

# The epidemiology of poisoning

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## Abstract

The epidemiology of poisoning can be studied from different perspectives. These include overall mortality, hospital admission rates, and enquiries to Poisons Information Services. Accidental poisoning is most common in children, but deliberate self-harm becomes predominant in teenage years and early adulthood. Understanding the patterns of poisoning assists in developing suicide prevention strategies and reducing the risks of accidental poisoning.

**Keywords** deliberate self-harm; epidemiology; poisoning; suicide

Although there are several ways in which poisoning may present, acute poisoning is the presentation with which doctors are most familiar. Poisoning may, however, be chronic, resulting from sources such as the environment, from food and water supplies, or from industrial release of waste product (Table 1). The reason for poisoning may be classified as ‘accidental’ or ‘deliberate’.

Data sources from which information on poisoning incidents can be gleaned include mortality data on accidental poisoning and suicide,<sup>1</sup> hospital admission or discharge data, and enquiries to poisons information services.<sup>2,3</sup> In addition, some countries collect information on chemical exposures, particularly those involving population groups, separately.

## Causes of poisoning

The pattern of poisoning seen varies with the geographical location. In developing countries with developing economies poisoning by pesticides and herbicides is often common. Patterns of habitation and work may also expose populations in warmer countries to toxins from snakes or spiders. In these countries self-harm often involves agents that are available and may reflect local tradition. For example, in Sri Lanka pesticide and oleander poisoning are frequently encountered problems, in China herbicides and pesticides, and in the UK paracetamol (acetaminophen) are the most frequent poisons taken deliberately.<sup>4–6</sup>

Obtaining estimates of the numbers of poisonings resulting from pesticide and agrochemicals is extremely difficult since data collection in developing countries is inconsistent, and probably only the most severe poisonings are treated in hospital. Nevertheless populations suffering such exposures are likely to run into the millions world-wide. In addition, mortality rates in developing countries are high, partly because of availability of

## Useful definitions

- **Suicide** – an intentional act resulting in death
- **Accidental poisoning** – an exposure to a poison resulting in symptoms which arises by an accidental action. Accidental poisoning is common in young children, but may occur in adults in the home, workplace, or as a result of fire or transport accident
- **Deliberate poisoning** – this forms part of the spectrum of disorders now classified as deliberate self-harm. It has also in the past been referred to as parasuicide, though this term is now out-dated
- **Occupational poisoning** – occurs in the context of employment
- **Environmental poisoning** – refers to exposure resulting from presence of a chemical either in the air, in food or water

Table 1

potent, locally produced products that may be poorly labelled and packaged, and partly because of difficulties in accessing therapy where this is likely to affect outcome. The cost of antidotes is also a significant problem, for example in the case of oleander poisoning, digoxin antibody is effective but may not be affordable in developing countries.<sup>5</sup>

In developed countries there is also variation in the type of product. A large study in Europe conducted in the period of 1989–1992 showed that although sedatives and analgesics were commonly used, Hungary was unusual in that agrochemicals counted for 19% of male and 15% of female self-harm episodes.

This study also shows that in Europe as a whole the reported rates of female self-harm (186/100,000 population) were higher than male (136/100,000 population). Some of those rates varied in different countries, the highest rate for females in this study being in France (462/100,000 population), and the next in order being in England, and Finland (323/100,000 population and 242/100,000 population respectively). The lowest rate seen was in Spain (69/100,000 population). Interestingly the rates for males did not show quite the same pattern with the highest being in Finland (314/100,000 population) and the next highest in England (215/100,000 population). Recent data in men aged 20–44 years shows that in Europe the rates of suicide mortality vary almost 10-fold with lowest rates around the Mediterranean sea (e.g. 5/100,000 population in Greece, 10/100,000 Italy, 12/100,000 Spain, 43/100,000 Finland and 90/100,000 Lithuania). Poisoning also changes over time and an overall analysis is key to evaluating trends in the overdose rate for a single agent.<sup>4</sup>

Changes in product licensing and packaging may also have effects. Pharmaceutical product withdrawals result in a change in overdose pattern that takes 3–6 months as products in the home are used up. Changes in pack size for paracetamol caused an initial decline in use in overdose,<sup>7</sup> but this has been short-lived and rates subsequently increased to levels above those before pack size legislation.<sup>8</sup> Concurrent disease may also have an impact on self-harm, and this has been shown for cancer.<sup>9</sup>

Information from poisons information centres may overestimate actual poisoning incidents, because many calls relate to

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**Number of deaths from drug-related poisoning by sex and underlying cause, <sup>a</sup> 2005–09<sup>b</sup>**

Cause	Sex	2005	2006	2007	2008	2009
Mental and behavioural disorders due to drug use (excluding alcohol and tobacco) (F11–F16, xF18–F19)	Males	700	639	662	705	586
	Females	127	100	119	139	101
Accidental poisoning by drugs, medicaments and biological substances (X40–X44)	Males	534	598	725	861	983
	Females	239	245	239	327	305
Intentional self-poisoning by drugs, medicaments and biological substances (X60–X64), and poisoning by drugs, medicaments and biological substances, undetermined intent (Y10–Y14)	Males	648	540	520	500	524
	Females	506	439	368	385	374
Assault by drugs, medicaments and biological substances (X85)	Males	5	5	7	9	5
	Females	3	4	0	2	0

Data from UK statistics for England and Wales<sup>1</sup>

<sup>a</sup> Cause of death was defined using the International Classification of Diseases, Tenth Revision (ICD-10) codes given in the table.

<sup>b</sup> Figures are for deaths registered in each calendar year.

**Table 2**

**Number of deaths where selected substances were mentioned on the death certificate, total mentions, 2005–09<sup>a</sup>**

	2005	2006	2007	2008	2009
All deaths from drug poisoning	2762	2570	2640	2928	2878
Heroin and Morphine	842	713	829	897	880
Methadone	220	241	325	378	408
Cocaine	176	190	196	235	202
All amphetamines	103	92	97	99	76
MDMA/Ecstasy	58	48	47	44	27
Cannabis	19	17	12	19	22
Gamma-hydroxybutyrate (GHB)/Gamma-butyrolactone (GBL)	4	7	9	20	16
All benzodiazepines	190	177	207	230	261
Temazepam	45	42	45	37	38
Diazepam	101	89	123	133	160
Nitrazepam	11	8	10	0	5
Zopiclone/Zolpidem	48	39	51	36	79
Barbiturates	14	17	6	13	13
All antidepressants	401	336	335	381	405
Tricyclic antidepressants (BNF 4.3.1)	272	212	203	227	218
Dosulepin	107	74	71	61	53
Amitriptyline	127	108	113	144	138
Monoamine-oxidase inhibitors (BNF 4.3.2)	2	0	1	2	2
Selective serotonin re-uptake inhibitors (BNF 4.3.3)	81	76	80	116	113
Other antidepressants (BNF 4.3.4)	56	46	62	47	79
Paracetamol (includes dextropropoxyphene mentioned without paracetamol) <sup>b</sup>	410	309	242	260	255
Paracetamol <sup>c</sup>	362	287	224	242	249
Paracetamol and dextropropoxyphene compound formulation <sup>b</sup>	202	97	72	48	32
Paracetamol and codeine compound formulation	43	42	49	57	53
Paracetamol and dihydrocodeine compound formulation	21	18	9	12	13

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