

Trends in deaths among drug users in Ireland from traumatic and medical causes, 1998 to 2005

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National
Drug-Related
Deaths Index

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Summary

The analysis presented in this paper is the first national report on non-poisoning deaths among drug users in Ireland. The data presented describe trends in non-poisoning deaths (deaths due to traumatic or medical causes) among drug users between 1998 and 2005. This paper is a companion to HRB Trends Series 4, which analysed trends in deaths by poisoning (directly drug-related deaths).

The data used for the analysis presented in this paper were obtained from the National Drug-Related Deaths Index (NDRDI) maintained by the Alcohol and Drug Research Unit of the Health Research Board. The NDRDI records data from four different sources on drug-related deaths and deaths among drug users and among those who are alcohol dependent. These data give a reliable estimate of the total burden of mortality related to drug use in Ireland.

The data relate to individuals with a history of drug dependency or non-dependent abuse of drugs or other substances (ascertained from toxicology results and from Central Treatment List, medical or coronial records) irrespective of whether the substance was directly implicated in the death.

A total of 885 non-poisoning deaths among drug users was recorded between 1998 and 2005. Of those with a known cause of death ($n=746$), 476 (63.8%) were due to trauma and 270 (36.2%) were due to medical causes.

The annual number of deaths due to trauma increased from 39 in 1998 to 83 in 2005. Half of these deaths were of young men aged between 20 and 29 years. The most common causes of death due to trauma were hanging (174, 36.5%) and road traffic collisions (95, 20.0%). Almost half of those involved in road traffic collisions were driving the vehicle at the time of the collision.

A positive toxicology report was available in 412 (86.5%) cases of death due to trauma. In many cases more than one substance was present. When trauma cases with a positive toxicology were analysed by type of death it was found that:

- Alcohol was present in nearly three-fifths (241, 58.5%) of the deaths.
- Cannabis was the illicit drug most commonly found (227, 55.1%).
- Cannabis (40, 67.8%), opiates (24, 40.7%) and cocaine (18, 30.5%) were found in the greatest proportions in deaths due to violence (shooting, stabbing or assault).
- MDMA (ecstasy) (26, 28.6%) was found in the greatest proportion in deaths due to road traffic collisions.

The annual number of deaths due to medical causes increased from 11 in 1998 to 63 in 2005. Over three-quarters of these deaths were of males, and the majority were aged between 30 and 44 years. The most common medical causes of death were cardiac events (67, 24.8%), followed by respiratory infections (48, 17.8%) and liver disease (31, 11.5%). When drug-use history was analysed by medical cause of death it was found that:

- The majority (180, 66.7%) of drug users who died of medical causes had a history of opiate use.
- Three-fifths (19, 61.3%) of those who died of liver disease had a history of alcohol dependency.
- The highest numbers of cocaine users (n=12) and cannabis users (n=24) were among those who died from a cardiac event.

Of the total number of deaths (including poisoning and non-poisoning deaths) recorded by the NDRDI in the period 1998–2005, 192 (7.9%) cases had a documented history of a blood-borne viral infection. The annual number of these cases increased from nine in 1998 to 41 in 2005. The number of drug users who have acquired a blood-borne viral infection highlights the need for continued and expanded harm reduction programmes, including treatment for problem alcohol use, to reduce the risk of infection and prevent the long-term health consequences of liver damage.

The number of drug users who died from hanging or from drowning supports the argument that substance misuse is related to suicide. There is a need for increased awareness and education around this issue, especially for those with a dual diagnosis of mental health and substance misuse problems who are already in treatment and those who present at emergency rooms with non-fatal drug- or alcohol-related injuries.

The number of drug users who were driving at the time of their death and had a positive toxicology is further evidence of the need for more reliable statistics on drink/drug driving. There is a need for expansion of the forensic analysis programme to ascertain the true incidence of driving while under the influence of drugs and/or alcohol. Unfortunately, there is currently no reliable system of road-side testing for the presence of drugs in the body.

The correlation of toxicology and drug-use history with the type of death recorded supports the argument that drug use is contributing to the premature death of drug users in Ireland. More effective measures are required to educate drug users about the health consequences of drug use, particularly the cardio-toxic effects of cocaine.

The continuing upward trend in drug-related deaths revealed in this paper and in its predecessor, Trends Series 4, reflects the increasing numbers in the population who are consuming drugs and taking risks and who have acquired infections or developed medical conditions associated with drug use.

Glossary

Drug users: Individuals who have a history of drug dependency or of non-dependent abuse of drugs and/or other substances

Illicit drugs: Heroin, cocaine, cannabis, MDMA, LSD, volatile inhalants

Median: The median is the value at the mid-point in a sequence of numerical values ranged in ascending or descending order. It is defined as the value above or below which half of the values lie. Unlike the mean (average), the median is not influenced by extreme values (or outliers). For example, in the case of five drug users aged 22, 23, 24 and 46 years respectively, the median (middle value) is 24 years, whereas the mean is 27.8 years. While both the median and the mean describe the central value of the data, the median is more useful in this case because the mean is influenced by the one older person in this example.

Non-poisoning deaths: Deaths in individuals with a history of drug dependency or non-dependent abuse of drugs (ascertained from toxicology results and from Central Treatment List, medical or coronial records) whether or not the use of the drug was directly implicated in the death

Poisoning deaths: Deaths which are directly due to the toxic effect of the presence in the body of one or more drugs and/or other substance(s) (not including prescribed medications)

Trauma: A serious injury to the body, often the result of violence or accident

Types of death due to medical causes: Cases in which more than one medical condition was listed as the cause of death were classified by the main cause of death. The main types of death from medical causes include:

- Cerebral event: Cerebral haemorrhage, cerebral vascular diseases, disorders of the brain
- Haemorrhage: Gastrointestinal haemorrhage, respiratory tract haemorrhage, haemorrhage not elsewhere classified
- Other infection(s): Bacterial diseases, other viral diseases, pancreatitis, meningitis, gastritis, tuberculosis
- Respiratory disease: Asthma, chronic obstructive pulmonary disease, emphysema, bronchitis, respiratory failure otherwise unspecified
- Respiratory infection: Pneumonia, abscess of the lung, pneumonitis due to solids or liquids

Acronyms

ADRU	Alcohol and Drug Research Unit
AIDS	Acquired Immune Deficiency Syndrome
BBV	Blood-borne virus
CTL	Central Treatment List
CSO	Central Statistics Office
EMCDDA	European Monitoring Centre for Drugs and Drug Addiction
ESRI	Economic and Social Research Institute
FSN	Family Support Network
HIPE	Hospital In-Patient Enquiry scheme
HIV	Human immunodeficiency virus
HRB	Health Research Board
ICD	International Classification of Diseases
LSD	Lysergic acid diethylamide
MDMA	3,4-methylenedioxymethamphetamine, also known as ecstasy
NDRDI	National Drug-Related Deaths Index
RTC	Road traffic collision

In the case of data presented by region, this paper refers to the areas covered by the regional drugs task forces (RDTFs), together with the local drugs task forces (LDTFs) within their boundaries, as follows:

Task force	Area included	
ECRDTF	East Coast Regional Drugs Task Force (DTF)	South-east Dublin city and county and East Wicklow, including the two local drugs task force (LDTF) areas within these boundaries
MRDTF	Midland Regional DTF	Counties Laois, Longford, Offaly and Westmeath
MWRDTF	Mid West Regional DTF	Counties Clare and Limerick, and North Tipperary
NDRTF	North Dublin City and County Regional DTF	North Dublin city and county, including the five LDTF areas within these boundaries
NERDTF	North Eastern Regional DTF	Counties Cavan, Louth, Meath and Monaghan
NWRDTF	North West Regional DTF	Counties Donegal, Leitrim and Sligo, and north-west Cavan
SERDTF	South East Regional DTF	Counties Carlow, Kilkenny, Waterford and Wexford, and South Tipperary,
SRDTF	Southern Regional DTF	Counties Cork and Kerry, including the Cork LDTF area
SWRDTF	South Western Regional DTF	South-west Dublin, west Wicklow and County Kildare, including the six LDTF areas within these boundaries
WRDTF	Western Region DTF	Counties Galway, Mayo and Roscommon

Introduction

The Irish National Drug-Related Deaths Index (NDRDI) is an epidemiological database which records cases of death by drug and alcohol poisoning, and deaths among drug users and those who are alcohol dependent. The NDRDI is maintained by the Alcohol and Drug Research Unit (ADRU) of the Health Research Board (HRB). It is jointly funded by the Department of Health and Children and the Department of Justice, Equality and Law Reform.

The NDRDI was established in September 2005 to comply with Action 67 of the National Drugs Strategy 2001–2008.¹ The aim of this action was to put in place a system for recording drug-related deaths and providing accurate data to enable the State and its agencies to respond in an appropriate and timely manner.

The number of drug-related deaths and deaths among drug users is one of the key indicators used to measure the consequences of problem drug use in Europe. The NDRDI enables accurate reporting of these key data to the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). The EMCDDA has recommended that all EU member states establish a special register to record these deaths.

The HRB Trends Series 4 (2008) recorded a total of 1,553 deaths due to poisoning between 1998 and 2005.² Analysis of these cases revealed that:

- Just over half the deaths were caused by more than one substance.
- Opiates, including heroin, were implicated in the majority of deaths.
- Cocaine was implicated in 100 deaths, of which almost three-quarters involved a combination of substances.
- Alcohol, in conjunction with another substance, was implicated in one-quarter of the deaths.
- The majority of cases were male and aged between 20 and 40 years, reflecting international trends.

Alcohol consumption has been reported as the third most detrimental risk factor for ill health and premature death in Europe.³ While the NDRDI has recorded data on alcohol-related deaths and deaths among those who are alcohol dependent since 2004, these data are not presented in this paper. Alcohol is included in the analysis presented in this paper only when it features as an additional addiction, and/or as part of a polysubstance finding in toxicology.

Most cases of drug misuse or dependence involve illicit drugs; however, licit drugs also may be misused and may lead to dependency. Deaths among drug users (whether the user is dependent or non-dependent) may be indirectly attributed to their drug use. This type of death is often defined as an indirectly drug-related death. For the purpose of this paper, these deaths will be referred to as **non-poisonings**. Factors contributing to death in such cases include:

- infection with HIV as a result of sharing drug paraphernalia, and subsequent development of an AIDS-related illness;
- the harmful effects of drug use (both short and long term) on the health of the drug user, such as the cardio-toxic effect of cocaine or drug-related liver disease;^{4, 5, 6, 7}
- actions taken while under the influence of drugs, such as accidents caused by impaired judgement or exacerbation of risky behaviours;^{4, 8}

- psychiatric illness as a co-morbid condition, which places the individual at a greater risk of suicide;^{8, 9, 10, 11}
- violence as a result of the drug use of another individual, such as a road traffic collision or an assault. In line with international practice, these deaths are not recorded by the NDRDI.

Documentation of a history of drug dependence or drug use is not always available, leading to an under-recording of the total number of non-poisoning deaths in the drug-using population.

Calculation of mortality figures for both poisonings and non-poisonings provides an estimate of the total burden of mortality related to drug use in Ireland.

Background

Deaths among drug users that are not directly due to poisoning have not been systematically documented in Ireland; they have been the subject of only two small, theme-based studies.¹² Families of substance users in Dublin (through the Family Support Network [FSN]) have advocated for some years for the development of a mechanism to accurately measure the extent of premature death among drug users. The analysis presented in this paper is the first national report on non-poisoning deaths among drug users in Ireland.

The evidence from International studies points to disease, suicide and trauma, in addition to poisoning/ overdose, as major causes of death among drug users.^{5, 6, 8, 10, 11, 13, 14} For example, drug users have a high risk of acquiring blood-borne viral (BBV) infections such as hepatitis B or C, which in turn increase the risk of liver disease. Equally, the use of stimulants such as cocaine is associated with cardiac problems. These international studies show that suicide is a major cause of death among users of illicit drugs. This is a complex issue, as many users of illicit drugs have additional risk factors for suicide, such as mental illness and emotional or social problems. The evidence also suggests that road traffic collisions (RTCs), other accidents and homicide are major causes of death among drug users. A number of factors may contribute to the increased risk of traumatic death among this group, including the drug-using lifestyle, e.g. involvement in crime, or the effect of psychoactive drugs on the psychomotor skills, judgement, alertness and mood of the user.

Aim of the NDRDI

The aim of the NDRDI is to ensure complete (90%) and accurate (95%) reporting of drug- and alcohol-related deaths, and deaths among drug users and among those who are alcohol dependent, and to provide accurate data to enable the State and its agencies to respond in an appropriate and timely manner.

Objectives of the NDRDI:

- To provide accurate information on drug- and alcohol-related deaths and deaths among drug users and among those who are alcohol dependent.
- To assist in identifying and prioritising areas for intervention and prevention, and to measure the effects of such interventions.

Methods

The data-collection tool was developed from those used in previous research and from tools devised by the EMCDDA. Data were collected retrospectively for each of the eight years between 1998 and 2005.

Data collected include:

- demographic details
- socio-economic information
- history of drug or alcohol dependence or non-dependent abuse of drugs
- risk factors, e.g. history of injecting, imprisonment
- drug or alcohol treatment history
- details about the death itself:
 - toxicology
 - cause of death.

Data sources

In order to ensure a complete and accurate database, the NDRDI records data from several sources: the Coroner Service, the acute hospital sector through the Hospital In-Patient Enquiry scheme (HIPE), methadone prescribing through the Central Treatment List (CTL), the General Mortality Register (GMR) and the community representative body, Family Support Network (FSN).

The Coroner Service

The primary objective of the Coroner Service is to establish, following public investigation, the cause of death (including how the person died) in cases of sudden or unexpected death.¹⁵ In Ireland, a coroner has the same absolute privileges as a judge. To establish the cause of death, the coroner can instigate further inquiries, such as ordering a post-mortem and, if necessary, an inquest. If the results of the post-mortem and any other tests establish the cause of death as being natural, the coroner can then issue a certificate to the Registrar of Births, Deaths and Marriages, enabling that office to issue a death certificate.

An inquest is an inquiry in public by a coroner, sitting with or without a jury, into the circumstances surrounding a death. An inquest must be held by law if a death could be due to unnatural causes. An inquest is concerned with establishing the facts of the death, rather than determining the innocence or guilt of any third party. Once the inquest has been completed, the final outcome is a matter of public record. The cause of death as determined by the coroner is recorded in the NDRDI.

NDRDI researchers collected data on site from the 48 current coroner districts countrywide and entered them into the database on laptops secured by encryption. The time between date of death and conclusion of inquest varies from case to case.¹⁶ This meant that information on some deaths which occurred between 1998 and 2005 could not be obtained from the coroners. The NDRDI database will be updated as and when the verdicts from these inquests become available, and amended figures will be presented in future publications.

The Hospital In-Patient Enquiry (HIPE) scheme

The Economic and Social Research Institute (ESRI) manages the HIPE scheme. HIPE is a computer-based health information system designed to collect medical and administrative data on discharges and deaths in acute hospitals.

Sixty acute hospitals participate in the HIPE scheme. The estimated coverage of cases discharged from these hospitals was approximately 95.5% in the period 1999–2004.¹⁷ The International Classification of Diseases (ICD) codes used by HIPE changed over the reporting period (from ICD9 CM to ICD10 AM), which may have led to some small differences in classification of cases.

An automated programme was developed by the HIPE information technology department of the ESRI to extract the required information from the HIPE database on cases with the relevant ICD diagnoses who had died in hospital. Ninety-eight per cent of HIPE hospitals provided data, which the NDRDI researchers downloaded on site in each hospital.

The Central Treatment List (CTL)

The CTL was established under Statutory Instrument No. 225 following publication of the *Report of the Methadone Treatment Services Review Group 1998*.¹⁸ This list is administered by the Drug Treatment Centre Board on behalf of the Health Service Executive and is a complete register of all patients in Ireland receiving methadone for treatment of opiate misuse. The data on all deaths reported to CTL staff between 1 January 1998 and 31 December 2005 were sent electronically in a secure format to the NDRDI.

The General Mortality Register (GMR)

The Registrar of Births, Deaths and Marriages formally records all notified deaths in Ireland. Using these data, the Central Statistics Office (CSO) categorises each death and the underlying cause of death using ICD codes, and returns this information to the GMR. If the gardaí investigate a death on behalf of the Coroner Service, they also provide supplementary information related to the death to the CSO (Form 104). In the case of each death, only one underlying cause of death and only one external cause, which describes the circumstances under which the death occurred, are recorded. The main disadvantage of this method of recording is that contributory factors, such as drug use, may not be recorded. Data are sent electronically from the CSO to the NDRDI.

The Family Support Network (FSN)

The FSN was established in 2000 by the CityWide Drugs Crisis Campaign. It consists of national representatives of family support groups, individual family members and those working directly with the families of drug users. Information on drug-related deaths may be given voluntarily by family members to personnel from the Network, who then forward it to the NDRDI. Informed consent is required prior to data collection. The FSN data collection is still in its pilot phase and the analysis presented in this paper does not include data from the FSN.

Ethical approval

Ethical approval for the NDRDI was obtained from the HRB ethics committee and from ethics committees covering each individual hospital providing HIPE data. Approval for the use of CTL data was obtained from the Methadone Prescribing Protocol Implementation Committee. All work was carried out in accordance with the IEA/European Epidemiology Group guideline document.¹⁹

Case matching

Cases from the coroners' files, HIPE, the GMR and the CTL were matched to avoid duplication and to maximise the amount of information available on each case. Cases were matched on a selection of variables, including name, gender, county of residence, date of birth and date of death. Cases from the coroners, the CTL and HIPE did not need to have a match in order to be included in the database. Named data were not available from the GMR for the period 1998 to 2005, so, to avoid duplication and over-estimation of the number of cases, GMR cases with no match are not included in this analysis. Improved access to GMR data will enable more complete matching with other NDRDI data sources for deaths that occurred in 2006 and after.

Types of cases included in the NDRDI

Non-poisonings: Deaths in individuals with a history of drug dependency or non-dependent abuse of drugs (ascertained from toxicology results and from CTL, medical or coronial records), irrespective of whether the use of the drug was directly implicated in the death, e.g. cardiac events after cocaine use.

Poisonings: Deaths directly due to the toxic effect of the presence in the body of a drug or drugs and/or other substance(s). Other terms used to describe such deaths include overdose, directly drug-related death and acute drug death. Deaths arising from adverse reactions to prescribed medication are not included in the NDRDI.

Analysis

Number and categories of cases included in the analysis

Between 1998 and 2005, 2,441 drug-related deaths and deaths among drug users met the criteria for inclusion in the NDRDI. Data on these cases were obtained from four sources, and 1,402 (57.4%) appeared in more than one source.

Overall, the annual number of deaths increased between 1998 and 2005. In 2003, there was a notable decrease, but numbers increased again in 2004 and 2005. Of the 2,441 deaths, 885 (36.3%) were non-poisonings (Table 1).

Table 1 Poisonings and non-poisonings by year of death, NDRDI 1998 to 2005 (N=2,441)

	1998	1999	2000	2001	2002	2003	2004	2005
All deaths	242	271	261	276	336	296	360	399
Poisonings (n=1556)	179	187	182	177	210	184	205	232
Non-poisonings (n=885)	63	84	79	99	126	112	155	167

Table 2 shows the number and percentage of non-poisoning deaths recorded in the NDRDI and assigned to one of the following categories:

- Trauma: deaths as a result of the involvement of an external element, e.g. hanging.
- Medical: deaths due to medical conditions, e.g. liver disease.
- Undetermined: deaths whose cause could not be determined by the coroner. (These cases were excluded from further analysis.)

- Unknown (CTL): deaths reported by the CTL and included in the NDRDI database that could not be matched with records from the other data sources. (Because the CTL does not record information on the cause of death, these unmatched cases could not be assigned to any category, and were therefore excluded from further analysis.)

Table 2 Non-poisoning deaths among drug users, NDRDI 1998 to 2005 (N=885)

Category of death	n	%
All cases	885	100
Trauma	476	53.8
Medical	270	30.5
Undetermined	2	0.2
Unknown (CTL)	137	15.5

Non-poisoning deaths from known causes

In total, 746 cases of non-poisoning death among drug users were included in further analysis. Over half (476, 63.8%) of these deaths were the result of trauma. Figure 1 shows that the annual number of these deaths more than doubled over the reporting period. The annual number of deaths from medical causes increased by almost 500% over the same period.

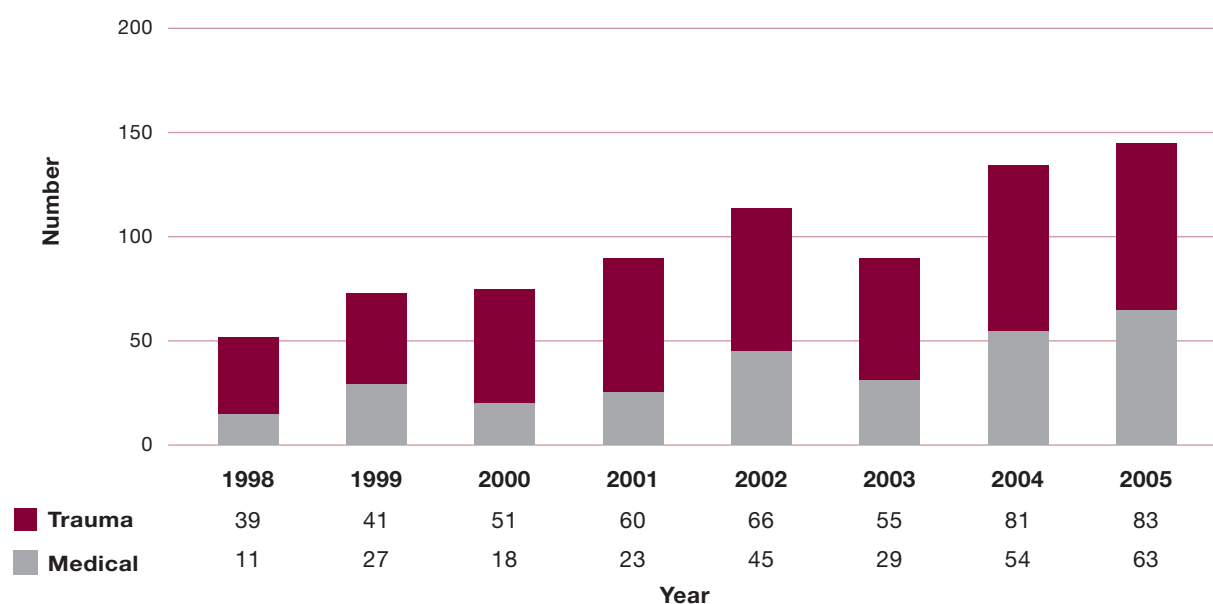


Figure 1 Non-poisoning deaths among drug users, NDRDI 1998 to 2005 (N=746)

Of the non-poisoning deaths with a known address (N=675), over one-quarter (191, 28.3%) were of people resident in the South Western Regional Drugs Task Force (SWRDTF) area (Figure 2).

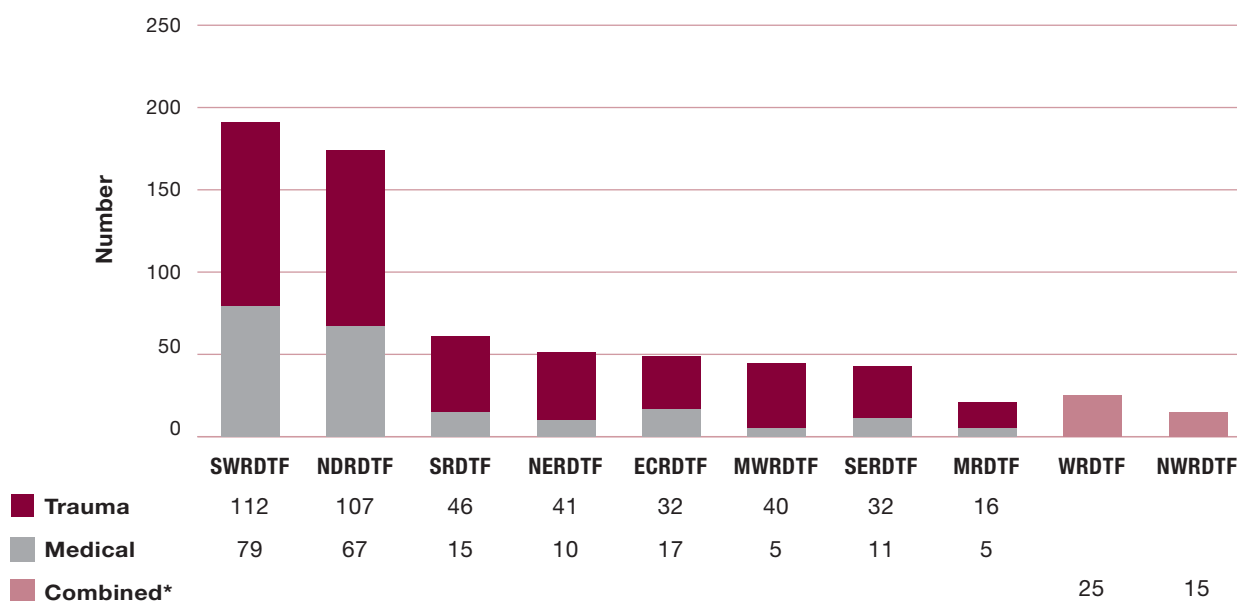


Figure 2 Non-poisoning deaths among drug users, by regional drugs task force area, NDRDI 1998 to 2005 (N=675)

* Numbers for the two categories are combined as the numbers of deaths from medical causes were less than five for the reporting period.

Deaths due to trauma

Of the 476 deaths due to trauma between 1998 and 2005, the highest numbers were the result of hanging (174, 36.5%) and road traffic collisions (RTCs) (95, 20.0%) (Figure 3). Almost half (47, 49.5%) of RTC cases were driving a vehicle at the time of the incident.

Of the RTC deaths recorded in the NDRDI, 83 cases were aged 15–34, which represents 6.9% of the total number of deaths due to RTC in the general population aged 15–34 years in the eight years 1998–2005. This percentage increased from 3.8% (9) in 2000 to 7.0% (15) in 2005.^{20, 21, 22, 23, 24, 25, 26}

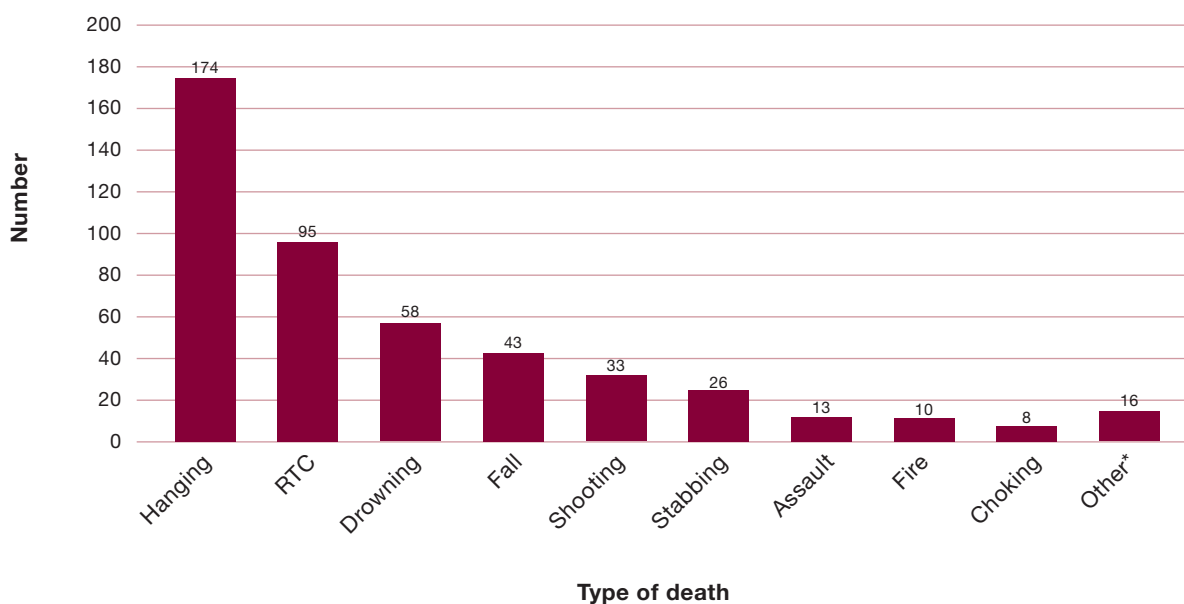


Figure 3 Deaths among drug users due to trauma, by type of death, NDRDI 1998 to 2005 (N=476)

* Includes cases of head trauma of unknown cause, carbon monoxide poisoning and domestic accident.

The annual number of deaths by hanging almost trebled over the reporting period (Table 3). It is important to note that this paper does not present deaths according to intent (suicide, accident, misadventure). The annual number of RTC deaths increased by 50% during the same period. Deaths due to trauma resulting from other causes are not itemised separately in this table because of the small numbers of cases in some years; however, the numbers of these cases show the same upward trend.

Table 3 Deaths among drug users due to trauma, NDRDI 1998 to 2005 (N=476)

	1998	1999	2000	2001	2002	2003	2004	2005
All cases	39	41	51	60	66	55	81	93
Hanging	11	19	18	16	27	22	30	31
RTC	8	8	10	15	13	9	16	16
Other trauma*	20	14	23	29	25	24	35	36

* Less than five cases were reported in some years for the other types of trauma, therefore they cannot be presented individually.

Demographic and economic characteristics

Almost all (435, 91.4%) cases of death due to trauma during the reporting period were male. The ratio of male to female did not alter over the reporting period.

Just over half (50.9%, 242) of all deaths due to trauma were of individuals aged between 20 and 30 years (Figure 3). (Date of birth was not available for one case.) Between 1998 and 2005 the median age at time of death fluctuated slightly, but remained in the late twenties (Table 4); for the eight-year period overall the median age was 27 years.

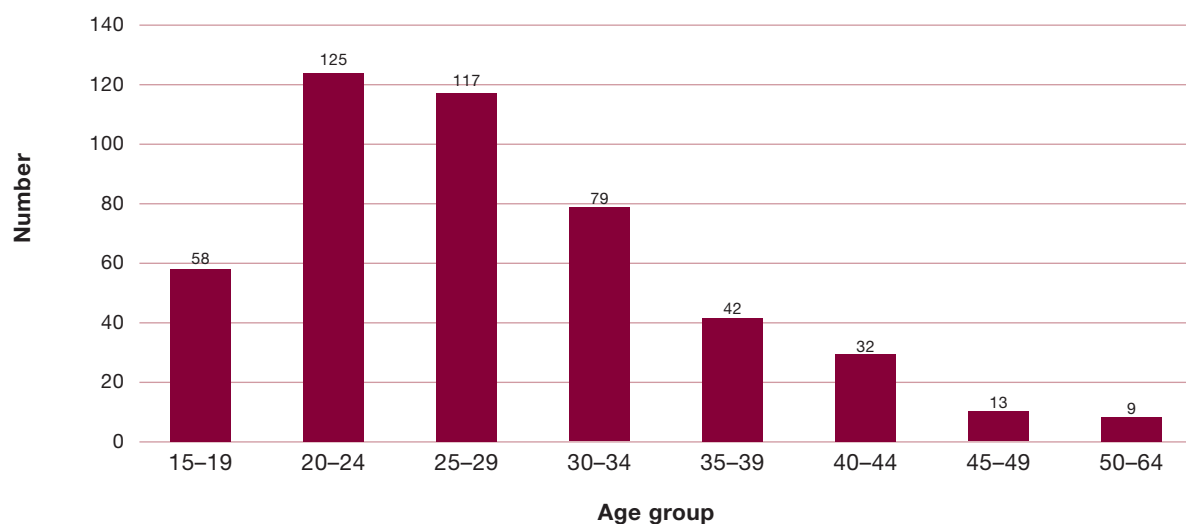


Figure 4 Deaths among drug users due to trauma, by age group, NDRDI 1998 to 2005 (N=475)

Table 4 Median age at time of death due to trauma, NDRDI 1998 to 2005 (N=475)

	1998	1999	2000	2001	2002	2003	2004	2005
Median age	27	25	25	26	26	29	27	27

Over half (219, 55.2%) of trauma cases for whom employment status was known were unemployed at the time of their death.

Almost half (218, 46.8%) of deaths due to trauma occurred inside Dublin. The annual number of deaths due to trauma inside and outside of Dublin (city and county) were broadly similar over the reporting period (Figure 5). (Place of residence was not available for 10 cases.)

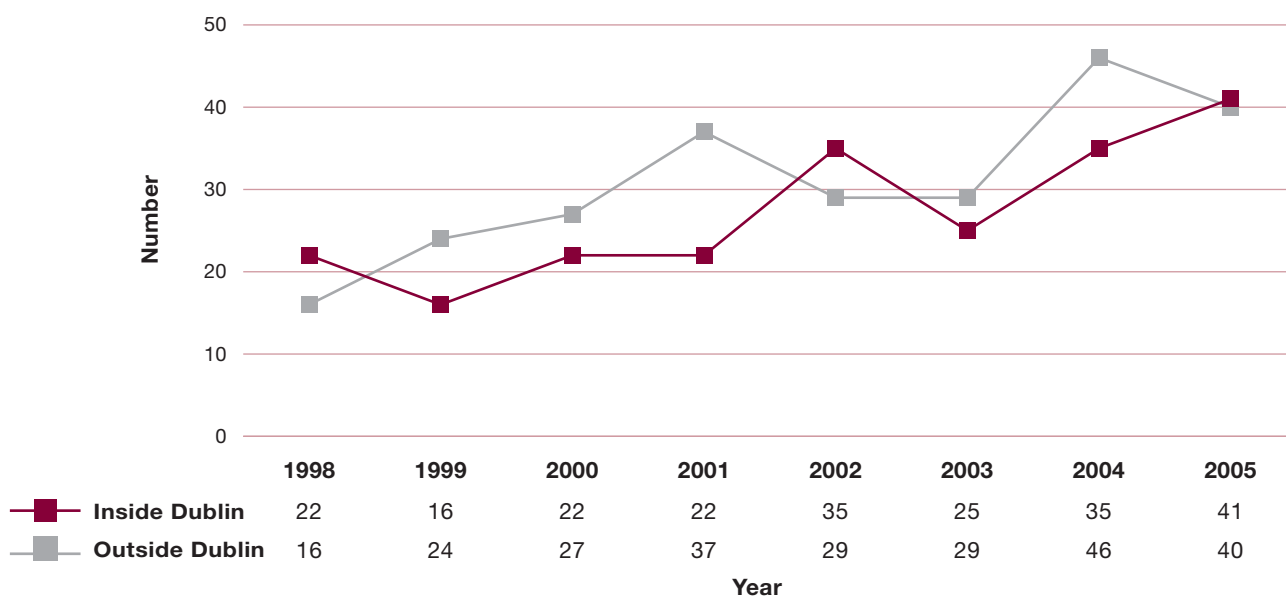


Figure 5 Deaths among drug users due to trauma, by place of residence, NDRDI 1998 to 2005 (N=466)

Toxicology results for deaths due to trauma

A positive toxicology report was available in 412 (86.5%) cases of death due to trauma (Table 5). In many cases more than one substance was present. A positive toxicology report does not necessarily mean that the substance was implicated in the death. Alcohol was present in a majority of deaths, as was cannabis.

When cases with a positive toxicology were analysed by type of death:

- Alcohol was present in 82 cases (55.8%), cannabis in 75 cases (51.0%), benzodiazepines in 47 cases (32.0%) and antidepressants in 17 cases (11.6%) of death due to hanging.
- MDMA (26, 28.6%) was found in the greatest proportion among deaths due to RTCs.
- Alcohol was present in 40 cases (75.5%), cannabis in 26 cases (49.1%), benzodiazepines in 20 cases (37.7%) and antidepressants in seven cases (13.2%) of death due to drowning.
- Cocaine (18, 30.5%) was found in the greatest proportion in deaths due to violence (shooting, stabbing or assault).
- Opiates were present in two-fifths (24, 40.7%) of violent deaths, but were found in the greatest proportion in deaths due to 'Other trauma', many of which were due to accidents.

Table 5 Positive toxicology in trauma cases, by type of death, NDRDI, 1998 to 2005

	All trauma deaths		Hanging		RTC		Drowning		Fall		Violence*		Other trauma	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Positive toxicology cases	412		147		91		53		32		59		30	
Alcohol	241	(58.5)	82	(55.8)	50	(54.9)	40	(75.5)	22	(68.8)	35	(59.3)	14	(46.7)
Cannabis	227	(55.1)	75	(51.0)	60	(65.9)	26	(49.1)	12	(37.5)	40	(67.8)	14	(46.7)
Benzodiazepine	127	(30.8)	47	(32.0)	22	(24.2)	20	(37.7)	11	(34.4)	20	(33.9)	7	(23.3)
Opiate‡	121	(29.4)	39	(26.5)	21	(23.1)	6	(11.3)	10	(31.3)	24	(40.7)	21	(70.0)
Cocaine	87	(21.1)	36	(24.5)	15	(16.5)	7	(13.2)	6	(18.8)	18	(30.5)	5	(16.7)
MDMA	62	(15.0)	10	(6.8)	26	(28.6)	10	(18.9)	5	(15.6)	9	(15.2)	~	
Antidepressant	31	(7.5)	17	(11.6)	~		7	(13.2)	~		~		~	
Other substance**	75	(18.2)	32	(21.8)	10	(11.0)	11	(20.7)	8	(25.0)	7	(11.9)	9	(30.0)

* Includes deaths due to shooting, stabbing or assault.

† This is a multi-response table taking account of up to 10 substances present on toxicology report. Therefore, numbers and percentages in columns may not add up to totals shown as individual cases may have more than one drug or substance present on their toxicology report.

‡ Includes methadone, heroin, morphine, distalgesic, tramadol or codeine.

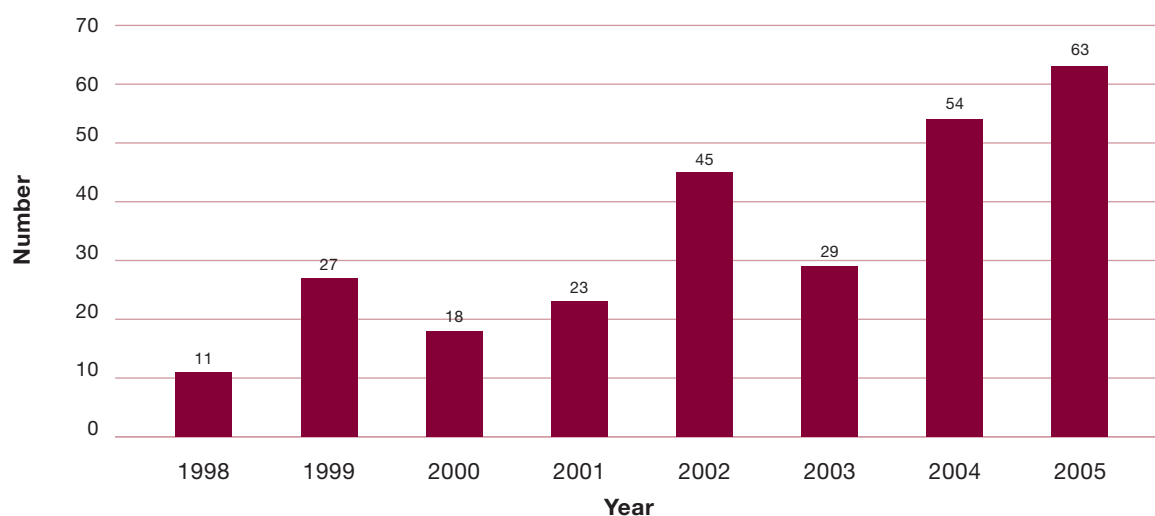
** Includes antihistamines, barbiturates, unspecified amphetamines, other chemicals, antiepileptics and non-benzodiazepine anxiolytics, non-opiate analgesics, local anaesthesia, antipsychotic drugs.

~ Cell contains less than five cases.

Of the total of 58 cases who died as a result of drowning, seven (12.1%) were known to be in drug treatment at the time of their death. Of the total of 174 cases who died as a result of hanging, 30 (17.2%) were known to be in treatment for substance misuse at the time of their death.

Deaths due to medical causes

Of the 746 deaths among drug users recorded by the NDRDI in the period 1998–2005, 270 (36.2%) were due to medical causes, with the annual number increasing from 11 cases in 1998 to 63 in 2005 (Figure 6).

**Figure 6** Deaths among drug users due to medical causes, NDRDI 1998 to 2005 (N=270)

Cases in which more than one medical condition was listed as the cause of death were categorised by the main cause of death. Cardiac events accounted for a quarter (67, 24.8%) of deaths due to medical causes between 1998 and 2005 (Figure 7), with the annual number of such cases increasing by one-third (31.6%)

over the reporting period. Almost one-fifth (48, 17.8%) of cases died as a result of a respiratory infection, with the annual number of such cases doubling over the reporting period. The annual number of deaths due to liver disease increased by 14% during the same period.

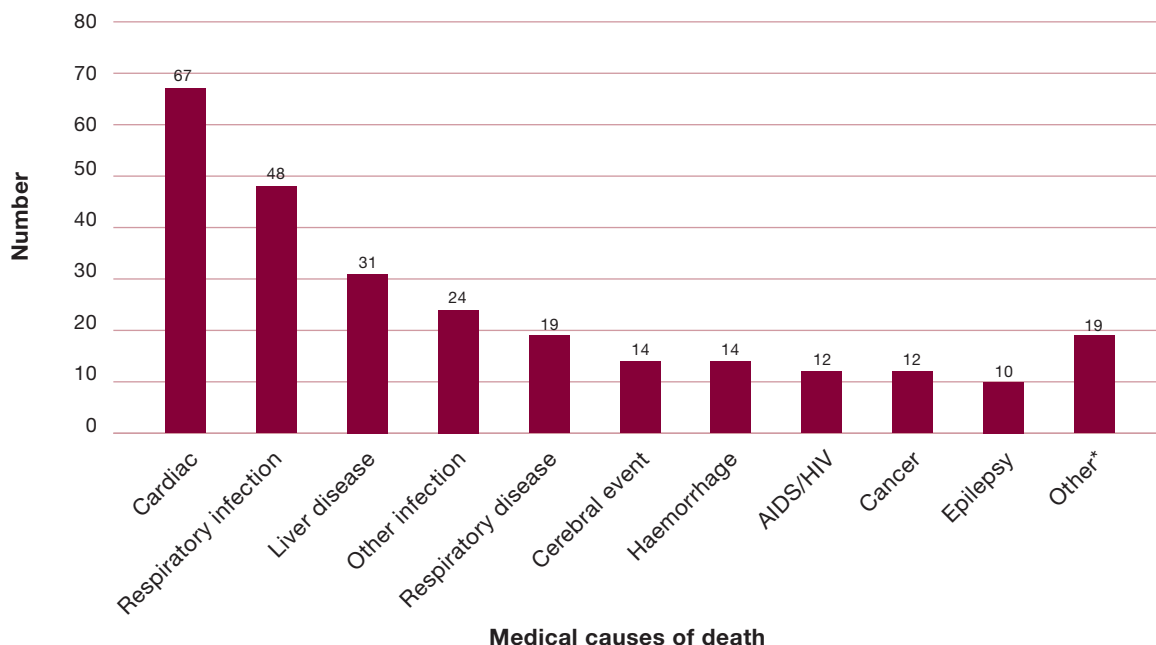


Figure 7 Deaths among drug users due to medical causes, by type, NDRDI 1998 to 2005 (N=270)

* Includes diabetes, other neurological conditions and multi-organ failure.

Demographic and economic characteristics

The majority (210, 77.8%) of deaths due to medical causes were of males, with the ratio of males to females remaining the same throughout the reporting period. Over half (158, 58.5%) of cases were aged between 30 and 45 years at the time of death (Figure 8). The median age at the time of death increased from 31 years in 1998 to 37 years in 2005, fluctuating in the intervening period (Table 6); for the reporting period overall the median age was 37 years.

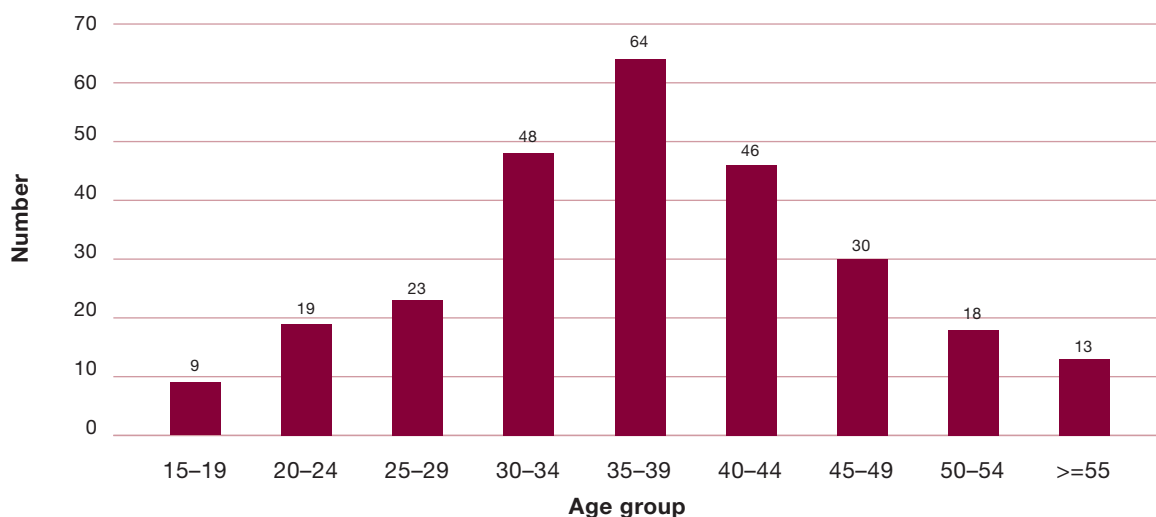


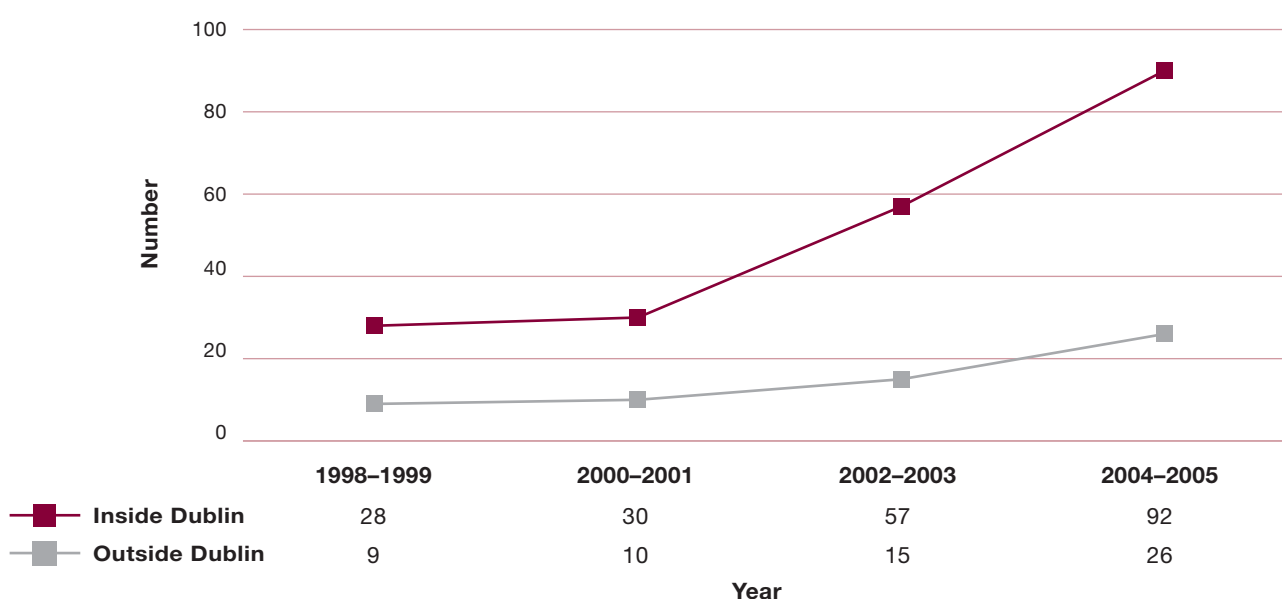
Figure 8 Deaths among drug users due to medical causes, by age group, NDRDI 1998 to 2005 (N=270)

Table 6 Median age at time of death from medical cause, NDRDI 1998 to 2005 (N=270)

	1998	1999	2000	2001	2002	2003	2004	2005
Median age	31	36	36	39	38	39	37	37

Almost two-thirds (106, 65.0%) of cases who died from medical causes, and for whom employment status was known, were unemployed at the time of their death.

The number of deaths due to medical causes increased steadily inside and outside Dublin (city and county) over the reporting period (Figure 9). Such deaths were more common inside Dublin. (Place of residence was not available for five cases.)

**Figure 9** Deaths among drug users due to medical causes, by place of residence, NDRDI 1998 to 2005 (N=265)

History of illicit drug use

The type of drug(s) misused was known for all those who died from medical causes, although drug use may or may not have been implicated in their death (Table 7). The majority (180, 66.7%) of cases had a history of opiate use.

When analysed by medical cause of death:

- The highest number of cocaine users (n=12) were among those who died from a cardiac event.
- Thirty-six per cent (n=24) of those who died as a result of a cardiac event were known to have used cannabis.
- Three out of every five (19, 61.3%) drug users who died as a result of liver disease were known to have a history of alcohol dependency.
- Almost one-third (6, 31.6%) of those who died as a result of a respiratory disease were known to have used cannabis.

Table 7 History of drug use in cases of death from medical causes, NDRDI, 1998 to 2005

Substance used	All medical deaths		Cardiac		Respiratory infection		Liver disease		Other infection		Respiratory disease		AIDS/HIV		Other medical cause	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
All cases*	270		67		48		31		24		19		12		69	
Alcohol	78	(28.9)	11	(16.4)	16	(33.3)	19	(61.3)	6	(25.0)	6	(31.6)	~		20	(29.0)
Cannabis	52	(19.3)	24	(35.8)	7	(14.6)	~		0		6	(31.6)	0		14	(20.3)
Benzodiazepine	10	(3.7)	~		~		~		~		0		0		~	
Opiate†	180	(66.7)	36	(53.7)	38	(79.2)	23	(74.2)	23	(95.8)	11	(57.9)	10	(83.3)	39	(56.5)
Cocaine	26	(9.6)	12	(17.9)	~		~		~		~		0		5	(7.2)
MDMA	7	(2.6)	0		~		0		0		~		0		~	
Other substance‡	13	(4.8)	~		~		0		~		~		~		6	(8.7)

* This is a multi-response table taking account of illicit use of up to six drugs. Therefore, numbers and percentages in columns may not add up to totals shown as individual cases may use more than one drug or substance.

† Includes heroin, morphine, codeine, street methadone, unspecified opiate-type drug and other opiate analgesic.

‡ includes hallucinogenic substances, other stimulants and volatile inhalants, prescription and over-the-counter medication.

~ Cell contains less than five cases.

Blood-borne viral infection

The NDRDI records all documented instances of infection with a blood-borne virus (BBV) in cases of death among drug users, whether or not the infection was implicated in the death.

In total, 192 (7.9%) of the cases recorded in the NDRDI (both poisoning and non-poisoning deaths, N=2,441) had a documented history of BBV infection. The number of cases increased from nine in 1998 to 41 in 2005 (Figure 10). Three out of every 10 cases (57, 29.7%) had more than one BBV infection. A large increase in the number of BBV infections recorded in the NDRDI was observed in 2002; the majority of these cases (29, 87.9%) were hepatitis C positive. Overall, 154 (80.2%) cases with a BBV infection were hepatitis C positive.

The majority (136, 70.8%) of cases with a BBV infection were male, and most (168, 87.5%) were resident in Dublin (city and county). Almost two-thirds (124, 64.6%) had a history of injecting drug use documented in the coronial files, of whom 44 were known to be injecting at the time of their death.

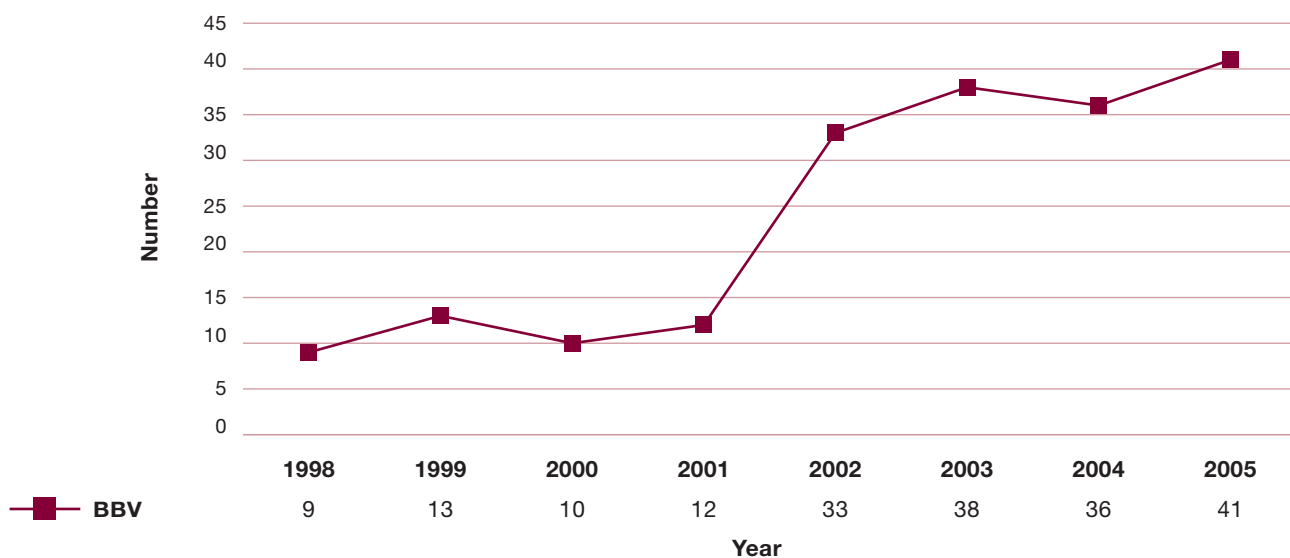


Figure 10 Deaths among drug users with a history of BBV infection, NDRDI 1998 to 2005 (N=192)

Of the 192 cases with a history of BBV infection, the majority (104, 54.2%) died of a medical cause; 17 (8.8%) died as a result of trauma; and 71 (37.0%) died of poisoning.

Figure 11 shows the breakdown of the 104 deaths from medical causes:

- 24 (23.1%) were due to respiratory conditions,
- 13 (12.5%) were due to other infections,
- 12 (11.5%) were due to an AIDS-related illness,
- 10 (9.6%) were due to liver disease, and
- 7 (6.7%) were due to alcoholic liver disease.

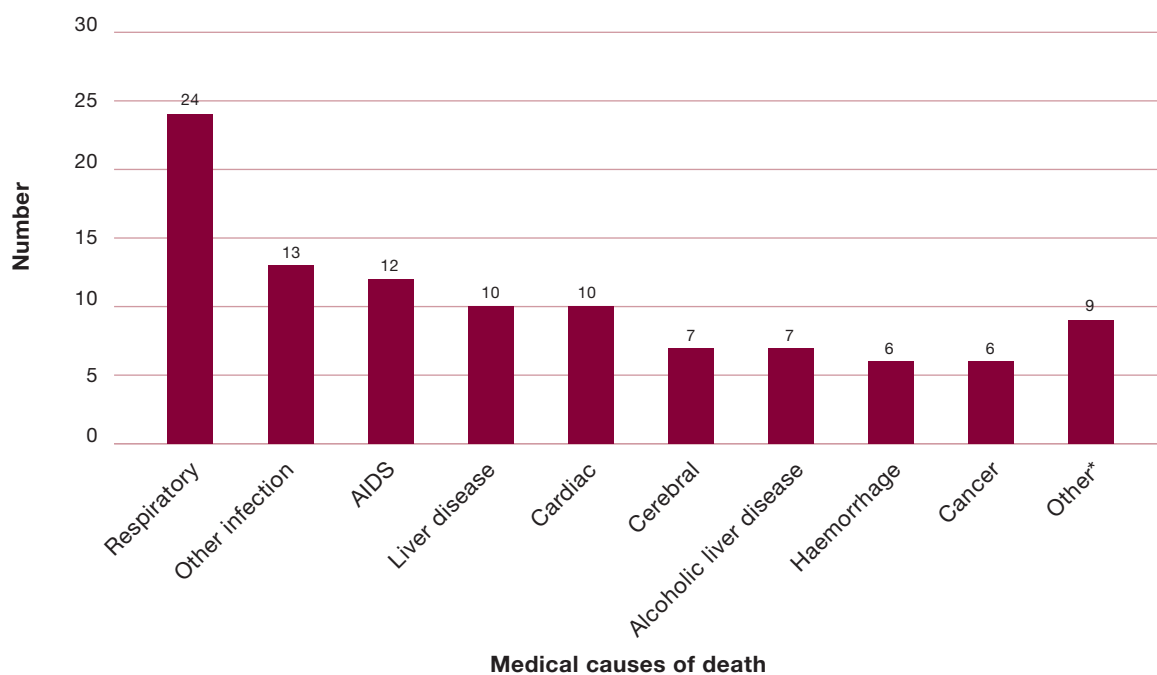


Figure 11 Deaths due to medical causes in cases with a history of BBV, NDRDI 1998 to 2005 (N=104)

* Includes multi-organ failure and epilepsy.

Discussion

This is the first detailed report from the NDRDI on non-poisoning deaths among drug users. This report, together with the NDRDI analysis of poisoning deaths published in 2008,² provides a reliable estimate of the total burden of mortality related to drug use in Ireland. Together these reports will equip the State and its agencies to respond in an appropriate and timely manner to drug-related deaths and deaths among drug users and will provide a baseline against which to monitor related responses.

There are different categories of drug user: problem drug users known to drug services, problem drug users not known to drug services, and occasional/recreational users. These different groups require different public health and prevention strategies. Analysis involving a breakdown of these categories is beyond the remit of this paper but will be the focus of future publications.

Of the non-poisoning deaths recorded in the NDRDI, the majority were due to trauma, mainly hanging, RTCs and drowning. The majority of the drug users who died as a result of trauma were young men in their twenties, a finding consistent with international research.^{4, 6, 8, 13}

One-fifth of deaths among drug users that were due to trauma were the result of RTCs, and almost half of these cases were driving at the time of death. This finding supports the position of the Road Safety Authority, which claims that one of the main causes of death on Irish roads is impaired driving due to the consumption of alcohol and/or drugs (both prescription and non-prescription).²⁷ The Road Safety Authority has campaigned for more reliable statistics on the incidence of drink/drug driving, and for expansion of the forensic analysis programme to ascertain the true incidence of driving under the influence of substances. Unfortunately, there is currently no reliable road-side test for the presence of drugs in the body.²⁸

This paper does not analyse deaths according to intent (suicide, accident, misadventure). However, the National Strategy for Action on Suicide Prevention states that 'alcohol and substance abuse are strongly related to suicide',²⁹ and many of the deaths by hanging or drowning recorded in the NDRDI had positive toxicology results for alcohol, cannabis, benzodiazepines and antidepressants. The presence of antidepressants suggests that a proportion of these cases may have had an existing mental health problem. National figures show that young men are over-represented in Irish suicide statistics.^{29, 30} The vast majority of cases recorded in the NDRDI who died from hanging or drowning were young men, with a median age of 27 years.

International research demonstrates a strong association between suicide risk and substance abuse.^{6, 8, 10, 11} Overall, the data from the NDRDI support the argument that substance misuse is related to suicide. One of the objectives of the National Strategy for Action on Suicide Prevention is to raise awareness of the association between alcohol and/or substance abuse and suicidal behaviour. There is a need for increased awareness of cases with dual diagnosis³¹ (individuals who have both a mental health issue and a substance misuse problem) given that a proportion of those who died as a result of hanging or drowning were in treatment for substance dependency at the time of their death.

International studies show that drug misuse, particularly in combination with alcohol, contributes to many homicides.^{8, 14} The majority of cases recorded in the NDRDI who died from violence had alcohol along with one or more other drugs, often cocaine, opiates or cannabis, present in their system.

Research from the UK suggests that the risk of traumatic death in drug users decreases after the age of 25, to be replaced by an increased risk of death from a pre-existing medical condition (often drug-related) in later life.⁴ The NDRDI data on deaths among drug users show a similar pattern. Overall, those who died from medical causes were older than those who died from traumatic causes. However, it should be noted that the majority of all non-poisoning cases died prematurely, well before their peers. The majority of medical deaths were among males, which reflects the gender balance among cases attending treatment.³²

The often chaotic lifestyle of problem opiate users, in conjunction with unsafe practices (for example sharing drug paraphernalia) and the long-term effects of drug use on the body, has been shown to

contribute to the harmful effects of drug use.^{4, 8} Analysis of NDRDI data supports this finding, showing that the majority of those who died from medical causes were opiate users.

Cocaine is known to cause vascular disease, with the majority of damage being borne by the heart.⁷ There is not necessarily a dose–response relationship between the amount of cocaine taken and the amount needed to cause a fatal outcome.⁵ Additionally, the combination of cocaine and alcohol, which can lead to the formation of cocaethylene in the body, can exacerbate the cardiotoxic effects of both these substances.³³ A quarter of all medical deaths recorded in the NDRDI were the result of a cardiac event. Almost one in five of these cases was known to have used cocaine.

Eight per cent of all deaths recorded in the NDRDI were infected with a blood-borne virus (BBV). This is not an unexpected finding, as injecting drug use is a risk factor for contracting a BBV and Irish research indicates that hepatitis C is endemic among injecting drug users.³⁴ The majority of cases with a BBV infection died from medical causes. There was a large increase in the number of BBV cases recorded in the NDRDI after 2002, of which the majority were hepatitis C positive. This increase may be a reflection of more detailed recording by coroners, or greater awareness and testing for hepatitis C by health services from 2002 onwards. The number of BBV cases recorded in the NDRDI is likely to be an under-estimation as this information is not always reported in the death records. However, the data highlights the continued need for harm reduction strategies, including education about preventing infection and the provision of sterile injecting equipment.

In many cases of death among drug users it is difficult to measure the exact contribution of the drug to the death; the presence of a drug in the toxicology report does not necessarily prove that the drug contributed to the death. Equally, one cannot discount the effect of a known psychoactive substance on an individual's behaviour around the time of their death, or its role in their death. For example, a positive toxicology for cocaine was found in the highest proportion among cases who died as a result of violence; cocaine is a stimulant known to cause violent behaviour.⁷ The correlation of toxicology and drug-use history with the type of death recorded supports the argument that drug use is contributing to the premature death of drug users in Ireland.

A major factor in reducing mortality and morbidity rates among illicit drug users is the provision of drug treatment, which is associated with reduced drug use, as well as decreased risk of overdose and of BBV infection.^{8, 35}

Alcohol was the most common substance found in toxicology reports of deaths due to trauma. Additionally, many of those who died from medical causes were known to be alcohol dependent. This supports the need to integrate the treatment of problem alcohol use within the drug treatment services.

In order to improve the quality of the information in the NDRDI, it is important that the recommendations made in the review of the Coroner Service are implemented.¹⁵ The measures recommended in relation to the organisation and management of the work of the Service would assist also in the standardisation of the information available from the coroners, particularly in relation to history of drug and alcohol treatment, record of imprisonment and details of prescribed medication. More timely return of toxicology, pathology and Garda reports to the Coroner Service would also improve the quality of information available to the NDRDI.

This analysis of non-poisoning deaths illustrates the total burden of mortality related to drug use in Ireland. The figures presented here may be an under-estimation of the true situation, as history of drug use is not available in all cases of death. The continuing upward trend in drug-related deaths revealed in this paper and in its predecessor, Trends Series 4,² reflects the increasing numbers in the population who are consuming drugs and taking risks and who have acquired infections or developed medical conditions associated with drug use.

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