of an age-matched general population, and Quaglio et al. (2001) found an IDU mortality rate in Italy to be 13 times greater than in the general population. Many of these studies show that drug misusers are at risk not just of drug overdose but also from acquired diseases, accidents and other causes of death associated with a lifestyle of drug misuse.

Of deaths from drug misuse, Allen (2001) reported a 5% rise in coroners' verdicts of death from drug misuse in the year 2000, from 573 to 605, while the National Programme of Substance Abuse Deaths (NP-SAD) recorded 1296 drug-related deaths in 2000. The Office for National Statistics (ONS, 2001) reported a total of 2943 deaths in England and Wales for 1999, where drug poisoning was the underlying cause of death. Such widely differing mortality rates reflect the variation in

* Corresponding author. Address: Department for Mental Health Nursing, University of Salford, Peel House, Albert Street, Eccles, Manchester M30 0NN, UK. Tel.: +44-161-295-2798; fax: +44-161-295-2963.

E-mail address: l.i.webb@salford.ac.uk (L. Webb).

03765-8716/03/$ - see front matter
doi:10.1016/S0376-8716(03)00191-1

data collection and recording. Whilst drug-related mortality studies provide invaluable information on levels of drug use and practice, assisting in the monitoring of effectiveness of national and regional drug policies, prescribing practices and treatment effectiveness, it has been reported that such studies cannot provide more detailed information on cause of death or provide accurate information on a base population (Powis et al., 1999; Gossop et al., 2002; Quaglio et al., 2001). When more detailed information is obtained, mortality data have been used to indicate personal factors and practices that increase risk within the population of drug misusers. From mortality data on UK drug-related deaths Ghodse et al. (1998, 2002) found that those most at risk were males under the age of 45, with a known history of drug misuse, polydrug use and using heroin. Brettle et al. (1997) reported that, in pre-AIDS deaths in HIV positive IDUs, 45% were from direct accidental overdose, while 24% of the drug-related fatalities were associated with an underlying drug-related medical condition. Sudden deaths had a significant underlying pathology that may have increased the individual's susceptibility to an overdose or bacterial infection.

There have been many recent calls for more accurate and detailed data on drug-related deaths in order to improve learning from both the medical and social situation in drug misuse and to monitor changes in drug use and consequent risk. The NP-SAD (Ghodse et al., 1998, 2002) collects data from coroners in England and Wales on deaths where licit or illicit drugs are implicated in the death. This database contains a source of information regarding the nature of death in each case and provides an opportunity to analyse in greater detail deaths generally recorded as drug overdose or drug misuse in mortality population studies. Therefore, the aim of this research was to examine the causes and manner of death recorded by NP-SAD in drug-related fatalities occurring in 2000 in England and Wales, in order to elicit the 'masked' manner of death in cases typically recorded as a death by drug misuse.

2. Methods

2.1. The NP-SAD database

The study sample was taken from accidental death cases reported by coroners in England and Wales to the NP-SAD in the year 2000. The database includes drug-related deaths where a psychoactive substance was directly implicated in the death, where the person had a history of dependence or abuse of psychoactive drugs. Coroners supply demographic data and information regarding prescribed medication, place and circumstances of death, substances found post mortem, coroner's verdict and causes of death as recorded in the death certificate. A description of the circumstances of death is also requested which provides explanation to the coroner's verdict.

2.2. Case identification

In accordance with both Quaglio et al. (2001) and Van Haastrecht et al. (1994) a drug-related fatality was defined as accidental overdose in cases of recent drug use under circumstances that did not suggest other causes of death. Therefore, cases were deemed to be accidental and caused by direct overdose when no evidence suggested otherwise. Cases were excluded on the grounds of being 'intentional' or 'not known' where (i) the coroner gave a verdict of suicide, or (ii) death was likely to have been caused by clear suicidal or homicidal intent but otherwise recorded as 'open verdict', or (iii) 'no verdict' or (iv) in accordance with Quaglio et al. (2001), the information available was insufficient to support a causal judgement.

2.3. Case categorisation

Cases were identified and attributed to six categories of cause of death according to the following hierarchy of evidence: cause of death listed in death certificates; coroner's verdict; drugs implicated; drugs found post mortem; additional descriptive information from the coroner's report. Causes of death according to the purposes of this study were:

(i) Overdose—death directly related to an episode of toxicity. For example, where cause of death is given as the physiological effects of the substance implicated or its direct consequences, i.e. respiratory depression, pneumonia, anoxia, renal failure, multiple organ failure.

(ii) Trauma—death attributed to a traumatic injury caused by behaviour related to intoxication, i.e. road traffic accident, drowning, electrocution. Deaths by traumatic accident were deemed drug-related where intoxication is likely to have contributed to dangerous behaviour.

(iii) Non-drug-related medical condition—toxicity superimposed on a pre-existing medical condition not related to drug abuse; where an existing medical condition is listed as a cause of death, i.e. asthma, epilepsy, arthrosclerotic heart disease, chronic bronchitis. Cases were attributed to this category where such a medical condition was mentioned as a contributing cause of death.

(iv) Drug-related medical condition—toxicity superimposed on a pre-existing medical condition related to substance misuse, i.e. hepatitis B, hepatitis C, chronic endocarditis, cirrhosis of the liver. Cases were attributed to this category where such a condition was mentioned as a contributing cause of death.

(v) Acute infection—death caused by acute infection related to an index episode of drug abuse, i.e. septicaemia, acute endocarditis, necrotising faciitis.

(vi) Acute physical event—non-traumatic physical/physio-pathological event related to an index episode of intoxication/drug misuse, i.e. aspiration of gastric contents, postural asphyxia, hypothermia. Deaths by acute non-traumatic physical event were deemed drug-related where intoxication is likely to have contributed to an inability to protect oneself from harm.

In order to gain a measure of concordance, case identification and categorisation were carried out by two researchers (LW and SC) independently. Categories of cause of death and case identification were confirmed by a medical consultant specialist in addiction (FS).

2.4. Data and statistical analysis

A cross-case analysis of causes of death and demographic data with psychoactive substances implicated and psychoactive substances found post mortem was conducted. Concordance between independent case selectors was measured using Phi, and prevalence ratios and their 95% confidence intervals were used for comparisons. All statistical analyses were conducted using SPSS for Windows (version 10.0) and CLINSTAT (Bland, 1990).

3. Results

3.1. Concordance ratings

Concordance between independent case selectors was 0.77 overall, with 0.85 for direct acute overdose, 0.92 for traumatic accident, 0.88 for acute event and 0.72 for drug-related and non-drug-related medical conditions. The concordance for acute infection was 0.64, although case selectors agreed on 11 out of 18 cases of acute infection.

3.2. Causes of death

One thousand and thirty-seven cases of accidental drug-related fatalities were identified in the year 2000. There were 802 cases identified as direct acute overdose, representing 77% of the total accidental deaths. Of the remaining 23%, 31 were deaths by traumatic accident (3%); 40 attributed to a non-drug-related medical condition (4%); 72 attributed to a drug-related medical condition (7%); 18 attributed to acute infection (2%) and 74 attributed to an acute, non-traumatic physical event (7%) (Table 1).

Within the categories of cause of death, the coroners frequently reported specific conditions related to the deaths. For acute physical events, aspiration of gastric contents was mentioned in 42 cases of direct aspiration asphyxia and 22 cases of aspiration pneumonia. There were six cases of postural asphyxia and one case of hypothermia. For traumatic accident, road traffic accidents were mentioned in 11 cases. Other traumatic accidents were listed variously as drowning, falls, electrocution and railway accidents. Other mentions were 'multiple injuries' without specification. Within both medical condition categories, there were 21 cases of a pre-existing cardiac disease or condition and six cases of cardiac arrest indirectly associated with substance misuse. Thirteen cases were mentioned with a pre-existing pneumonia/bronchopneumonia, two cases of epilepsy, five of renal disease, six of pre-existing asthma and 16 cases of a chronic infection or illness which included HIV, arthritis, back pain and pancreatitis. Liver disease was mentioned in 39 cases which included hepatitis B and C (HBV, HCV), cirrhosis and fatty liver. Of 20 cases in which acute infections were specified, these included necrotizing faciitis, septicaemia and endocarditis.

3.3. Causes of death and demographic characteristics

Table 1 shows the demographic distribution by cause of death. The majority of cases were male (79.8%), under the age of 45 years (84.3%), unemployed (61.5%), with a history of drug abuse/dependence (72.8%). The mean age of the sample was 37.7 years. Analysis of demographic data by cause of death category shows notable differences in risk between genders, and females are less likely to die by traumatic accident (prevalence ratio = 0.1), acute non-traumatic physical event (prevalence ratio = 0.2) or drug-related medical condition (prevalence ratio = 0.2), but have a narrowed differential of risk of fatality from a non-drug-related medical condition (prevalence ratio = 0.4) and acute infection (prevalence ratio 0.5).

By comparison with the 15–24 age group, the 25–34 age group has the highest risk of death by all categories, notably drug-related medical condition (prevalence ratio = 30.0), acute infection (prevalence ratio = 10.0) and direct overdose (prevalence ratio = 2.3). The 35–44 age group has similar levels of risk in all but traumatic accidents. The over 45 group has a significantly reduced risk from traumatic accidents (prevalence ratio = 0.1).

There was a significant prevalence difference by employment status with those categorized as employed showing a reduced risk of fatality in all categories except traumatic accident, while those of no fixed abode are more at risk of direct overdose than other causes of drug-related fatality. Cases with a history of drug misuse were more likely than non-addicts to die from a drug-related condition (prevalence ratio = 1.1). All acute infection fatalities were cases with a history of drug misuse.

Table 1
Demographic distribution by cause of death (%)

	Direct overdose ($n = 802$)		Traumatic accident ($n = 31$)		Non-drug-related medical condition ($n = 40$)		Drug-related medical condition ($n = 72$)		Acute infection ($n = 18$)		Acute physical event ($n = 74$)		Total ($n = 1037$)
	%	PR	%	PR	%	PR	%	PR	%	PR	%	PR	
Gender													
Male	79.9	1.0	87.1	1.0	72.5	1.0	80.6	1.0	66.7	1.0	85.5	1.0	828
Female	20.3	0.3[a]	12.9	0.1[b]	27.5	0.4[b]	19.4	0.2[b]	33.3	0.5	14.9	0.2[b]	209
Age group													
15–24	17.2	1.0	25.8	1.0	2.5	1.0	1.4	1.0	5.6	1.0	21.6	1.0	165
25–34	39.4	2.3[a]	48.4	1.9	30.0	12.0[a]	41.7	30.0[a]	55.6	10.0[a]	39.2	1.8[a]	412
35–44	27.7	1.6[a]	22.6	0.9	37.5	15.0[a]	36.1	26.0[a]	33.3	6.0[a]	28.4	1.3	297
45–65+	15.5	0.9	3.2	0.1[b]	30.0	12.0	20.8	15.0[a]	5.6	1.0	10.8	0.5	161
Occupation status													
Unemployed	61.8	1.0	51.6	1.0	60.0	1.0	81.9	1.0	72.2	1.0	67.6	1.0	638
Employed	35.4	0.6[b]	48.4	1.1	35.0	0.6[b]	15.3	0.2[b]	22.2	0.3[b]	29.7	0.4[b]	370
Living arrangement													
Fixed address	85.9	1.0	93.5	1.0	90.0	1.0	94.4	1.0	88.9	1.0	93.2	1.0	907
No fixed abode	6.7	0.8[b]	3.2	0.1[b]	0		5.6	0.6[b]	5.6	0.6[b]	4.1	0.4[b]	63
Place of death													
Resident address	62.0	1.0	22.6	1.0	47.5	1.0	54.2	1.0	11.1	1.0	68.9	1.0	615
Hospital	26.7	0.4[b]	38.7	1.7	50.0	1.1	37.5	0.7[b]	88.9	8.0[a]	21.6	0.3[b]	305
Other	11.3	0.2[b]	38.7	1.7	2.5	0.1	8.3	0.2[b]	0		9.5	0.1[b]	117
Addict status													
Yes	71.3	1.0	71.0	1.0	60.0	1.0	88.9	1.0	100		74.3	1.0	755
No	20.1	0.3[b]	12.9	0.2[b]	35.0	0.6[b]	9.7	0.9[b]	0		10.8	0.2[b]	194
Not known	8.6		16.1		5.0		1.4		0		14.9		88

[a] 95% C.I. > 1.0.
[b] 95% C.I. < 1.0.

Table 2
Implicated psychoactive substance by manner of death (%)

Implicated drug alone or in combination	Direct overdose ($n = 802$)		Traumatic accident ($n = 31$)		Non-drug-related medical condition ($n = 40$)		Drug-related medical condition ($n = 72$)		Acute infection ($n = 18$)		Acute physical event ($n = 74$)	
Heroin/morphine	424	(53)	9	(29)	9	(23)	33	(46)	11	(61)	42	(57)
Other opiates	106	(13)	2	(6)	9	(23)	8	(11)	0		7	(5)
Methadone	101	(13)	3	(10)	2	(5)	19	(26)	2	(11)	20	(19)
Antidepressants	87	(11)	1	(3)	7	(18)	3	(4)	0		3	(4)
Hypnotic/sedative	91	(11)	7	(23)	7	(18)	10	(14)	3	(17)	11	(15)
Anti-psychotic	14	(2)	0		1	(3)	0		0		4	(4)
Cocaine	35	(4)	8	(26)	3	(8)	3	(4)	2	(1)	5	(7)
Ecstasy	15	(2)	7	(23)	1	(3)	1		0		2	(3)
GHB	2		0		0		0		0		0	
Anti-epileptic	3		0		0		0		0		0	
Anti-Parkinson's	3		0		0		0		0		1	(1)
Alcohol[a]	232	(29)	15	(48)	9	(23)	22	(31)	1		21	(27)
Amphetamines	11	(1)	2	(6)	6	(15)	0		0		0	

[a] Where combined with another substance(s).

3.4. Substances implicated in death and cause of death

Table 2 shows the numbers and percentages of psychoactive substances implicated in the cause of death, as sole drug or in combination with other drugs. Table 3 shows the numbers and percentages of psychoactive substances found post mortem by cause of death, as sole drug or drug in combination.

Heroin/morphine, alone or in combination with other drugs, was most frequently mentioned in all categories except traumatic accident. It accounted for 53% of deaths by direct overdose and was found post mortem in 61% of overdose cases. It was the most frequently implicated substance in acute infections (61%), drug-related medical conditions (46%) and acute physical events (57%). Heroin/morphine was found post mortem in 55% of cases where death was caused by aspiration of gastric contents, aspiration pneumonitis or postural asphyxia. Other opiates (i.e. co-proxamol, dihydrocodeine) were most frequently implicated in non-drug-related medical conditions (23%), particularly as the sole drug implicated in the death (13%). Twenty-three percent of prescribed drugs in this category were other opiates. Methadone was implicated in 13% of direct overdose cases and in only 4% as the sole drug implicated. It was implicated more frequently in acute event (19%) and drug-related medical condition fatalities (26%). Alcohol, in combination with other drugs, was most frequently implicated in traumatic accidents (48%) and was present post mortem in 55% of traumatic accidents. Ecstasy was implicated in 15 (2%) overdose cases, with only 6 (1%) as the sole drug. However, ecstasy was found post mortem in 20 (3%) direct overdose cases and implicated in 23% of traumatic accident deaths, including one case in which ecstasy was the sole drug implicated in the death. Cocaine was implicated in 4% of overdoses, 2% as the sole drug, and was present in 9% of overdose cases post mortem. It was also implicated in 26% of traumatic accidents, in one case as the sole drug. Amphetamines were implicated in only 1% of overdose cases, but in 15% of non-drug-related medical condition fatalities, while accounting for 10% of deaths in this category as the sole drug implicated.

4. Discussion

In the present study, 77% of total accidental deaths were due to the direct toxic effects of the drugs used. For almost a quarter of the total cases, the manner of death was found to be other than direct overdose in this study. Analysis of the demographic details of cases by manner of death indicates there is no higher risk of death by a particular manner for females, contrary to indicators in previous studies (Powis et al., 1999), although young

Table 3
Drug, alone or in combination, found post mortem by manner of death (%)

Drug alone or in combination found post mortem	Direct overdose ($n = 802$)		Traumatic accident ($n = 31$)		Non-drug-related medical condition ($n = 40$)		Drug-related medical condition ($n = 72$)		Acute infection ($n = 18$)		Acute physical event ($n = 74$)	
Heroin/morphine	488	(60.8)	10	(32.3)	9	(22.0)	42	(58.3)	11	(61.1)	41	(55.4)
Other opiates	168	(20.9)	2	(6.5)	9	(22.0)	17	(23.6)	0		13	(17.6)
Methadone	112	(14.0)	4	(12.9)	3	(7.5)	21	(29.2)	6	(33.3)	17	(23.0)
Antidepressants	112	(14.0)	2	(6.5)	7	(17.5)	6	(8.3)	0		8	(10.8)
Hypnotic/sedative	220	(27.4)	9	(29.0)	7	(17.5)	26	(36.1)	3	(16.7)	26	(35.1)
Anti-psychotic	20	(2.5)	0		0		1	(1.4)	0		4	(5.4)
Cocaine	74	(9.2)	8	(25.8)	3	(7.5)	8	(11.1)	2	(11.1)	10	(13.5)
Ecstasy	20	(2.5)	7	(22.6)	1	(2.5)	2	(2.8)	0		0	
GHB	1	(0.1)	0		0		0		0		0	
Anti-epileptic	9	(1.1)	0		1	(2.5)	0		0		1	(1.4)
Anti-Parkinson's	2	(0.2)	0		0		1	(1.4)	0		1	(1.4)
Alcohol[a]	316	(39.4)	17	(54.8)	15	(37.5)	23	(31.9)	1	(5.6)	25	(33.8)
Amphetamines	31	(3.9)	2	(6.5)	6	(15.0)	1	(1.4)	0		1	(3.0)

[a] Where combined with another substance(s).

males show a higher risk from traumatic accidents and acute physical events such as asphyxiation. In line with previous research (Powis et al., 1999), these results suggest trends in manner of death by age group where, by 25 years of age, there is a decreasing risk of death by direct overdose, traumatic accident, an acute physical event or acute infection. There is, however, increasing risk of death for older users by exacerbation of a pre-existing medical condition, particularly a drug-related condition.

Known drug addicts run a higher risk than other users of dying from a drug-related medical condition or an acute physical event such as aspiration of gastric contents. An examination of the detailed living arrangements indicates a higher risk to the homeless from overdose (86% of homeless) compared with other groups ('with others', 75%, 'alone', 77%), supporting previous research (Gossop et al., 2002). Those living with others at home (family, partner or friends), or in some other form of shared accommodation, have a raised risk of dying from aspiration of gastric contents or postural asphyxia. As a high percentage of these deaths (69%) occur at home or in a friend's house, many people dying of asphyxia may not be alone at the time. This was also found by other mortality and overdose survivor research (Gossop et al., 2002; Bennett and Higgins, 1999; Powis et al., 1999) and indicates the necessity for addressing basic education of the recovery position to users and non-users alike. This evidence may also suggest a case for lay administration of naloxone through take-home prescriptions among known heroin users (Strang et al., 1996, 1999). There may also be a case for recognizing and addressing the issue of fear of prosecution delaying first aid by those present at a drug overdose or asphyxiation.

Heroin/morphine was implicated in over half of all accidental deaths in this study. Of those who died from direct overdose over half had heroin/morphine, as one of a number of drugs implicated in the death, and a third of those direct overdose cases died after taking only heroin/morphine. In comparison with other substances, other high fatality risk factors for heroin/morphine users are contracting an acute infection leading to septicaemia or endocarditis, or contracting a chronic infection such as HIV, HBV or HCV. Heroin/morphine does not appear as a lower risk than other substances in any cause of death category except traumatic accident. In contrast, methadone is implicated in only 13% of direct overdose cases and only 4% of cases as the sole drug implicated. This finding is also supported by the rate of methadone found post mortem, where only 14% of cases of direct overdose were recorded as positive for methadone. This finding supports studies of drug users in treatment having reduced mortality (Fugelstad et al., 1997). Methadone users, however, have an increased mortality risk associated with a drug-related medical

condition or an acute physical event. This appears reasonable when considering that methadone users are likely to be older, to have long histories of drug misuse and are more likely to have contracted drug-related medical conditions. Other opiates, such as co-proxamol and dihydrocodeine, were found to be a high risk factor for direct overdose, particularly where they were taken with other substances. However, as a single substance, they were most likely to be implicated in a cause of death associated with a non-drug-related medical condition. This may suggest errors in self-medication and hidden intentional deaths. They may also represent a proportion of the non-addict group who are overdosing on their prescribed or over-the-counter medication.

In the NP-SAD database, alcohol is only recorded where it is present or implicated in combination with other drugs. Despite this, alcohol is implicated in 300 cases in all categories of cause of death, and implicated in a third of overdose deaths. It is the most frequently mentioned drug in traumatic accidents. When looking at the presence of alcohol post mortem, it features in nearly 40% of all cases. The findings underline the prevalence of alcohol as a feature of drug-related fatalities and the frequent concurrent use of alcohol with other drugs.

Analysis of substances in fatalities other than overdose reveals possible risks not commonly highlighted in harm prevention among drug users. The high percentage of deaths by traumatic accident associated with stimulants indicates a level of reckless behaviour and poor awareness of danger that may not be well recognised by users and educators alike. Indeed, cocaine- and ecstasy-related deaths are associated notably with risk-taking behaviour such as swimming, jumping out of moving vehicles or from buildings and walking on railway lines. In addition, cocaine was only recorded as implicated in 54 deaths but was found post mortem in 105 cases. These findings suggest that the prevalence of cocaine use is higher than mortality figures that indicate and point to either a lower risk of death among cocaine users or lower incidence of recording due to the different presentation of such deaths, i.e. association with traumatic accidents. The level of implicated amphetamines in deaths associated with a non-drug-related medical condition, particularly underlying heart disease, draws attention to the risk of amphetamine use for this group and a need to raise awareness of drug use screening and advice where heart disease is diagnosed.

This study highlights that a structured system of coronial reporting can provide a wealth of data that give more detailed information than death certificates or mortality studies alone provide at present in the UK. This study demonstrates a small proportion of the possibilities of risk monitoring with the information that coroners currently provide voluntarily, and yet there is not currently a standardized system of toxicological testing and reporting at inquest, or a statutory requirement of coroners to provide detailed information. While this issue is being reviewed by the UK Government's Home Office, coroners reporting voluntarily to the NP-SAD database are already contributing in some way to a more-detailed and standardized system of evaluating drug-related deaths in England and Wales. However, these reports rely on toxicology and death certificate information. Gossop et al. (2002) have suggested that death certificate cause of death is often imprecise or ill-founded and that accuracy could be improved by routine recording of all substances found by toxicological examination. It would also be helpful if negative findings could be included as standard as it is currently unclear if substances not reported were not present post mortem or not tested for.

Acknowledgements

We are grateful to the coroners of England and Wales, and their officers, who have contributed to this programme, and we thank them and all the staff, past and present, who have contributed to the development of the National Programme of Substance Abuse Deaths.

References

Allen, R., 2001. Deaths reported to coroners England and Wales, 2000. Home Office Statistical Bulletin 7/01. Home Office, London.

Bennett, G., Higgins, D., 1999. Accidental overdose among injecting drug users in Dorset, UK. Addiction 94, 1179–1190.

Bland, J.M., 1990. CLINSTAT user's guide. St. George's Hospital Medical School, London.

Brettle, R., Chiswick, A., Bell, J., Busuttil, A., Wilson, A., Povey, S., Leen, C., 1997. Pre-AIDS deaths in HIV infection related to intravenous drug use. Quarterly Journal of Medicine 90, 617–629.

Fugelstad, A., Annell, A., Rajs, J., Agren, G., 1997. Mortality and causes and manner of death among drug addicts in Stockholm during the period 1981–1992. Acta Psychiatrica Scandinavica 96, 169–175.

Ghodse, H., Oyefeso, A., Webb, L., Pollard, M., Schifano, F., Corkery, J., 2002. Drug-related deaths as reported by coroners in England and Wales, January–June 2001. NP-SAD Surveillance Report No. 8., St. George's Hospital Medical School, London.

Ghodse, H., Oyefeso, A., Kilpatrick, B., 1998. Mortality of drug addicts in the United Kingdom 1967–1993. International Journal of Epidemiology 27, 473–478.

Gossop, M., Stewart, D., Treacy, S., Marsden, J., 2002. A prospective study of mortality among drug misusers during a 4-year period after seeking treatment. Addiction 97, 39–47.

Joe, G., Lehman, W., Simpson, D., 1982. Addict death rates during a four-year post-treatment follow-up. American Journal of Public Health 72, 703–709.

Office for National Statistics, 2001. Deaths related to drug poisoning: England and Wales, 1995–99. Health Statistics Quarterly 09, Spring 2001, pp. 70–72.

Powis, B., Strang, J., Griffiths, P., Taylor, J., Williamson, S., Fountain, J., Gossop, M., 1999. Reported overdose among injecting drug users in London: extent and nature of the problem. Addiction 94, 471–478.

Quaglio, G., Talamini, G., Lechi, A., Venturini, L., Lugoboni, F., 2001. Study of 2708 heroin-related deaths in north-eastern Italy 1985–98 to establish the main causes of death. Addiction 96, 1127–1137.

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

Strang, J., Powis, B., Best, D., Vingoe, L., Griffiths, P., Taylor, C., Welch, S., Gossop, M., 1999. Preventing opiate overdose fatalities with take-home naloxone: pre-launch study of possible impact and acceptability. Addiction 94, 199–204.

Van Haastrecht, H., Mientjes, G., van den Hoek, J., Coutinho, R., 1994. Death from suicide and overdose among drug injectors after disclosure of first HIV test result. AIDS 8, 1721–1725.