

Trends in deaths related to drug misuse in England and Wales, 1993–2004

Oliver Morgan, *Office for National Statistics and Imperial College London*,
Clare Griffiths, Barbara Toson and Cleo Rooney, *Office for National Statistics*,
Azeem Majeed, *Imperial College London*,
Matthew Hickman, *University of Bristol*

Introduction

The UK has a higher prevalence of drug misuse than any other country in Europe.^{1,2} About a third of all adults in England and Wales have used drugs at least once in their lifetime.³ Reported lifetime prevalence of drug use is highest among adults aged under 30, with almost half having used drugs at least once.³

Reducing deaths related to drug misuse was included in the Government's ten-year strategy for tackling drug misuse in 1998.⁴ In 2000 the Advisory Council on the Misuse of Drugs published a report, *Reducing Drug Related Deaths*.⁵ In response to this report's recommendations, a technical working group consisting of experts across government, the devolved administrations, coroners, toxicologists and drugs agencies was set up. Following a review of the system for collecting data on drug-related deaths, the working group proposed an indicator for the surveillance of deaths related to drug misuse. Following the work of the technical group, the Government set a target to reduce deaths related to drug misuse by 20 per cent by 2004, compared to a 1999 baseline. This target was subsequently included in the Government's 2002 Drugs Strategy.^{4,6}

Recent efforts to reduce harm from drug misuse include revised guidelines for the treatment of drug misuse issued in 1999,⁷ and a doubling of Government investment in specialist drug treatment to over £250 million between 2001 and 2004. In this article we report trends in deaths related to drug misuse in England and Wales, looking particularly at the period between 1999 and 2004.

In this article we report trends in deaths related to drug misuse in England and Wales from 1993 to 2004, looking particularly at the period between 1999 and 2004, for which there was a Government target to reduce these deaths by 20 per cent. Although there was an overall decline in deaths related to drug misuse between 1999 and 2004, the percentage reduction, at 9 per cent, was less than the Government target. There was an increase in deaths between 2003 and 2004, largely accounted for by deaths involving heroin/methadone and morphine. Mortality rates were highest in young adults and an increase in mortality rates within this group appears to have been the driver behind rising mortality trends during the 1990s.

Methods

The Office for National Statistics (ONS) maintains a dedicated database of drug poisoning deaths in England and Wales since 1993. Drug poisoning deaths are extracted from the national deaths database using specific International Classification of Diseases codes for the underlying cause of death.⁸ In addition to data supplied in the cause of death section of the coroner's death certificate, the database also contains textual information supplied voluntarily in confidence by coroners to ONS about circumstances of the death, which may include more detailed information about the drugs involved.⁹

We defined deaths related to drug misuse as deaths where the underlying cause was poisoning, drug abuse or drug dependence and where any of the substances controlled under the Misuse of Drugs Act (1971) were involved.^{8,10} We calculated directly age-standardised mortality rates using the European standard population as the reference population. Age-standardisation makes allowances for differences in the age structure of populations which means that results can be compared over time and between sexes. We calculated age-specific rates for two periods: 1993–1998 and 1999–2004.

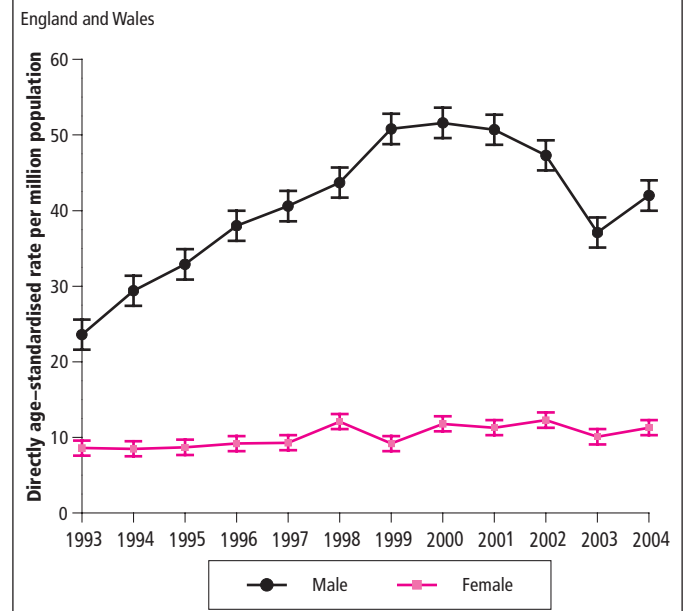
We calculated years of life lost (YLL) for death before 55 years old, standardised to the European standard population. YLL is useful for highlighting causes of death that affect younger people. It measures the number of years a person would have lived if they had not died prematurely. Therefore taking 55 as the threshold for premature death, a person who dies at 45 will contribute 10 years of life lost. We also calculated age-standardised rates of years of life lost per 10,000 population. This represents the rate of years of life lost if the population of England and Wales had the same population structure as the European standard population. We assessed achievement of the Government's target by calculating the percentage change in the number of deaths between 1999 and 2004.

Results

Between 1993 and 2004 there were 12,687 deaths related to drug misuse among males and 3,401 deaths among females. The median age at death remained similar throughout the study period and for males was lower (32 years) than for females (38 years). Overall, 45 per cent of deaths related to drug misuse had an underlying cause of drug abuse/dependence and a third were considered to be accidental (Table 1). Intentional self-poisoning and deaths of undetermined intent accounted for approximately 11 per cent each; these two categories are normally combined by ONS to estimate suicide deaths.¹¹ Less than 1 per cent of deaths were due to homicide: these are usually cases in which drug dealers who supplied the drug were prosecuted for manslaughter.⁹

Age-standardised rates for males increased more than two-fold between 1993 and 2000 from 24 to 52 per million, subsequently declining to 37 per million in 2003 and rising again to 42 per million in 2004 (Figure 1). The decline in 2003 occurred in all age groups, but was most pronounced among males aged 20 to 39 years. The age-standardised mortality rate for females was consistently lower than for males, gradually increasing about 3 per cent per year from 9 to 11 per million. Age-specific mortality rates were low for children under the age of 15 years (Figure 2) and highest for young adults, peaking among 25- to 29-year-olds. Among the population aged 70 years and over, mortality rates increased with age. There was a change in the age-specific rates during the first and second halves of the study period. Compared with 1993 to 1998, the age-specific rates between 1999 and 2004 were much higher among 25- to 54-year-olds, but similar in other age groups.

Figure 1 Age-standardised mortality rates for deaths related to drug misuse, 1993–2004



Throughout the whole period from 1993 to 2004, the age-standardised years of life lost (YLL) before age 55 were higher for males (11,760 in 1993 and 18,875 in 2004) than females (2,615 in 1993 and 4,380 in 2004) (Table 2). For males, there was an increase in YLL from 1993 until 1999, whilst from 2001 to 2003 there was a decrease. Among females, the pattern was less clear, although YLL and YLL rates tended to be lower at the beginning of the study period.

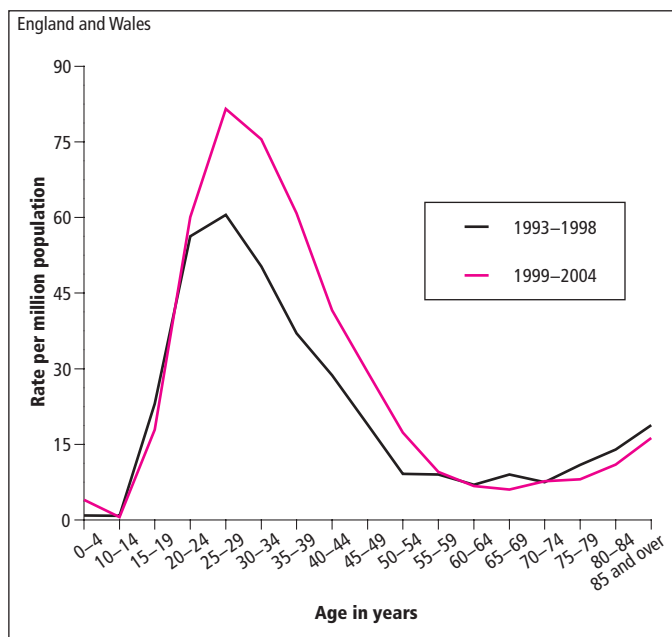
Table 1 Number of deaths related to drug misuse by underlying cause of death, 1993–2004

England and Wales

	Male		Female		Persons	
	Number	Percentage	Number	Percentage	Number	Percentage
Drug abuse/dependence	6,101	48.1	1,055	31.0	7,156	44.5
Accidental poisoning	4,423	34.9	983	28.9	5,406	33.6
Intentional self-poisoning	952	7.5	766	22.5	1,718	10.7
Undetermined intent	1148	9.0	570	16.8	1,718	10.7
Homicide	63	0.5	27	0.8	90	0.6
Total	12,687	100	3,401	100	16,088	100

Figure 2

Age-specific mortality rates for deaths related to drug misuse, persons, 1993–1998 and 1999–2004



The proportion of deaths where specific drugs were mentioned was similar for the entire study period 1993–2004 (data not shown). The substance most frequently mentioned on the death certificate was heroin/morphine, which was mentioned on almost half of deaths among males and over a quarter of deaths among females (Table 3). Methadone was mentioned for 22 per cent of males and 16 per cent of females. The proportion of female deaths with mentions of benzodiazepines was nearly twice that of males (27 per cent compared with 15 per cent), although the number of male deaths involving benzodiazepines was twice that of females. Barbiturates, codeine and dihydrocodeine were also mentioned in a larger proportion of female deaths than male deaths.

Table 2

Years of life lost (YLL) before 55 years, number and age-standardised rate per 10,000 population, deaths related to drug misuse, 1993–2004

England and Wales

	Male		Female	
	YLL	Rate	YLL	Rate
1993	11,760	5.7	2,615	1.3
1994	15,085	7.4	3,000	1.5
1995	17,415	8.6	3,330	1.7
1996	20,060	9.9	3,980	2.0
1997	21,240	10.7	3,810	1.9
1998	22,450	11.3	5,240	2.7
1999	25,365	12.8	3,630	1.9
2000	24,577	12.3	4,965	2.5
2001	25,035	12.6	4,770	2.5
2002	23,410	11.8	4,540	2.3
2003	17,040	8.5	3,885	2.0
2004	18,875	9.3	4,380	2.2

More than one drug was mentioned on the death certificate in 26 per cent of male deaths and 37 per cent of female deaths. For most substances the proportion of deaths where substances were mentioned alone was similar for males and females (Table 3). However, the proportion of female

deaths where heroin/morphine or opiates (unspecified) were mentioned alone was smaller than for males, whereas benzodiazepines were twice as likely to be mentioned alone (32 per cent compared with 16 per cent) for female deaths. No specific drug was mentioned for 6 per cent of male and 5 per cent of female deaths.

In 2004, the total number of deaths related to drug misuse was 1,427, 9 per cent lower than in 1999, the baseline year for the Government's target (Table 4). Though in 2003 the number of deaths was 20 per cent lower than in 1999, the steep increase in 2004 meant that the Government target was not met. Mentions of specific substances that decreased by less than the target level of 20 per cent were heroin/morphine, benzodiazepines, dihydrocodeine, cocaine, and ecstasy. Taken together, these drugs were mentioned in 73 per cent of all drug-misuse-related deaths in 2004. The large increase in deaths involving heroin/morphine during 2004 accounted for much of the increase in deaths related to drug misuse; overall deaths increased by 172 between 2003 and 2004 and mentions of heroin/morphine increased by 153. There was a notable increase in the number of deaths involving codeine from 26 in 1999 to 54 in 2004 as well as cocaine from 88 in 1999 to 147 in 2004, though 65 per cent of these deaths also mentioned other drugs.

Discussion

Drug-misuse-related poisoning is a significant cause of mortality in England and Wales. Although there was an overall decline in deaths related to drug misuse between 1999 and 2004, the percentage reduction, at 9 per cent, was less than the Government target of 20 per cent. Mortality rates were highest in young adults and an increase in mortality rates within this group appears to have been the driver behind rising mortality trends during the 1990s. This was also reflected by increased years of life lost during this period.

Strengths and limitations

Surveillance of deaths related to drug misuse is important for measuring the success of interventions and for planning future harm minimisation strategies. The headline indicator of drug-misuse-related deaths is a useful tool as it gives a single combined figure for deaths involving a range of substances. Because it captures acute poisoning deaths, it should respond rapidly to prevention initiatives. It also provides a useful measure of overall mortality burden in the population. For example, in 2004 drug misuse was the third most common cause of death among young adults aged 15–34 (565 males and 123 females) after land transport accidents (970 males and 208 females) and suicide not including drug poisoning, (828 males and 189 females). In the UK, almost 70 per cent of deaths among opiate misusers are due to fatal poisoning, which is higher than many other countries.^{12,13} Drug-related deaths due to bacterial or blood-borne virus infections, fatal accidents or violence that occurred while under the influence of drugs cannot be directly attributed to drugs through routine mortality statistics.

Although routinely collected mortality data provides the most complete dataset on deaths related to drug poisoning in England and Wales, it must be interpreted with caution as information on the death certificate is not recorded for epidemiological purposes⁹ and measurement of deaths related to drug misuse alone does not provide information about the reasons behind the trends identified. Additionally, particular drugs may not be mentioned on the death certificate if the coroner does not consider them to be relevant. About 10 per cent of drug poisoning deaths have no specific information about the drug(s) taken.⁸ Inconsistency in the application and scope of toxicological examinations undertaken by coroners can also mean that some deaths involving drugs of misuse may not be identified.⁹

Table 3

Number of deaths related to drug misuse where specific substances were mentioned on the death certificate, 1993–2004

England and Wales

	Male (Total number of deaths=12,687)			Female (Total number of deaths=3,401)		
	Mentions	Percentage	Percentage mentioned alone	Mentions	Percentage	Percentage mentioned alone
Heroin/morphine	6,090	(48)	74	982	(29)	65
Methadone	2,740	(22)	56	558	(16)	53
Benzodiazepines	1,938	(15)	16	925	(27)	32
Opiates (unspecified)	1,111	(9)	83	190	(6)	69
Cocaine	709	(6)	35	133	(4)	35
Amphetamines (excluding ecstasy)	469	(4)	32	123	(4)	39
Ecstasy	283	(2)	49	59	(2)	53
Barbiturates	161	(1)	75	182	(5)	76
Codeine	199	(2)	37	118	(3)	37
Dihydrocodeine	691	(5)	50	376	(11)	50
Not specified	807	(6)	-	179	(5)	-

Note: Deaths where more than one substance was involved will be counted more than once.

Table 4

Number of deaths and percentage change compared to 1999 for specific substances involved in deaths related to drug misuse, 1999–2004

England and Wales

		1999	2000	2001	2002	2003	2004
All drug misuse	Number	1,571	1,666	1,628	1,565	1,255	1,427
	Percentage change		(6)	(4)	(0)	(-20)	(-9)
Heroin/morphine	Number	754	926	889	790	591	744
	Percentage change		(23)	(18)	(5)	(-22)	(-1)
Methadone	Number	298	238	207	216	175	200
	Percentage change		(-20)	(-31)	(-28)	(-41)	(-33)
Benzodiazepines	Number	240	207	222	242	211	206
	Percentage change		(-14)	(-8)	(1)	(-12)	(-14)
Opiates (unspecified)	Number	147	168	166	135	84	107
	Percentage change		(14)	(13)	(-8)	(-43)	(-27)
Dihydrocodeine	Number	121	108	118	107	94	81
	Percentage change		(-11)	(-2)	(-12)	(-22)	(-33)
Cocaine	Number	88	80	96	139	113	147
	Percentage change		(-9)	(9)	(58)	(28)	(67)
Amphetamines (excluding ecstasy)	Number	54	23	28	38	33	35
	Percentage change		(-57)	(-48)	(-30)	(-39)	(-35)
Ecstasy	Number	26	36	55	55	33	48
	Percentage change		(38)	(112)	(112)	(27)	(85)
Barbiturates	Number	26	17	29	17	18	14
	Percentage change		(-35)	12	(-35)	(-31)	(-46)
Codeine	Number	26	27	32	30	33	54
	Percentage change		(4)	(23)	(15)	(27)	(108)

Note: Deaths where more than one substance was involved will be counted in more than one row.

Interpretation of results

Following a steep rise throughout the 1990s, the decline in deaths related to drug misuse since 2000 coincided with increased provision of drug treatment services. Between 1998/99 and 2003/04, the number of people reported as presenting to specialist drug agencies nearly doubled (unpublished data: National Drug Evidence Centre) and the quantity of methadone prescribed to treat opiate misuse increased almost 60 per cent (unpublished data: Department of Health). However, the recent reduction in the number of deaths has been insufficient to meet the Government's target of a 20 per cent reduction between 1999 and 2004. Heroin/

morphine continues to be the drug most frequently implicated in deaths related to drug misuse and dominates trends overall. The recent notable increase in deaths involving cocaine mirrors the increased availability of cocaine and crack cocaine, and its uptake among opiate users.^{14,15}

At the population level, deaths related to drug misuse are a product of the size of the drug using population (i.e. the population at risk) and the risk of fatal poisoning among drug users (i.e. case fatality rate). Risk of drug-related overdose tends to increase with age and duration of dependence.¹⁶ Because median age at death remained similar throughout the study period, this indicates the absence of a cohort effect. Therefore,

it is likely that period effects (i.e. size of population at risk) are a more important driver of trends in drug-misuse-related mortality than cohort effects. However, due to the relatively short time series of data available, it was not possible to conduct a full age-period-cohort analysis to assess the contribution of temporal and age effects. Data on mortality risk are needed to measure whether interventions have succeeded in reducing the risk of death. However, apart from small scale pilot studies, no national data on trends in mortality risk among problem drug users have been available since 1993.¹⁷ Hence, it is difficult to assess whether the fall in deaths from 2000 was due to the impact of increased treatment reducing the risk of death, or simply followed changes in the prevalence or pattern of problem drug use.

Estimating trends in the size of the drug using population is difficult and uncertain.^{18,19} An alternative approach is to measure the availability of drugs, estimated from law enforcement drug seizures.^{1,20} This assumes that availability is directly related to market demand. Using this approach, we conducted an earlier analysis showing that increased availability of heroin and methadone was closely associated with increased fatal poisoning deaths involving these drugs (unpublished data). Another approach is to conduct a population survey to ask about drug misuse. In England and Wales this is done as part of the British Crime Survey, which is a household survey that asks a sample of individuals about their self-reported drug use.²¹ Unlike drug availability, trends in self-reported use show little correlation with drug-misuse-related deaths, with reported use of Class A drugs remaining stable at about 3 per cent.²¹ This may be because the survey is unlikely to include drug users at greatest risk of fatal poisoning.

Conclusion

Drug-misuse-related poisoning mortality remains an important public health issue in England and Wales. The recent downward trend is encouraging, with a reduction of 9 per cent in deaths related to drug misuse between 1999 and 2004. The target set by the Government was for a 20 per cent reduction over this period. The reduction comes after a large increase in deaths during the 1990s. Surveys of the risk of overdose death over time are required to support interpretation of drug-misuse-related mortality and help assess whether the increase in treatment has led to a decrease in risk and number of drug-related deaths.

Meaningful interpretation of surveillance data needed to plan effective strategies to reduce the number of drug-misuse-related deaths depends on understanding the size of the drug using population and the risk of fatal poisoning among drug users. Studies of mortality risk among the drug-using population are needed to provide this interpretation.²²

Key points

- Between 1993 and 2004 there were 12,687 deaths related to drug misuse among males and 3,401 deaths among females.
- Age-standardised mortality rates for males increased from 24 to 52 per million between 1993 and 2000, subsequently declining to 37 per million in 2003 and rising again to 42 per million in 2004.
- Between 1999 and 2004, the percentage reduction in deaths related to drug misuse was 9 per cent, less than the Government target of 20 per cent.
- Heroin/morphine was the most commonly mentioned substance, involved in almost half of deaths related to drug misuse among males and over a quarter of deaths among females.

Acknowledgements

Oliver Morgan is funded by the National Health Service London Deanery of Postgraduate Medical and Dental Education. Matthew Hickman is supported by an NHS National Career Scientist Grant.

References

1. European Monitoring Centre for Drugs and Drug Addiction (2005) *The State of the Drugs Problem in Europe*. Annual Report 2005. Available at: <http://europa.eu.int>
2. Bargagli A M, Hickman M, Davoli M, Perucci C A, Schifano P, Buster M *et al* (2005) Drug-related mortality and its impact on adult mortality in eight European countries. *European Journal of Public Health* **79**, 191–199.
3. European Monitoring Centre for Drugs and Drug Addiction (2004) *2004 National report to the EMCDDA by the Reitox National Focal Point. UNITED KINGDOM. New developments, Trends and in-depth information on selected issues*. Available at: www.emcdda.eu.int/index.cfm?fuseaction=public.AttachmentDownload&nNodeID=13339&slanguageISO=EN.
4. The UK Anti-Drugs Coordinator (1998) *Tackling Drugs to Build a Better Britain. The Government's Ten-Year Strategy for Tackling Drug Misuse*, Cm 3945. TSO: London.
5. The Advisory Council on the Misuse of Drugs (2000) *Reducing Drug Related Deaths*. TSO: London.
6. National Treatment Agency for Substance Misuse (2004) *Reducing drug-related deaths. Guidance for drug treatment providers*: National Treatment Agency.
7. Department of Health (1999) *Drug misuse and dependence: guidelines on clinical management*, TSO: London.
8. Office for National Statistics (2006) Report: Deaths related to drug poisoning: England and Wales, 2000–2004. *Health Statistics Quarterly* **29**, 69–76.
9. Christophersen O, Rooney C and Kelly S (1998) Drug-related mortality: methods and trends. *Population Trends* **93**, 29–37.
10. Office for National Statistics (2002) Report: Deaths related to drug poisoning: results for England and Wales, 1993–2000. *Health Statistics Quarterly* **13**, 76–82.
11. Brock A and Griffiths C (2001) Trends in Suicide by Method in England and Wales 1979 to 2001. *Health Statistics Quarterly* **20**, 7–18.
12. Hulse G K, English D R, Milne E and Holman C D (1999) The quantification of mortality resulting from the regular use of illicit opiates. *Addiction* **94**, 221–229.
13. Gossop M, Stewart D, Treacy S and Marsden J (2002) A prospective study of mortality among drug misusers during a 4-year period after seeking treatment. *Addiction* **97**, 39–47.
14. Hope V D, Hickman M and Tilling K (2005) Capturing crack cocaine use: estimating the prevalence of crack cocaine use in London using capture-recapture with covariates. *Addiction* **100**, 1701–1708.
15. Mwenda L, Ahmad M and Kumari K (2005) *Findings 265. Seizures of drugs in England and Wales, 2003*, Home Office, London.
16. White J and Irvine R (1999) Mechanisms of fatal opioid overdose. *Addiction* **94**, 961–972.
17. Ghodse H, Oyefeso A and Kilpatrick B (1998) Mortality of drug addicts in the United Kingdom 1967–1993. *International Journal of Epidemiology* **27**, 473–478.
18. Hickman M, Higgins V, Hope V, Bellis M, Tilling K, Walker A *et al* (2004) Injecting drug use in Brighton, Liverpool, and London: best estimates of prevalence and coverage of public health indicators. *J Epidemiol Community Health* **58**, 766–771.
19. Hickman M, Seaman S and De Angelis D (2001) Estimating the relative incidence of heroin use: applications of a method for adjusting observed reports of first visits to specialist drug treatment agencies. *American Journal of Epidemiology* **153**, 632–641.
20. United Nations Office on Drugs and Crime (2005) *World Drugs Report 2005*, United Nations: New York.
21. Home Office (2005) *Drug Misuse Declared: Findings from the 2004/05 British Crime Survey*, Home Office: London..
22. Hickman M, Carnwath Z, Madden P, Farrell M, Rooney C, Ashcroft R *et al* (2003) Drug-related mortality and fatal overdose risk: pilot cohort study of heroin users recruited from specialist drug treatment sites in London. *Journal of Urban Health* **80**, 274–287.