NPIS
National Poisons Information Service

Health Protection Agency

National Poisons Information Service

Annual Report 2007/2008

National Poisons Information Service

Commissioned by the Health Protection Agency through its Chemical Hazards and Poisons Division (CHaPD)

NPIS Units at 31 March 2008

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Foreword

This has been very a productive and successful year for the National Poisons Information Service (NPIS). The major changes in service delivery that were planned in previous years have now been fully adopted by all contributing units, with the development of a truly national service and resulting improvements in service delivery and user satisfaction.

The NPIS can be particularly proud of the feedback it has had from stakeholders. The response to routine surveys on the telephone service continues to be very favourable. A highly successful stakeholder meeting was held in January 2008, which generated much in the way of useful comments and feedback, which were in the main most positive. In addition, feedback from users has highlighted the value of TOXBASE as decision support software for hospital emergency departments.

All of the staff of the NPIS have worked extremely hard during the year, overcoming some significant challenges. We would like to take this opportunity to congratulate them on the achievements that have been made, which are further detailed in this report.

Elaine Lynch-Farmery
Chemical Hazards and Poisons Division, HPA

Simon Thomas
Chair, NPIS Clinical Standards Group

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Executive Summary

Poisoning accounts for over 100,000 NHS hospital admissions in the UK each year. The significant workload involved falls, in particular, on hospital emergency departments, minor injuries units, primary care services and NHS patient helplines. The Health Protection Agency commissions the four units of the National Poisons Information Service (NPIS) in Birmingham, Cardiff, Edinburgh and Newcastle to provide information and support on the diagnosis and management of poisoning to health care professionals in the UK. The work of the NPIS is essential in supporting health care for this large patient group, encouraging optimal care for those with serious poisoning, and preventing unnecessary hospital admissions when the risk of toxicity is low.

The NPIS provides evidence-based information via its telephone service and its online poisons information database, TOXBASE. NPIS policy has been to encourage use of TOXBASE as a first point of call for information, reserving telephone enquiries for more complex cases. This report for 2007/08 provides information on TOXBASE sessions and telephone enquiries across the UK.

In 2007/08 the NPIS received over 525,000 poisons-related enquiries. There was increasing activity on TOXBASE, for which annual poisons enquiry sessions numbered over 470,000 and product hits exceeded 1 million. Over 52,000 telephone enquiries were answered in 2007/08. Approximately a third (17,000) of these involved children under 10 years, reflecting the frequency of accidental poisoning in this age group; a further 12% (around 6000) of enquiries involved those aged 10–19 years.

Around 67% of TOXBASE sessions and 37% of the telephone enquiries were from hospitals. Enquiries from NHS Direct (in England and Wales) and NHS 24 (in Scotland) made up 23% of the total number of TOXBASE sessions and almost 20% of the telephone enquiries.

This year the issue of drugs of misuse is highlighted, which is a particular concern in the clinical management of young people. Appropriate clinical management of this patient group is crucial if adverse outcomes are to be prevented. The most important recent change in enquiry patterns relating to these agents is the increase in workload relating to cocaine, but there have also been increases in activity for ketamine, methamphetamine and benzylpiperazine, although these drugs are much less commonly encountered.

Pharmaceuticals continue to be a large component of the work of the NPIS. In this year's report data on medication errors are being highlighted, such errors may lead to major health complications and were the source of over 12% of the telephone enquiries in 2007/08.

Poisoning caused by non-pharmaceuticals is also common. Suspected exposure to other chemicals (industrial, agricultural and garden and household products) accounted for approximately 160,000 product accesses on TOXBASE. This year toxic alcohol poisoning is highlighted as it is the second most common reason for referral to an NPIS consultant.

The NPIS provides advice and support on drug and chemical exposure during pregnancy through the National Teratology Information Service (NTIS). There were about 35,000 accesses to pregnancy information on TOXBASE in 2007/08, an increase of over 9000 on 2006/07. In 2007/08 the NTIS answered close to 4500 pregnancy-related telephone enquiries, a reduction of around 350 on the previous year. This year the report contains a section on poisoning in pregnancy. Just under 300 enquiries involving poisoning in pregnancy were received by the NTIS and the NPIS took a further 300 or so enquiries, some of which may have involved the same case. The five most common substances implicated in these enquiries were paracetamol, ibuprofen, aspirin, fluoxetine and carbon monoxide. Where possible, the NTIS collects fetal outcome data following overdose in pregnancy. Overall, rates of fetal malformation were slightly higher than expected, but there were no significant increases in the rates of fetal malformations after reported poisoning by any of the top five agents.

Recommendations arising from the recent external clinical governance review, previously made available but formally published in August 2007, have now been considered in detail. Some have already been implemented, including better contingency arrangements to the national telephone service, establishment of a curriculum of competencies for specialists in poisons information, and increased opportunities for joint education and development for NPIS staff. Other recommendations, such as call recording, will be implemented during the coming year.

Increased investment into the NPIS online poisons information database, TOXBASE, continues to bear fruit, with product accesses from health care professionals continuing to increase year on year. This easy availability of high quality, clear and detailed information on a large number of potential toxins has allowed NHS staff to manage most episodes of poisoning without the need to use the NPIS telephone service, facilitating a planned reduction in telephone enquiries. However, although the total number of telephone enquiries has continued to fall, those that are received are becoming more complex, as evidenced by the increasing number requiring the input of an NPIS consultant.

All NPIS units now enter patient data on to a secure central database, UKPID. This allows staff to retrieve information already entered about enquiries irrespective of their location, allowing better collaborative working. Statistics relating to poisons enquiries are also more easily available on a national level; some of these data are presented in this report and illustrate the type and value of information now available for public health purposes. For example, NPIS data demonstrate a year-on-year increase in the proportion of its workload relating to enquiries about cocaine.

The use of the single national telephone number, out-of-hours poisons information telephone service and the national consultant clinical toxicology rota to answer out-of-hours referrals to NPIS consultants continue to work well. By August 2007 all NPIS units were using the same software (UKPID) to record data and these feed into a central server, facilitating ease of access between units. Stakeholder feedback demonstrates an exceptionally high degree of user satisfaction with the NPIS working arrangements.

Two appendices show the contribution that NPIS staff have made to the development and dissemination of the national and international clinical toxicological evidence base.

1 Introduction

Poisoning continues to be an important public health issue in the UK. It accounts for over 100,000 NHS hospital admissions in the UK* each year (around 1% of the total number), creating a significant workload for health service staff, especially hospital emergency departments and minor injuries units. Many thousands of different types of agent are involved and the appropriate management of poisoning is therefore a major task for the NHS.

Although the majority of poisoning-related deaths occur outside hospital, reduction of in-hospital morbidity and mortality is still an important challenge. Many enquiries are about potential poisoning in primary care settings, and are made to NHS patient helplines (NHS Direct in England and Wales and NHS 24 in Scotland). Appropriate referral, triage and treatment of patients, both in primary care settings and in hospitals, is a key approach to reducing morbidity and mortality. A large number of suspected accidental exposures to poisons occur in children† and managing these appropriately is a further challenge for the NHS. Appropriate advice often prevents unnecessary hospital attendance or admission.

The National Poisons Information Service (NPIS), a network of dedicated units commissioned by the Health Protection Agency, provides information on the diagnosis and treatment of poisoning to health care professionals in the UK. Its objectives are to optimise patient care throughout the patient care pathway, minimise the adverse consequences of poisoning, and reduce unnecessary use of hospital facilities. The NPIS is funded mainly through 'Government Grant in Aid' from the UK Health Departments, some contract income and some research income.

* Health Protection in the 21st Century. Understanding the Burden of Disease: Preparing for the Future. London: Health Protection Agency, 2005.

† A First Class Service: Quality in the New NHS. London: Department of Health, 1998.

2 NPIS Structure

The National Poisons Information Service (NPIS) provides a 24-hour consultant-supported clinical toxicology on-call service that gives advice on the management of poisoning and on the clinical implications of chemical incidents and accidents. The NPIS has provided information by telephone since 1963. The poisons information database, TOXBASE (www.toxbase.org), was introduced in 1982 and was transferred to the internet and adopted as the first-line information source for health care professionals in the UK in 1999. TOXBASE has received major software updates since that time and was moved to a new platform in spring 2008.

There are currently four NPIS 'provider' units (two in England and one each in Scotland and Wales). The Northern Ireland Regional Medicines and Poison Information Service in Belfast provides a daytime service; it uses the NPIS out-of-hours. Clinical staff in these units also provide specialist clinical services to their local populations. The NPIS is contracted to provide poisons information in the Republic of Ireland by the provision of TOXBASE to major hospital emergency departments and to the National Poisons Information Centre in Dublin. Out-of-hours telephone support is provided by both NPIS specialists in poisons information (SPIs) and consultants.

Information on TOXBASE accesses and telephone enquiries is given in this report. The increasing use now being made of TOXBASE as a result of NPIS promotional exercises has allowed a reduction in the number of telephone enquiries, freeing staff to perform more strategic work for the service, including production of TOXBASE monographs. When first received, telephone enquiries are managed by information scientists – who may have a scientific, nursing or pharmacy background – with NPIS consultant clinical toxicologists available for further advice as required.

Information on the potential toxicity of drugs and chemicals in pregnancy is provided by the National Teratology Information Service (NTIS). This was established as part of NPIS Newcastle in 1995. Information on aspects of the toxicity of drugs and chemicals in pregnancy is increasingly made available on TOXBASE.

In order to maintain a consistent approach, irrespective of the provider unit answering an enquiry, it is essential to have national mechanisms for addressing issues that affect the service. Commissioning issues are dealt with by the HPA NPIS Commissioning Group, which meets quarterly and more often if needed. Clinical issues, including clinical governance matters, are discussed by the NPIS Clinical Standards Group, which also meets quarterly, usually on the same day as the HPA NPIS commissioning meetings. These meetings are attended by a representative of the commissioner, a senior clinician from each provider unit, and a senior information scientist. Invitations are also sent to representatives of the National Poisons Information Centre in Dublin. Operating procedures are updated frequently and made available to NPIS staff via TOXBASE.

To encourage a common and evidence-based approach to the clinical management of poisoning, all NPIS clinical and information staff are invited to attend continuing professional development (CPD) meetings which deal with new data and important clinical issues. These have now been taking place for two years and happen at least three times annually, with each provider unit taking it in turn to host the event.

In addition, there are now regular meetings of the TOXBASE Editing Group and the UKPID User Group. These also have representation from each provider unit and discuss issues relating to TOXBASE and UKPID, the common NPIS call-logging software. The National Poisons Information Centre in Dublin and the Northern Ireland Regional Medicines and Poison Information Service also contribute to TOXBASE development.

NPIS National Telephone Support

A single national telephone number for the service operates, underpinned by a complex call-routing system designed to send each enquiry to the most appropriate NPIS unit where an information scientist is available to handle it. An out-of-hours telephone enquiry rota for the NPIS units is in place, supported by an on-call rota for NPIS consultant clinical toxicologists.

This networked service enables information to be provided from all units during the day (Monday to Friday, 08.00 to 20.00 hours), with two units remaining open until 23.00 hours, and a single unit remaining open overnight. Each unit handles telephone enquiries from a designated geographical area during the day. Birmingham, Cardiff and Newcastle support the out-of-hours national rota for telephone enquiries. If all

lines into the geographically preferred unit are busy, the call is automatically transferred to a unit with available capacity.

The NPIS national telephone number is provided through a contract between the HPA and British Telecom. During 2007 a contingency plan was developed with BT to ensure the integrity of the telephone answering service. Should any of the three out-of-hours units become unable to accept enquiries to their landlines (e.g. switchboard failure or building evacuation) then calls can be diverted to authorised mobile telephones held within each unit.

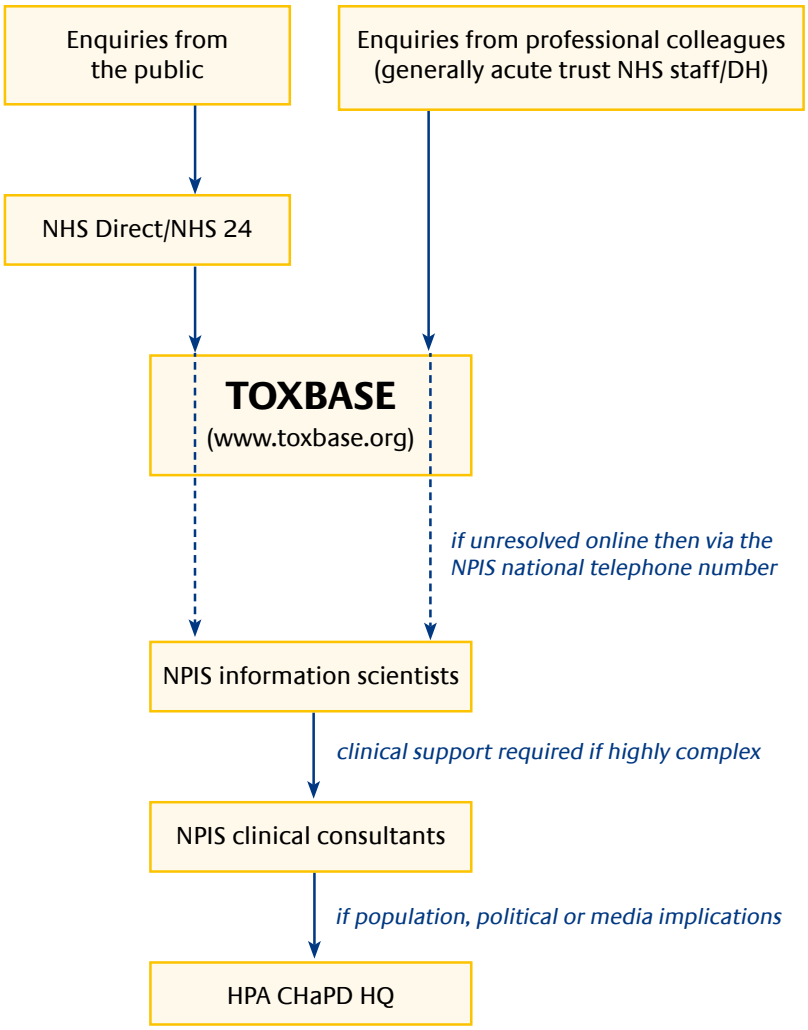


FIGURE How poisons enquiries are answered

3 NPIS Activities in 2007/08

3.1 Overall Service Profile

The total number of telephone enquiries received by the NPIS in 2007/08 was 52,386 (excluding 4456 calls made to the NTIS), an 8.9% decrease on the figure for 2006/07 (Figure 3.1). This year-on-year reduction has been achieved by wider use being made of TOXBASE (www.toxbase.org) as the first point of contact, leaving the telephone service for more complex enquiries. The average length of individual telephone calls has increased, probably reflecting the complexity or severity of cases of poisoning where direct input from NPIS staff is appropriate.

The number of TOXBASE user sessions (defined as logons on the TOXBASE site) during 2007/08 was 474,977, an increase of 7.2% on the figure for 2006/07 (Figure 3.1). This includes 4028 sessions for educational purposes (a 36.2% increase on 2006/07) and 9255 made by the NPIS units in Birmingham, Cardiff and Newcastle (which might be to answer telephone enquiries, or for educational or monograph-writing purposes). Since NPIS Edinburgh does the bulk of the final editing and checking on TOXBASE, accesses are not counted from this source. In addition, there were 822 sessions from the Northern Ireland Regional Medicines and Poison Information Service in Belfast, 3506 sessions from the National Poisons Information Centre in Dublin, and 3345 sessions from other poisons units outside the UK. These are all excluded from the remainder of this part of the report, together with any accesses by temporary users (588), leaving a total of 449,798 sessions. Each session consisted of one logon period during which the user may have accessed one product several times or several products on the database (average of 2.2 products per session). There was a total of 1,004,500 product accesses in 2007/08, but, applying the same exclusions as for logons, 819,764 product accesses are included in further analyses. Table 3.1 shows the number of poisons enquiries from the UK mainland countries and relates that to population. Table 3.2 shows the variation in TOXBASE use by strategic health authorities in England compared with use in Scotland and Wales.

Figure 3.2 shows that 299,453 (66.8%) of TOXBASE sessions and 19,390 (37.0%) of telephone enquiries came from hospitals. The other major users were NHS Direct (England and Wales) and NHS 24 (Scotland) with 102,536 (22.9%) of TOXBASE sessions and 10,324 (19.7%) of telephone enquiries. Of the telephone enquiries, 45.4% were made by doctors and 42.5% by nurses; these are similar rates to those last year (43.3 and 45.3%, respectively).

Over a third (17,009; 35.3%) of telephone enquiries for which age was known involved children under 10 years of age. The great majority of these (89.1%) were regarding children under 5 years old, reflecting the patterns of accidental childhood exposures in the general population. There were 6016 telephone enquiries about young people aged

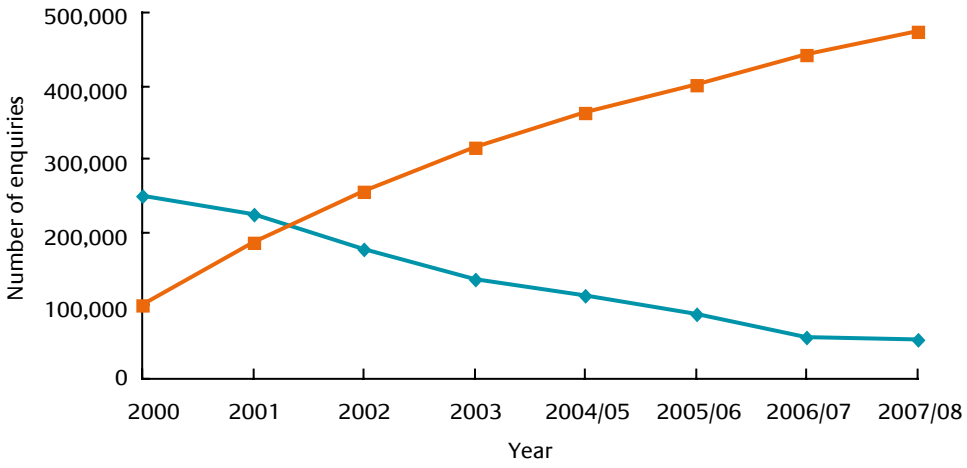


FIGURE 3.1 Telephone enquiries (♦) and TOXBASE (■) sessions from 2000 to 2007/08 (data for 2000–2003 by calendar year; 2004/05–2007/08 by financial year)

TABLE 3.1 Regional distribution of poisons enquiries to the NPIS in 2007/08

Country	Telephone enquiries	TOXBASE sessions*	Total	Telephone as a % of total	Population (mid-2006 estimates)	Poisons enquiries/ 100,000 population
England	41,453	355,295	396,748	10.4	50,762,900	782
Scotland	2,376	42,676	45,052	5.3	5,094,800	884
Wales	5,053	20,879	25,932	19.5	2,965,600	874
Overall	**48,882**	**418,850**	**467,732**	**10.5**	**58,823,300**	**795**

* This analysis assumes that TOXBASE sessions are similar in character to telephone enquiries. However, while for England on average two products are accessed per session, for Scotland it is three and for Wales almost four, suggesting that some users may be logging off less frequently. The net effect would be to increase the differential in overall TOXBASE usage between England and Scotland and Wales. Taking this into account, Wales has the highest telephone enquiry and product access rate per head.

TABLE 3.2 TOXBASE sessions and sessions per 100,000 population by strategic health authority in England compared with Scotland and Wales, in 2007/08

Country	Region*	TOXBASE sessions	Sessions/ 100,000 population
England	East Midlands	30,176	701
	East of England	36,823	664
	London	45,997	612
	North East	18,775	734
	North West	54,996	803
	South Central	30,775	779
	South East Coast	23,772	564
	South West	33,514	661
	West Midlands	37,409	697
	Yorkshire and The Humber	42,700	843
Scotland		42,676	834
Wales		20,879	704

* Where recorded.

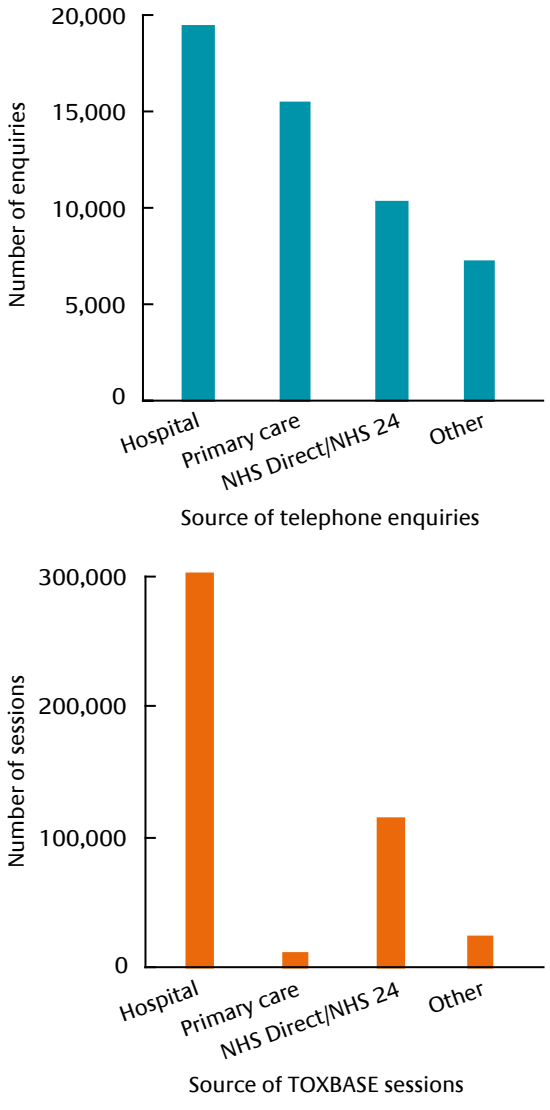


FIGURE 3.2 Telephone enquiries and TOXBASE sessions in 2007/08 by source of enquiry

10–19 years, and these are the subject of further discussion in Section 4.2. The age of patients who were the subject of telephone enquiries is shown in Figure 3.3. Age was not recorded in 2851 enquiries. It should be noted that the age is not always available from the enquirer, but it is usually known whether the subject is a child or adult.

Overall, 45.2% patients were male and 52.7% female (2.1% unrecorded). For place of occurrence, 85.7% of all potential exposures were reported to have happened in the home, 2.9% in agricultural or other workplaces and 2.0% in medical facilities, with 5.7% classified as 'other' and 3.6% unknown. Half (50.4%) involved accidental poisoning, 28.0% deliberate poisoning, 12.6% medication error (by patients, carers or medical professionals) and 1.5% substance abuse (4.7% other circumstances; 2.8% unknown).

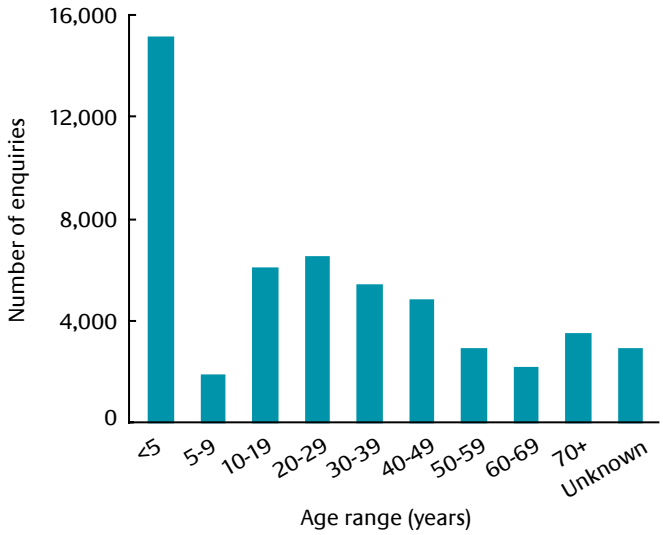


FIGURE 3.3 Age of poisoned patients reported in telephone enquiries to the NPIS in 2007/08

The types of products that were the subject of telephone enquiries are shown in Figure 3.4. The breakdown is similar to that in 2006/07, with pharmaceuticals again involved in over 50% of enquiries. It should be noted that the figure for industrial chemicals includes all instances of alcohol ingestion taken with or without an overdose.

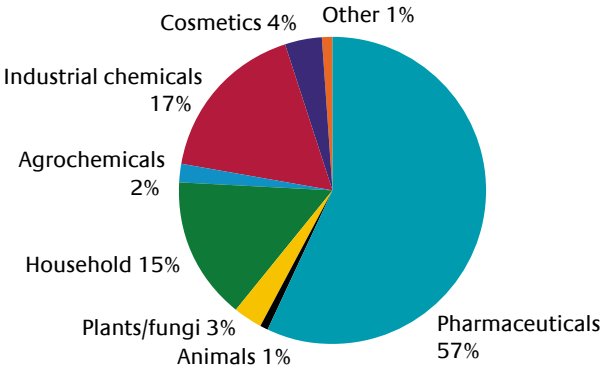


FIGURE 3.4 Types of products involved in telephone enquiries to the NPIS in 2007/08

Table 3.3 shows the ten pharmaceutical agents that were the most frequent subject of enquiries by telephone calls and TOXBASE sessions. One of the agents was the compound analgesic co-codamol (paracetamol and codeine). The number of enquiries listed for paracetamol in the table does not include those for compound analgesics.

TABLE 3.3 Pharmaceutical agents: top telephone enquiries and TOXBASE accesses in 2007/08

Telephone		TOXBASE	
Agent	Number of enquiries	Agent	Number of accesses
Paracetamol	5,075	Paracetamol	76,936
Ibuprofen	2,671	Ibuprofen	40,197
Diazepam	1,230	Salicylates	21,040
Citalopram	1,042	Diazepam	16,512
Co-codamol	1,005	Citalopram	15,317
Zopiclone	929	Co-codamol	13,353
Fluoxetine	794	Zopiclone	13,237
Aspirin	783	Fluoxetine	12,575
Mirtazapine	525	Amitriptyline	9,220
Olanzapine	502	Tramadol	8,343

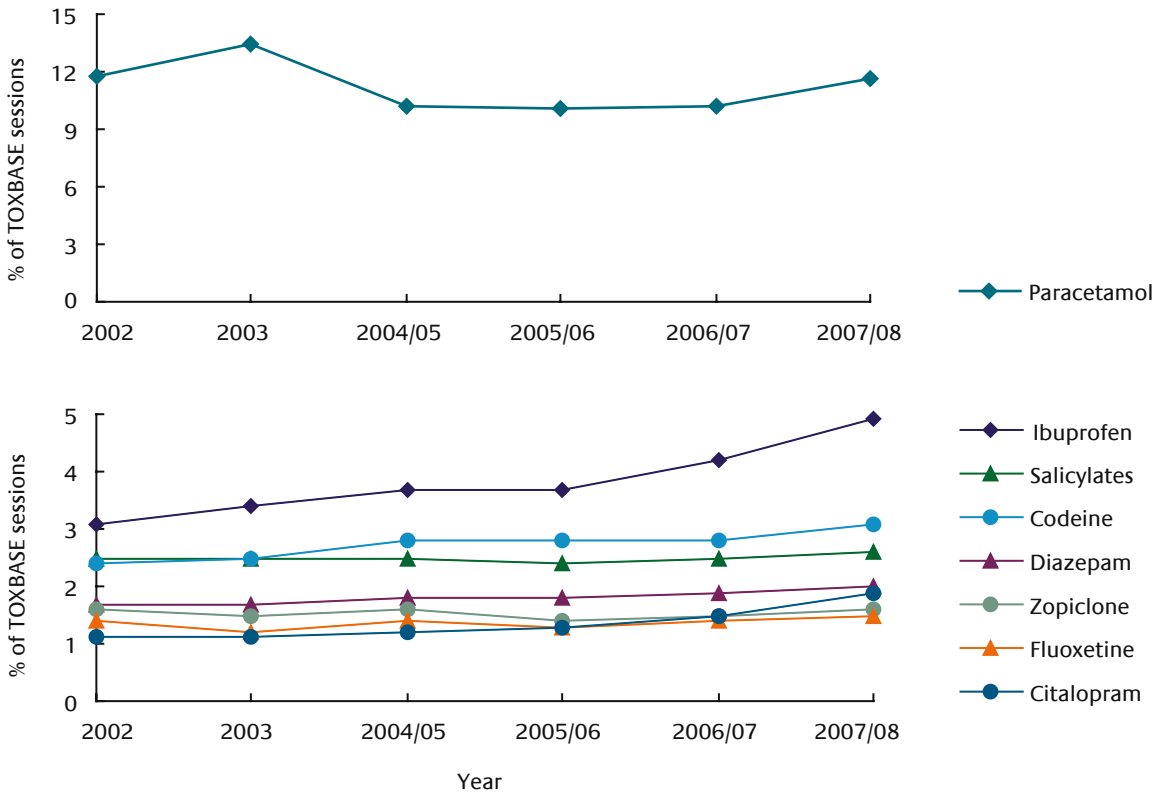


FIGURE 3.5 Percentage of TOXBASE accesses about common agents from 2002 to 2007/08 (data for 2002 and 2003 by calendar year; 2004/05–2007/08 by financial year)

The pattern of enquiries is similar for both telephone and TOXBASE, with analgesics and drugs that affect the central nervous system predominating. In comparison with 2006/07, mirtazapine is included in the top agents in telephone enquiries in 2007/08 (diclofenac enquiries have decreased) and tramadol in TOXBASE sessions (codeine enquiries have decreased).

Most exposures (86.8%) were the result of ingestion, but other routes included inhalation (3.2%), eye contact (2.8%), skin contact (2.1%), and the remainder multiple or other routes (5.1%). Figure 3.5 shows trends for the most common seven agents over the last five years as a percentage of all TOXBASE accesses. Paracetamol has consistently been the source of most enquiries, although the proportion of accesses relating to this agent has not changed in recent years. In contrast, the proportions of accesses relating to ibuprofen and citalopram have been increasing year on year.

3.2 Consultant Referrals

The NPIS operates a national consultant clinical toxicology on-call rota, with consultant clinical toxicologists from the four units (Birmingham, Cardiff, Edinburgh and Newcastle) providing out-of-hours cover (18.00 to 09.00 hours, Monday to Thursday, weekends and public holidays) for the UK and the Republic of Ireland. All staff on the rota are involved in the care of poisoned patients in their own local NHS poisons treatment facilities. A nationally agreed protocol is used to determine when specialists in poisons information should refer enquiries. The national rota is managed from NPIS Edinburgh.

For daytime cover, units continue to make local arrangements and may be supported by consultants, academic clinical staff and specialist registrars (SpRs) who are not on the NPIS consultant toxicologist rota, but under the supervision of NPIS consultants. NPIS Edinburgh also provides consultant support for Northern Ireland enquiries during the working week. Units provide cross-cover in emergencies and occasionally, in a

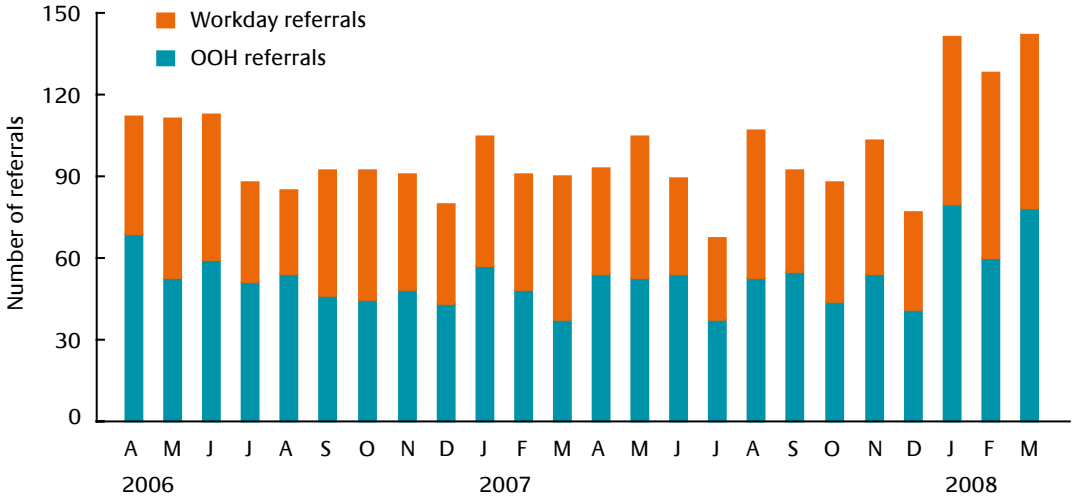


FIGURE 3.6 Consultant referrals by month of the year from April 2006 to March 2008

planned manner, support colleagues in special circumstances during the working week.

For telephone enquiries, details of the original call are now available on the UKPID central server for audit and checking, and the call reference number is sent to the relevant consultant for audit purposes. In addition, consultants keep contemporaneous local records of advice given, which are passed to the NPIS unit that took the original call for addition to the call record.

For the purposes of collating and auditing consultant referrals, NPIS Cardiff now provides a monthly spreadsheet of enquiries that were referred to a consultant. Data on day and month, source and agents are given below.

There were 1232 referrals made to NPIS consultants in 2007/08, a 6.9% increase on 2006/07. Figure 3.6 shows referrals by month since April 2006. The number of out-of-hours (OOH) referrals had been stable, but an increase in referrals has been seen in the first three months of 2008. This has not resulted from a change in any particular unit, but may reflect an increase in enquiries involving toxic alcohols over this period (59 enquiries about methanol and ethylene glycol compared with 54 for the previous nine months). Table 3.4 shows the referrals by country, with most referrals coming from England, and by NPIS unit, showing differences in referrals rate between units.

TABLE 3.4 Referrals by country and referring NPIS unit

Country	Number of referrals	% of referrals
England	855	69.4
Scotland	213	17.3
Wales	100	8.1
Northern Ireland	19	1.5
Republic of Ireland	36	2.9
Other	9	0.7
Total	**1232**	

	OOH referrals		Workday referrals (09.00–18.00 hours Mon–Fri)	
NPIS unit	Number	%	Number	%
Birmingham	191	28.8	129	22.7
Cardiff	218	32.9	159	27.9
Edinburgh	23*	3.5	151	26.5
Newcastle	231	34.8	130	22.8
Total	**663**		**569**	

* The number of calls from Edinburgh to the out-of-hours rota is small because Scottish calls are transferred to the national telephone rota between 20.00 and 08.00 hours weekdays and on weekends and public holidays.

Distribution by day of the week is shown in Figure 3.7, with most referrals on weekdays. The average number of referrals per day was 3.4 (range 0–13 referrals).

The vast majority of consultant referrals came from hospitals (1127; 91.5%), with GPs (66; 5.4%), NHS Direct/NHS 24 (14; 1.1%) and others (23; 1.9%) much less commonly involved. Hospital referrals by department are shown in Table 3.5. There was an increase in referrals from intensive care units and high dependency units compared to previous years.

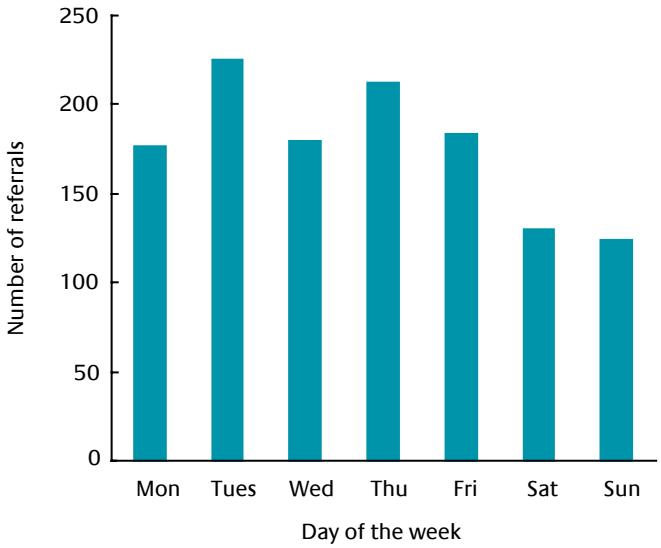


FIGURE 3.7 Consultant referrals by day of the week in 2007/08

TABLE 3.5 Consultant referrals from hospital by department in 2007/08 (where confirmed, 1095 referrals)

Source	Number of referrals	% of referrals
Emergency departments	482	44.0
HDU/ITU	200	18.3
Paediatric	118	10.8
Medical	112	10.2
Admissions/short stay/ assessment	76	6.9
Pharmacy/MI	23	2.1
Surgery	9	0.8
Psychiatry	8	0.7
Other	67	6.1

The most common products which were the subject of referrals are shown in Table 3.6. While paracetamol, co-codamol, aspirin, amitriptyline and ibuprofen all appear in the top ten telephone enquiries, digoxin and iron are less common but do cause serious poisonings. Suspected exposure to substances containing toxic alcohols (methanol, ethylene glycol and diethylene glycol) are the second most common reason for consultant referral and, in view of their importance, are highlighted later in the report (see Section 4.6). In 63 referrals the product taken was unknown and help with diagnosis was required. Alcohol (drink) was involved in 49 referrals.

TABLE 3.6 Top products which were the subject of referrals in 2007/08

Product	Number of referrals
Paracetamol	172
Toxic alcohol*	113
Digoxin	47
Co-codamol	44
Aspirin	39
Iron	36
Amitriptyline	33
Ibuprofen	22

* Antifreeze, methanol, ethylene glycol, screenwash.

Feedback into NPIS services

Analysis of the consultant referrals is used to improve the services offered by the NPIS. This includes additions and changes to TOXBASE entries that reflect user concerns. Any problems highlighted by such calls, or in cases which are difficult or complex, result in further discussion by email, telephone, or at one of the NPIS CPD meetings. This year CPD topics have included adder bites and poisoning caused by anticoagulants, digoxin, drugs of abuse and valproic acid.

3.3 Non-UK and Subscription Users of the NPIS

An out-of-hours telephone enquiry service for the Republic of Ireland is provided by the NPIS under contract. In 2007/08 there were 2445 telephone enquiries that were routed to the NPIS national telephone out-of-hours rota (a decrease of 14.8% over 2006/07).

In addition, NPIS Edinburgh has a separate contract to provide TOXBASE specifically tailored to medical professionals in the Republic of Ireland. By the end of March 2007 there were 72 Irish registered users who had 14,553 sessions on TOXBASE (an increase of 15.8% on 2006/07).

NPIS units received 454 telephone enquiries from the Channel Islands, Isle of Man and other countries. There were 925 sessions on TOXBASE from the Channel Islands, 490 from the Isle of Man, and 9264 from other countries (a 41% increase on 2006/07). This includes fee-paying poisons centres in Australia, Brazil, Hong Kong, Singapore and UAE, as well as European poisons centres by special arrangement.

3.4 Stakeholder Feedback

Using common methodology, the NPIS units have collected information on user satisfaction with their telephone services since 2002. This is to establish if they are meeting the needs of their users, and to identify and address problems, both internal (e.g. difficulties accessing the service, inappropriate advice or impolite staff) and external (e.g. inadequate access to TOXBASE or use of referral protocols).

This is the fifth annual survey to be performed by the NPIS using established methodologies. Questionnaires were sent out to a sample of callers between April 2007 and March 2008. The sample size is intended to be at least 3% of all telephone enquiries in each unit, with the exception of Edinburgh, which takes fewer telephone enquiries and so surveys a larger proportion in order to obtain an adequate sample size.

In previous years the methodology for selecting enquiries differed slightly between the units. For this year, a common method of random allocation of calls for stakeholder feedback was introduced in all the units. The method of data collection was also simplified, with some questions previously asked being dropped from the questionnaire for the current year.

In interpreting the results of this survey, it is important to take into account the fact that rates of telephone enquiry are declining with the increased uptake online of TOXBASE. These now constitute less than one-sixth of all enquiries to the service. It is therefore to be expected that telephone enquiries are likely to be about more complex issues or made when access to TOXBASE is difficult.

Survey results

During 2007/08, the four NPIS units answered a total of 50,879 enquiries involving specific patients and therefore suitable for this exercise and 1,915 questionnaires were sent out. All the units surveyed more than 3% of their telephone enquiries and the survey involved 3.8% of all patient-specific telephone enquiries overall. There were 869 completed responses giving a response rate of 44%, which is typical for surveys of this type.

The responders included consultants (2%), junior hospital doctors (11%), nurses (37%), hospital pharmacists (1%) and GPs (32%). The proportions of responders by professional group (doctors 43%, nurses 40%, others 10%) are similar to those for telephone enquirers as a whole (doctors 45%, nurses 42%, others 12%) with no suggestion of selection or responder bias.

A total of 358 (42%) respondents or their colleagues had accessed TOXBASE before contacting the NPIS. No TOXBASE access was available for 14% of respondents and 35% did not know what TOXBASE was. Of the latter, 62% were GPs, who as individuals would need to use TOXBASE infrequently, and 9% were in the nurse (other) category. Those staff managing cases of poisoning most often, i.e. hospital consultants, junior hospital doctors, emergency department nurses and NHS Direct/24 nurses made up only 0.6, 0.6, 6.2 and 0.6%, respectively, of those responding that they did not know

what TOXBASE was. Lack of awareness of TOXBASE is higher for this year's respondents but, since the survey is confined to those making telephone enquiries, the sample is therefore increasingly biased towards those with less knowledge of, or access to, TOXBASE.

Where TOXBASE had already been accessed the most common reasons given by respondents for calling the NPIS were that there was not enough information on TOXBASE to answer the specific question posed or there were special circumstances. These findings are similar to those of previous years. The most common reasons given for why TOXBASE was not consulted before making a telephone enquiry were a lack of availability in the department, difficulty in logging on/computer connection, or the caller had no training in its use.

To assess the quality of the service as perceived by users, respondents were asked to what degree they agreed or disagreed with a series of statements relating to the particular enquiry they made to the NPIS. Respondents showed a high degree of satisfaction in the way they answered the various questions posed.

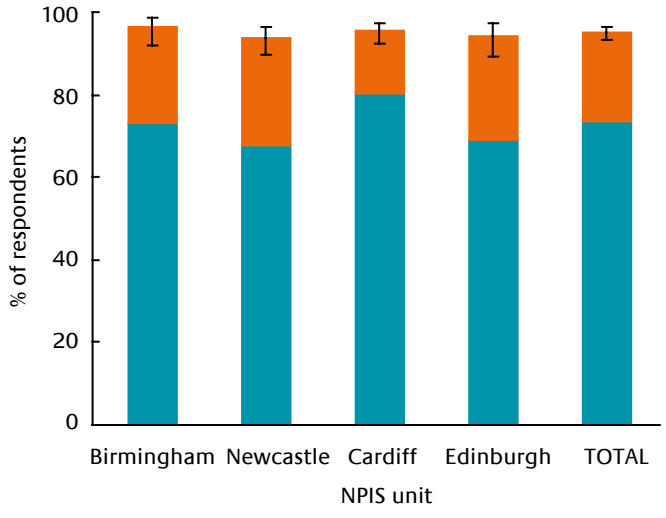


FIGURE 3.8 Overall quality scores (with 95% confidence intervals) for the four NPIS units expressed as the percentage of respondents scoring 5 (■) or 6 (■) out of a possible 6 (non-respondents are excluded from the denominator)

There continues to be a high rate of overall satisfaction with the service, defined as a score of 5 or 6 out of a total of 6, with an overall satisfaction score of 95.0% if non-responders are excluded from the denominator and 91.9% if they are included.

The proportions of respondents indicating high overall satisfaction scores are similar between the four units (Figure 3.8). No statistically significant differences were seen between the units.

The proportions of respondents indicating high overall satisfaction scores (5 or 6 out of a possible 6) are shown in Figure 3.9. There have been no appreciable changes in the total figure since 2002, but the proportion of respondents scoring the service as 6/6 (excellent) has increased slightly from 66.8% in 2002 to 73.7% in 2007/08.

Respondents continue to have a high level of satisfaction with the service, both overall and for individual aspects of the service. Improvements from an already high baseline have been achieved since 2002 in the time taken for the telephone to be answered, the speed of delivery of information, and the amount of information provided. No specific issues were identified where satisfaction appeared particularly low or where there was a reduction in satisfaction with time.

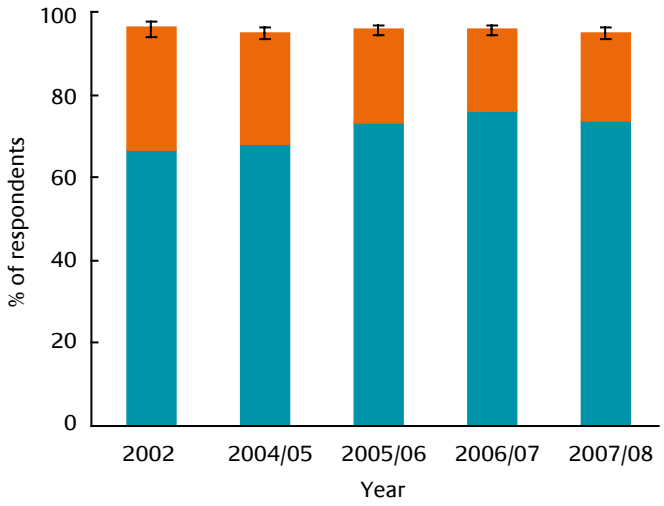


FIGURE 3.9 Overall quality scores (with 95% confidence intervals) from 2002 to 2007/08 for the four NPIS units, expressed as the percentage of respondents scoring 5 (■) or 6 (■) out of a possible 6

Individual units should continue to support TOXBASE and encourage its widespread understanding and availability. The survey should be repeated on a regular basis with adequate numbers of questionnaires sent out by all units to achieve meaningful results. Individual units should consider their own data in detail, including free text comments, since these are often very informative. Methodology should be developed to measure service user perceptions of calls referred to a consultant and for TOXBASE accesses.

Stakeholder meeting

The NPIS held a stakeholder meeting at the Royal College of Gynaecologists in London on 17 January 2008 which was attended by representatives of the funding agencies, and emergency department physicians, other hospital staff, NHS Direct and HPA staff. NPIS directors and staff talked about the service and sought the views of the audience on how it should be developed. Feedback from participants was very positive and confirmed the overall direction of the development of the service was fit for purpose.

3.5 National Teratology Information Service

The National Teratology Information Service (NTIS) was established as part of NPIS Newcastle in 1995. It provides a national service on all aspects of the toxicity of drugs and chemicals in pregnancy. Information is provided to health care professionals by the telephone information service and online through TOXBASE. The NTIS also provides advice on drug and chemical exposure during pregnancy on request to official organisations such as the Health Protection Agency, the Medicines and Healthcare products Regulatory Agency, the Commission for Human Medicines, the European Medicines Agency, the British National Formulary and the Neonatal Formulary.

To assist with enquiry answering, summary information has been written for a number of drugs and chemicals. Currently 460 summaries are available, 200 of which can be accessed directly by health care professionals via TOXBASE, while the remainder are available on request.

As few data exist on the potential fetotoxicity of drug and chemical exposures in human pregnancy, the NTIS attempts to obtain pregnancy outcome data for enquiries meeting specific follow-up criteria (Table 3.7). During 2007/08 extensive work has been completed to add legacy data previously held on paper to the NTIS electronic follow-up database. The NTIS now has outcome information in this format on approximately 10,000 exposed pregnancies, an increase of 2000 on the number available a year ago.

TABLE 3.7 NTIS prospective follow-up criteria

Poisoning
Drugs under intensive surveillance by the MHRA ('black triangle' drugs)
Known or suspected human teratogens
Chemical exposures
Occupational or environmental exposures

As well as the addition of legacy data to the NTIS follow-up database detailed above, the NTIS increased its production of pregnancy monographs during 2007/08 and developed a new standardised format for these. In addition, in-house monograph production training for staff has been developed, including critical appraisal skills in relation to reproductive toxicology data.

NTIS enquiries

During 2007/08 the NTIS received 4456 telephone enquiries related to pregnancy, a decrease of 8% on the figure for 2006/07. The pregnancy summaries hosted by the TOXBASE website had approximately 35,000 accesses during 2007/08, an increase of nearly 9000 accesses over the previous year, reversing the downward trend recorded last year (Figure 3.10). This increased TOXBASE activity has been encouraged by the addition of 43 new or updated pregnancy monographs to the website during 2007/08. These included monographs on various antibiotics, vaccines, antipsychotics and insect repellents.

The distribution of telephone enquiries taken by the NTIS by country in the UK is shown in Table 3.8. In addition, the NTIS also took 109 calls from outside the UK, the majority from the Republic of Ireland.

TABLE 3.8 Regional distribution of telephone enquiries to the NTIS in 2007/08

Country	Number of enquiries	% of enquiries
England	3812	85.5
Scotland	274	6.2
Wales	216	4.8
Northern Ireland	45	1.0
Other (including the Republic of Ireland)	109	2.5
Total	**4456**	**100**

Of the 4456 enquiries referred to the NTIS during 2007/08, 3438 (77%) concerned maternal exposures. Figure 3.11 shows the total number of exposures by category of exposure and the types of substances involved are detailed in Table 3.9. Therapeutic use of medicines during pregnancy remains the largest category about which enquiries are made.

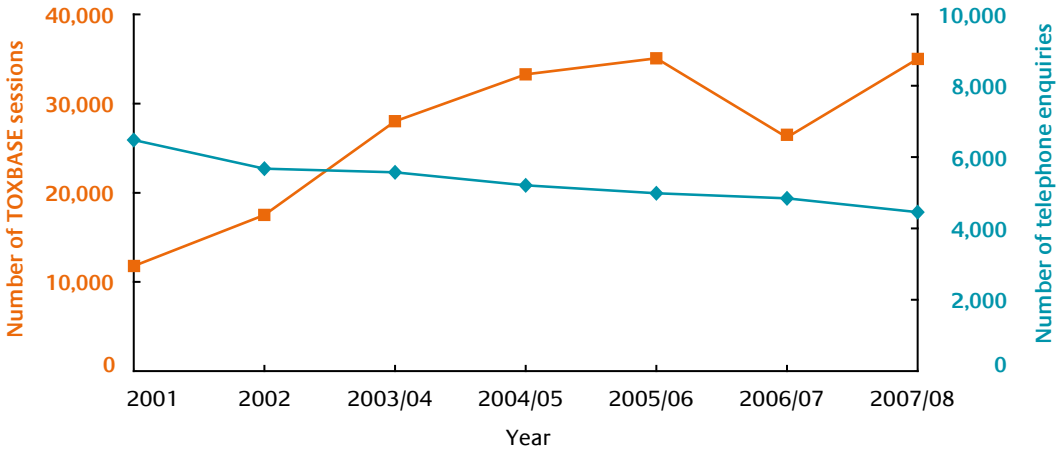


FIGURE 3.10 Telephone enquiries and TOXBASE sessions from 2001 to 2007/08 (data for 2001 and 2002 by calendar year; 2003/04–2007/08 by financial year)

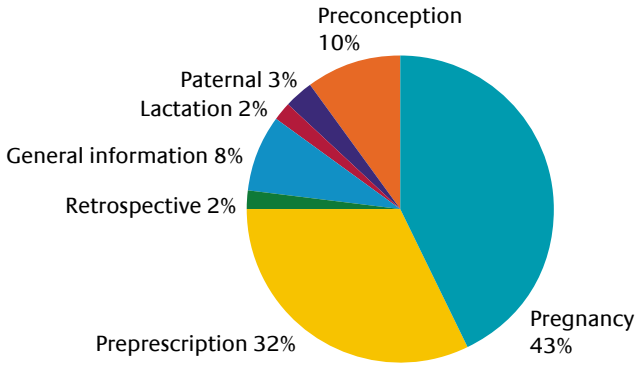


FIGURE 3.11 Total number of exposures by category of exposure in 2007/08

TABLE 3.9 Telephone enquiries to the NTIS by type/ substance exposure in 2007/08

Type of exposure	Number of enquiries	% of enquiries
Therapeutic	3955	88.8
Drug overdose	145	3.2
Poisoning	134	3.0
Substance abuse	32	0.7
Complementary medicines	46	1.0
Occupational	61	1.4
Environmental	35	0.8
Miscellaneous	48	1.1
Total	**4456**	**100**

Quality assurance

A random sample of 240 (5.4%) enquiries, 20 per month, made directly to the NTIS was selected for quality assurance monitoring. Questionnaires were sent out to enquirers between one and four weeks after the enquiry. As of May 2008, 195 (81%) forms had been returned.

The respondents' assessment of overall quality is shown in Figure 3.12. Of all respondents, 89% rated the service as 'excellent' or 'very good' and only 2% as 'average', 'poor' or 'below average'.

Twenty-two (9%) of the respondents made helpful comments on how the service could be improved. Common themes were increased advertising of the service, better use of electronic communication options, increased information on TOXBASE with more frequent updating of monographs, and extension of core opening times.

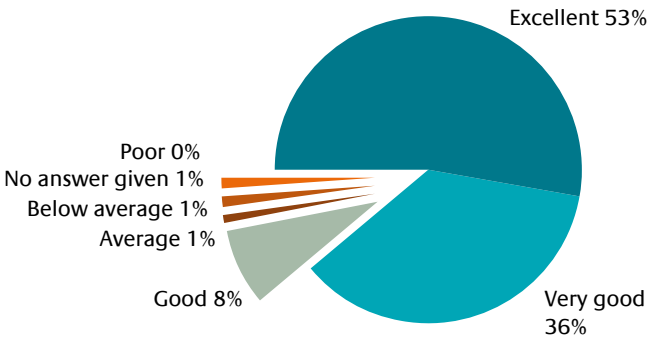


FIGURE 3.12 Quality assurance questionnaire results: overall satisfaction with the information received from the NTIS

3.6 TOXBASE Editing

TOXBASE contains entries on around 14,000 substances and products, not including synonyms, as well as around 4000 information monographs. New and updated TOXBASE entries are circulated to all NPIS units for review before going 'live' on the database. Areas of clinical controversy or uncertainty are discussed by the NPIS directors at quarterly meetings. Monthly literature reviews, undertaken in the main by NPIS Birmingham, are circulated as Current Awareness in Clinical Toxicology (see Section 3.7), to assist in updating TOXBASE.

The TOXBASE Editing Group includes representatives of clinical and information staff from all the NPIS units, together with a public health physician and scientist from the Chemical Hazards and Poisons Division of the Health Protection Agency. It meets approximately three times a year to agree policy for TOXBASE development, discuss the format for TOXBASE monographs, and agree and prioritise work programmes on the database content.

Most of the updating and new entry production is carried out by NPIS Edinburgh, with some specific areas of work undertaken by the other units. In addition, NPIS Edinburgh conducts annual reviews of the content of the most common 100 accesses to TOXBASE. NPIS Edinburgh reviews any entries older than five years and is moving to a rolling five-year review of entries by all units. NPIS Edinburgh continues to review all over-the-counter (OTC) pharmaceuticals (over 1000) annually. Over 2100 new and updated entries were placed on TOXBASE in 2007/08.

3.7 Product Data Centre

Many accidental and deliberate poisonings occur from exposure to consumer products. In order for the NPIS to provide accurate advice on the treatment and management of such patients, reliable information on the composition of consumer products is necessary. Product datasheets (MSDS) also provide information for updating TOXBASE, enabling end-users to obtain specific advice on many common products.

NPIS Birmingham has the responsibility of providing product data to all NPIS units and liaises with manufacturers to ensure that the data held are comprehensive and up-to-date. In 2007/08, some 8500 MSDS were added to the Product Data Centre, which now holds some 50,000 MSDS. The database is indexed by product name, manufacturer, date of the MSDS, and the accession date for the MSDS to the database.

In practice, the vast majority of enquiries can be dealt with by searching by product name (full or partial name) and/or by manufacturer. The nature of most poisoning exposures is such that this is the information that is generally given to medical personnel and then passed on to the NPIS. The date of the MSDS can differentiate between information on updated formulations. Where these fields are insufficient, the database is also fully text searchable, which enables searches to be made on any other criteria, e.g. active ingredients or use.

NPIS Birmingham has developed a database to support the Product Data Centre. This database holds contact details for more than 2500 companies and assists in the tracking of correspondence with companies. It also includes data on the current marketing status of products such as pesticides.

3.8 Current Awareness in Clinical Toxicology

To ensure that NPIS staff are equipped to answer enquiries on all aspects of human toxicology and that TOXBASE is kept up-to-date, access to current scientific literature is essential. With the assistance of the other NPIS units, NPIS Birmingham produces Current Awareness in Clinical Toxicology each month. Each issue lists some 300 citations, with 10–12 key papers being highlighted each month because of their importance to clinical management. In the digital version, some 80% of the citations have abstracts. Citations are selected using searches specially developed for the purpose run against Medline, Embase, and Current Contents.

Current Awareness is distributed electronically or in hard copy to all NPIS units and can be used to produce citations for scientific papers employing any reference style. In addition, the American Academy of Clinical Toxicology (AACT), the European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) and the Asia Pacific Association of Medical Toxicology (APAMT) distribute Current Awareness in Clinical Toxicology to their members worldwide.

All citations in Current Awareness are added to a literature database, which currently contains over 60,000 references. This database is fully searchable using keywords, authors, journals and text words.

4 Poisonings of Interest in 2007/08

4.1 Drugs of Misuse

The prevalence of exposure to drugs of misuse is high in the UK population, with more than 10% of 16–59 year old adults having used an illicit drug in the previous year and 3.4% having used a class A drug*. The UK has the highest prevalence of use of dependency-associated drugs and the second highest incidence of drug-related death in Europe†. The age-standardised mortality associated with drug misuse increased between 1993 and 2000 but has declined since. There were 1644 identified drug-related deaths in the UK in 2005, most involving males and implicating opioids, especially heroin, methadone and dihydrocodeine. Deaths associated with cocaine and codeine have been increasing‡. Toxicity caused by drugs of misuse contributes a significant proportion of enquiries to poisons units, emergency department attendances and hospital admissions.

The annual report is highlighting drugs of misuse this year because of their public health importance and because information on the epidemiology of toxicity associated with these agents is limited. There is a particular need to monitor the health effects of emerging agents such as methamphetamine, ketamine and benzylpiperazine, drugs that are being used increasingly in some parts of the world.

NPIS data reflect registered health care professionals accessing information about specific substances on TOXBASE or by the telephone information service. However, the numbers of TOXBASE accesses or telephone enquiries do not correlate directly with numbers of patients treated, because there may not be a contact if the health care professional is already familiar with the substance, enquiries (especially TOXBASE accesses) may be for educational reasons rather than directly related to a case, and there may be several contacts for the same patient from different health care professionals involved.

Trends with time

The total numbers of NPIS telephone enquiries are declining as NHS staff increasingly use TOXBASE, so time trends in total numbers of TOXBASE accesses or telephone enquiries to specific drugs may be misleading. Annual data are therefore expressed as proportions of total accesses or enquiry numbers.

Amongst the class A drugs selected for study, MDMA (ecstasy) has been the most common agent accessed on TOXBASE or subject to a telephone enquiry in recent years. However, the proportion of accesses and telephone enquiries relating to this drug has been declining. In contrast, the proportion relating to cocaine has progressively increased; this is now the second most frequently accessed drug of misuse on TOXBASE and the most frequently involved in telephone enquiries. These cocaine data are of particular relevance because of the increases in hospital admissions and deaths associated with this agent§. The proportion of TOXBASE accesses and telephone enquiries relating to methadone has not changed substantially in recent years and TOXBASE activity for heroin is also unchanged (Figure 4.1), while the proportion of telephone enquiries involving heroin is decreasing (Figure 4.2), in line with the reduction in heroin-associated deaths observed in recent years§.

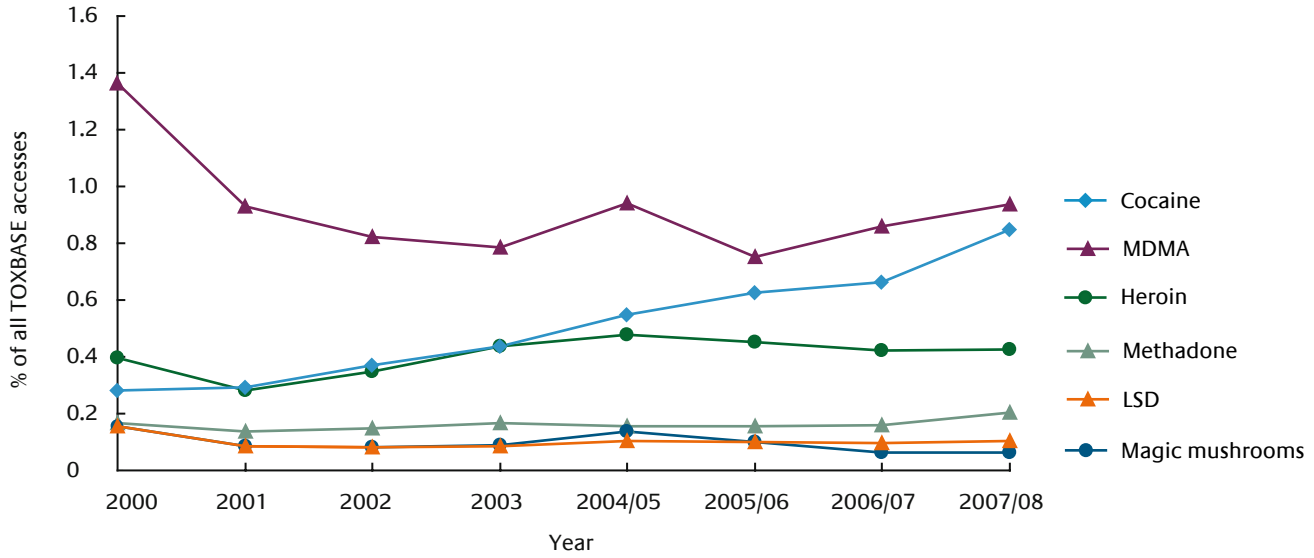
For non-class-A drugs, increases in TOXBASE accesses have been observed for ketamine and methamphetamine. The proportion of telephone enquiries about methamphetamine has also increased, although total numbers remain very small, while equivalent figures for ketamine have not changed. TOXBASE accesses for cannabis, amphetamines (other than methamphetamine and MDMA) and GHB have not changed substantially, while the proportions of telephone enquiries relating to these agents have declined. TOXBASE accesses for GBL appear to be increasing but a monograph about this substance has only been available for access since 2003. Enquiries relating to benzylpiperazine are also uncommon but are growing.

* National Statistics for Health and Social Care. Statistics on Drug Misuse, England, 2007. NHS Information Centre. Available at www.ic.nhs.uk (accessed July 2008).

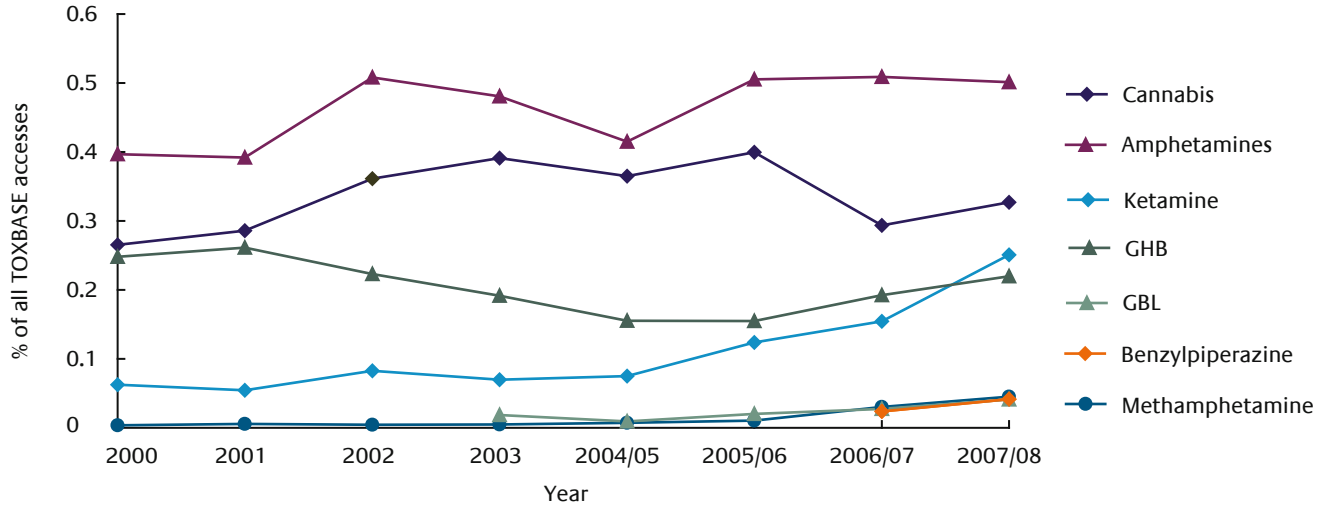
† Reuter P, Stevens A. An Analysis of UK Drug Policy: A Monograph Prepared for the UK Drug Policy Commission. April 2007. Available at www.ukdpc.org.uk (accessed June 2008).

‡ Morgan O, Griffiths C, Toson B, Rooney C, Majeed A, Hickman M. Trends in deaths related to drug misuse in England and Wales, 1993–2004. Health Statistics Quarterly, 2006; 31: 23–27.

§ National Statistics Online. Drug poisoning. Available at www.statistics.gov.uk/cci/nugget.asp?id=806 (accessed July 2008).

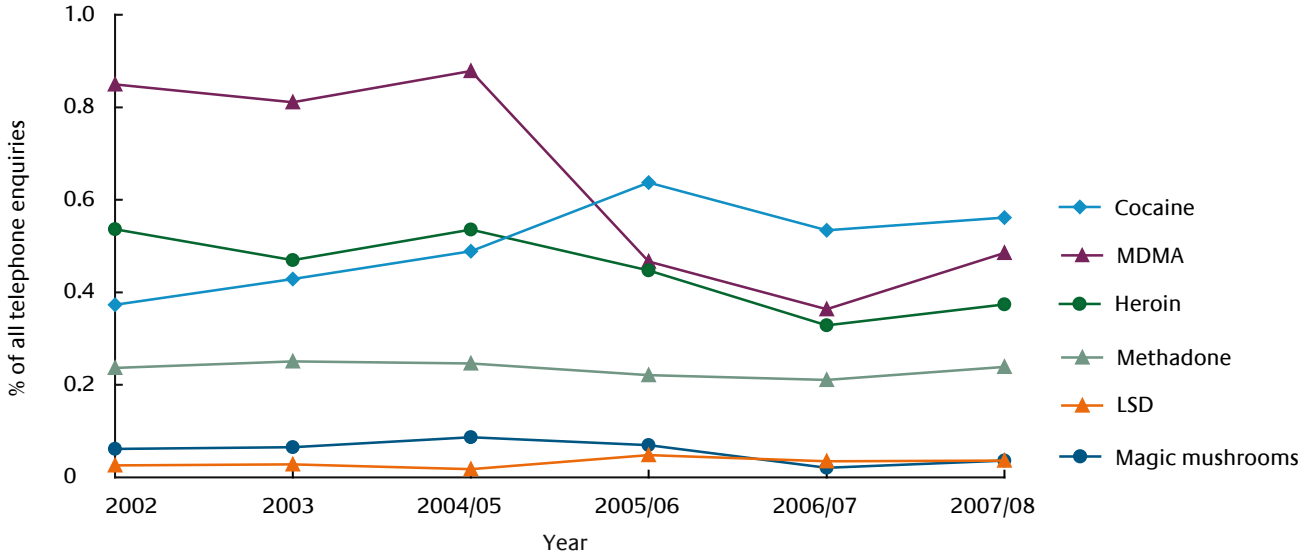


(a) Class A drugs of misuse

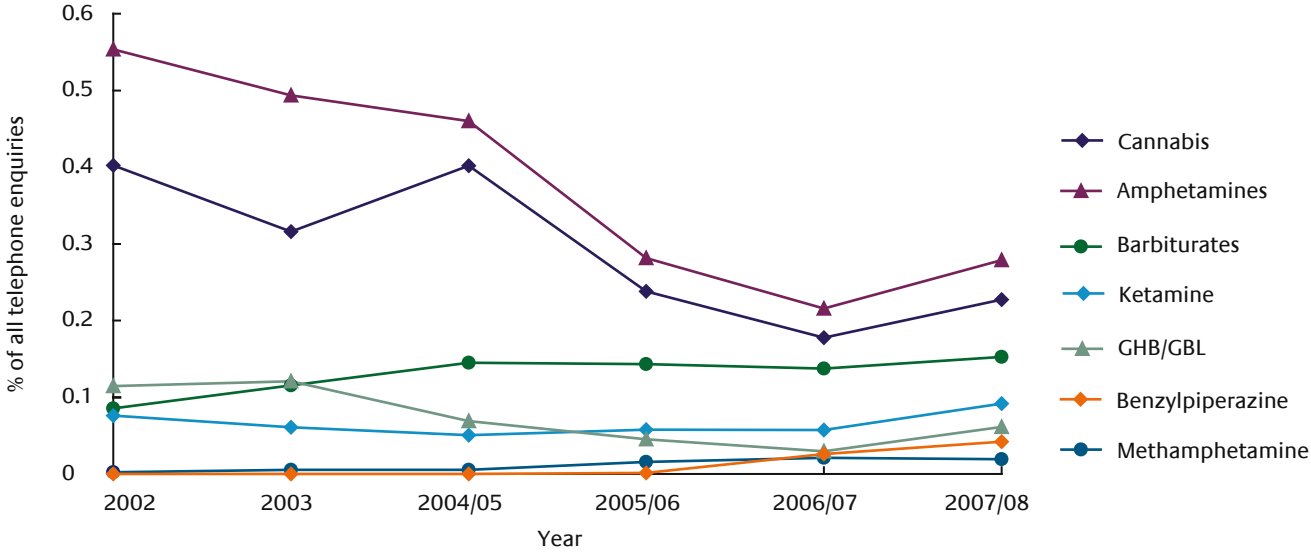


(b) Other drugs of misuse

FIGURE 4.1 TOXBASE accesses relating to specific drugs of misuse
(data for 2000–2003 by calendar year; 2004/05–2007/08 by financial year)



(a) Class A drugs of misuse



(b) Other drugs of misuse

FIGURE 4.2 Telephone enquiries relating to specific drugs of misuse
(data for 2002 and 2003 by calendar year; 2004/05–2007/08 by financial year)

Telephone enquiry data for 2007/08 have been analysed in further detail to provide information on the characteristics of exposure. The drugs of misuse most frequently involved in telephone enquiries during this year were cocaine, MDMA, heroin, amphetamines and methadone. For all drugs studied, the patients involved were more commonly male (Figure 4.3).

As would be predicted, the peak age group involved was 20–29 years, but an important minority of enquiries related to children under 5 years of age. MDMA and cannabis were most commonly involved in patients aged between 10 and 19 years. Enquiries relating to barbiturates commonly involved older patients and arose from therapeutic rather than recreational use (Figure 4.4).

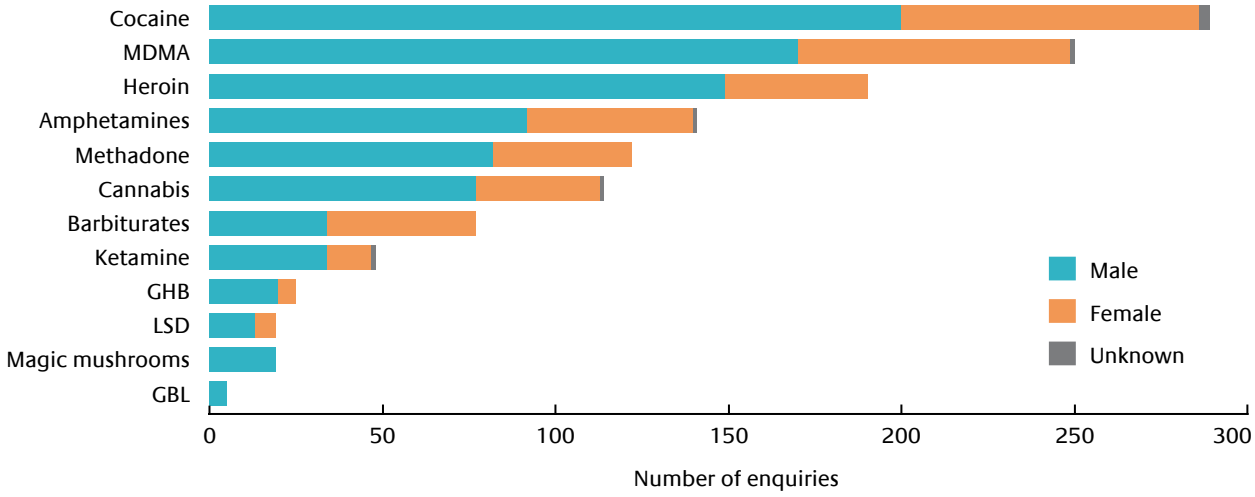


FIGURE 4.3 Telephone enquiries: distribution by gender for selected drugs of misuse in 2007/08

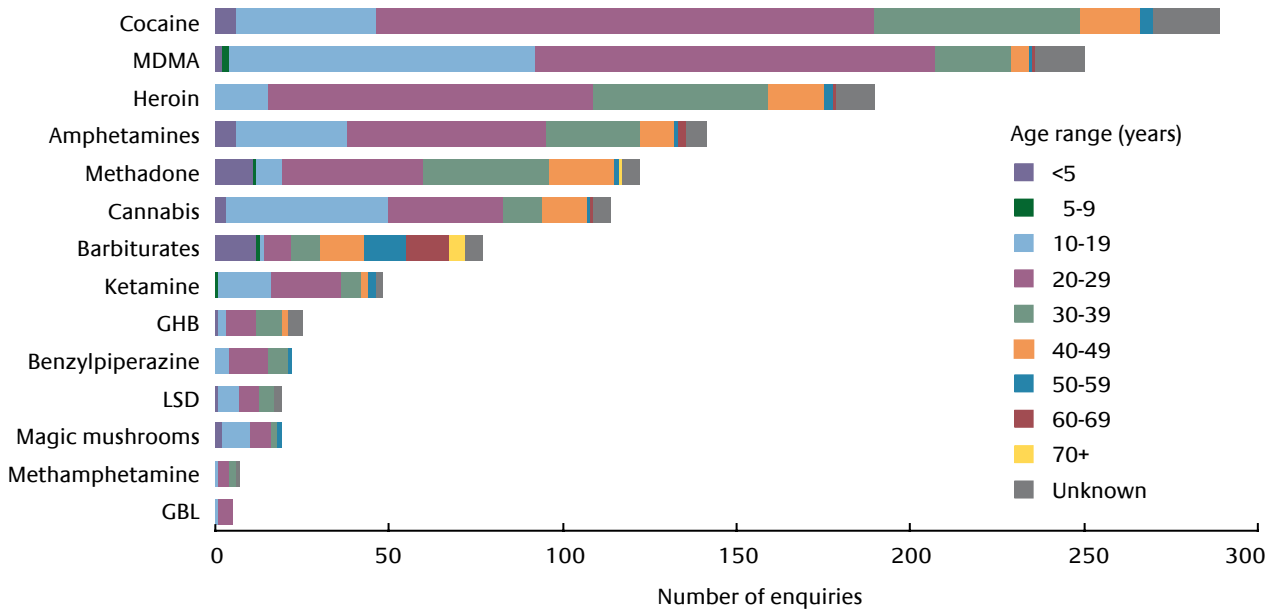


FIGURE 4.4 Telephone enquiries: distribution by age for selected drugs of misuse in 2007/08

The circumstances of poisoning are shown in Figure 4.5. As would be predicted, intentional overdose and recreational use predominated, but some calls related to accidental exposures. Therapeutic error was also sometimes involved, most commonly relating to methadone and barbiturates.

Most episodes of poisoning occurred in the home or other domestic settings, but a significant minority of enquiries relating to cocaine, heroin and methadone came from prisons (Figure 4.6).

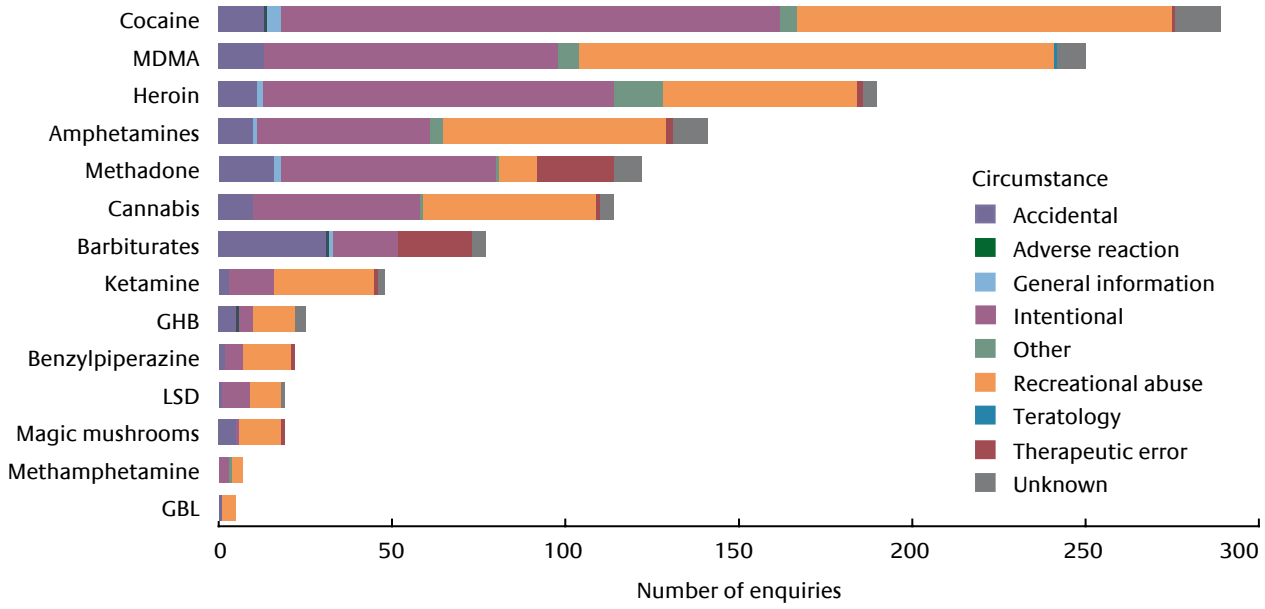


FIGURE 4.5 Telephone enquiries: circumstances of poisoning for selected drugs of misuse in 2007/08

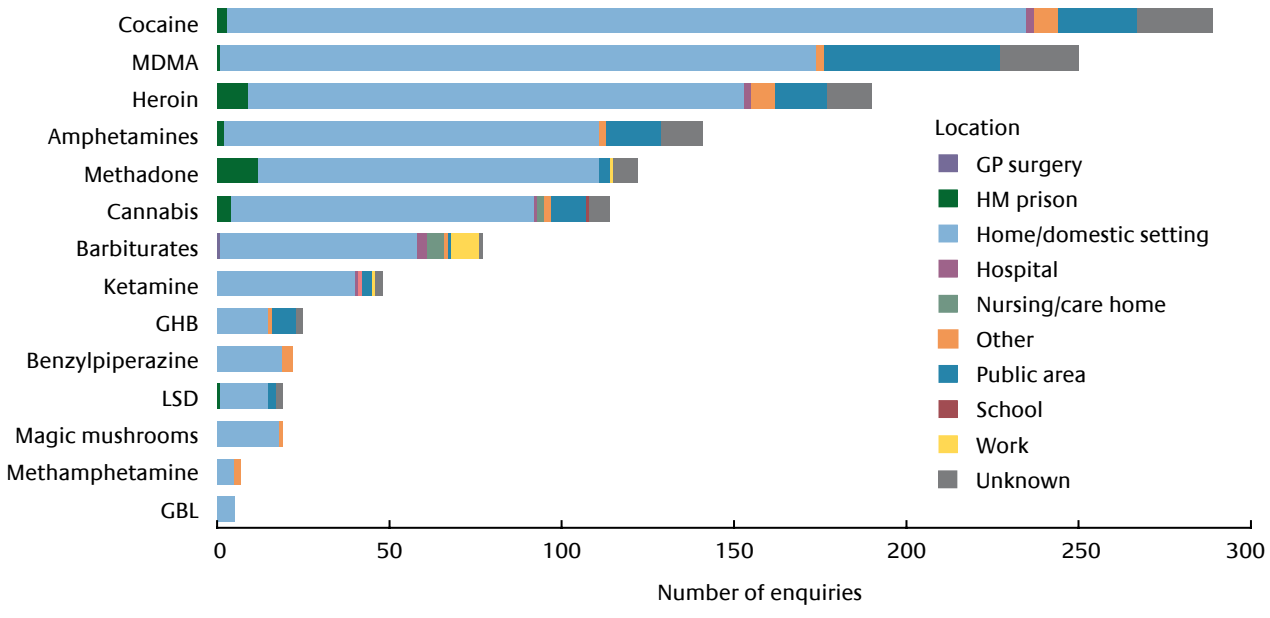


FIGURE 4.6 Telephone enquiries: location of poisoning for selected drugs of misuse in 2007/08

The severity of poisoning can be assessed using the poisoning severity score (PSS). For most enquiries, the PSS indicated mild or no toxicity. Cannabis was associated with the lowest proportion of enquiries scored as 'moderate' or 'severe', while the highest proportion related to LSD and magic mushrooms exposures, although the patient numbers involved were small (Figure 4.7).

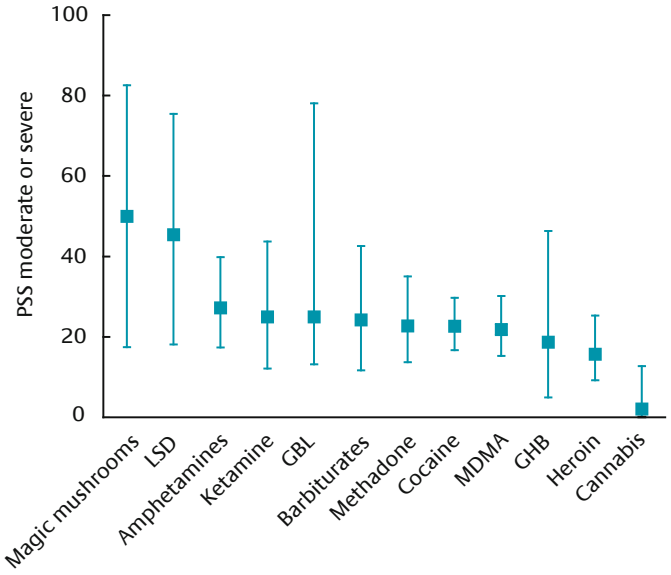


FIGURE 4.7 Proportion of telephone enquiries associated with moderate or severe toxicity as determined using the poisoning severity score (with 95% confidence intervals)

Summary

The major change of concern in recent years is the increase in the proportion of enquiries that involve cocaine. The increases in TOXBASE activity for ketamine and TOXBASE and telephone activity for methamphetamine and benzylpiperazine are also of concern, although these drugs are much less commonly encountered. Over the same period enquiries and accesses relating to MDMA have declined as a proportion of overall activity, as has the telephone workload relating to cannabis and amphetamines.

Most current telephone enquiries involve males and patients aged 20–29 years, are intentional or recreational in nature, and occur in a domestic setting. Only a minority of NPIS telephone enquiries are associated with moderate or severe toxicity.

4.2 Enquiries involving Young People

Poisoning in young people (defined here as those aged 10–19 years) remains an important public concern, and the NPIS received 6016 telephone enquiries relating to this group. These enquiries are an indication of the types of poisonings suspected in this age group and are not a measure of incidence.

The distribution of enquiries by age and gender is shown in Figure 4.8; more females than males were involved in all age groups from 13–19 years. Of these exposures, 3461 (57.5%) were considered deliberate, 1733 (28.8%) were considered accidental, 522 (8.7%) were medication errors, and 300 'other' or unknown. The most common products involved are shown in Table 4.1.

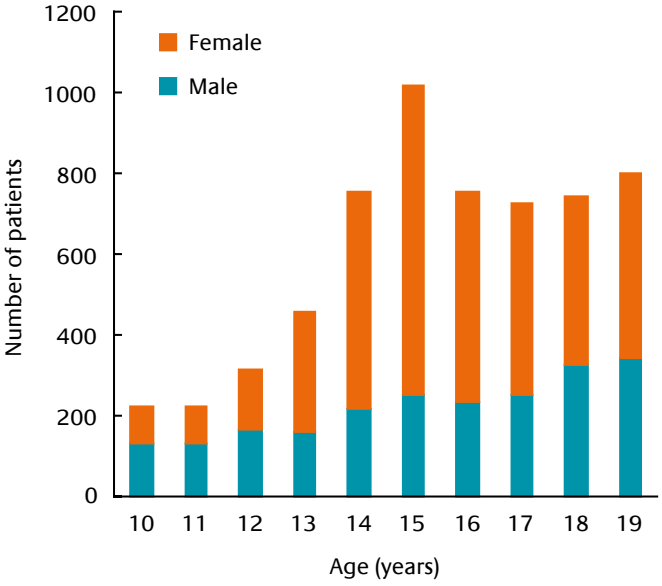


FIGURE 4.8 Age of patients (10–19 years) in telephone enquiries in 2007/08

Of the enquiries on alcohol, 34 involved alcohol alone and the remainder involved alcohol taken in combination with other products. The top ten is similar to that for patients of all ages (Table 3.3), except for the presence of ferrous sulphate (iron tablets), which can cause serious toxicity in overdose, and mefenamic acid, a non-steroidal anti-inflammatory drug usually prescribed for dysmenorrhoea (period pains), which

TABLE 4.1 Top agents involved in telephone enquiries concerning patients aged 10–19 years in 2007/08

Product	Number of enquiries
Paracetamol	1394
Ibuprofen	399
Alcohol (drink)	319
Co-codamol	174
Aspirin	154
Fluoxetine	108
Ferrous sulphate	97
Diclofenac	88
Citalopram	86
Mefenamic acid	75

commonly causes convulsions in overdose. The drug of abuse most frequently implicated (apart from alcohol) is MDMA, with 74 enquiries.

Summary

More females than males are involved in poisonings in young people. The products taken are similar, but not identical, to those taken by adults; alcohol is often involved.

4.3 Medication Error Queries

The NPIS receives enquiries relating to suspected medication errors as a cause of potential overdose. They cause concern to those involved, and may result in complications for some patients, especially the elderly or the very young.

The NPIS received 6946 telephone enquiries concerning medication errors for patients during the year. Of these, 1546 (22%) involved patients aged 70 years or more and a further 877 (13%) involved children less than 5 years of age (Figure 4.9).

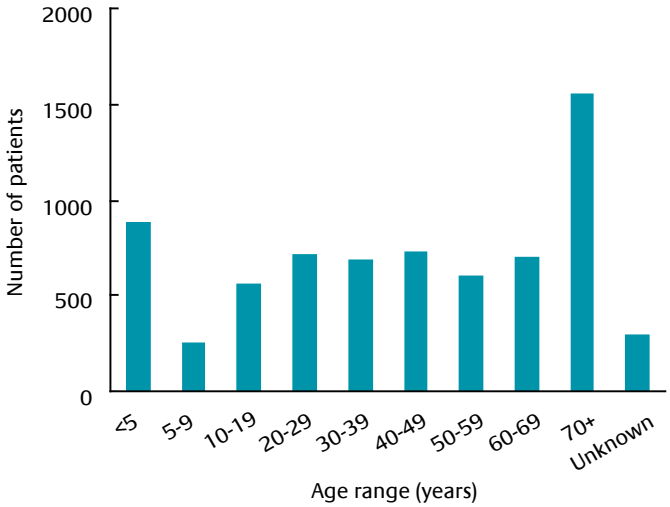


FIGURE 4.9 Age of patients incurring medication errors in 2007/08

The distribution of enquiries by gender was 57% of cases were female and 42% male (for 1% the gender was not stated). The vast majority (90%) of reported medication errors occurred at home. However, 4% occurred in hospitals, 4% in nursing and care homes, and 1% in GP surgeries.

An individual medication error may involve an excess dose, a wrong medication, or several different medications, and the last may also involve an individual receiving another patient's medication in error. Ingestion was the commonest route of exposure (93%), with injection (4%), eye exposure (1%) and other routes (under 1%) less frequently involved.

Drugs used as analgesics or for the treatment of joint disorders (29%), those acting on the central nervous system (22%), and cardiovascular drugs (18%) were the most commonly implicated (Figure 4.10).

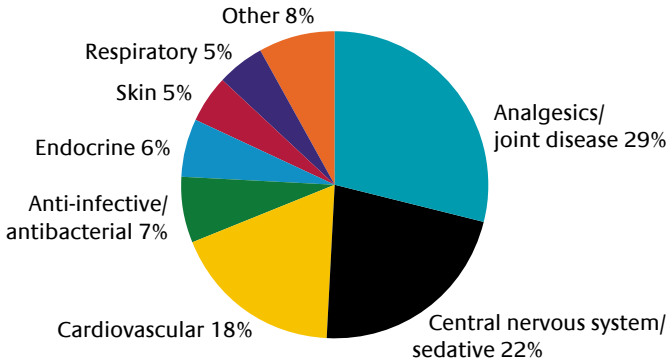


FIGURE 4.10 Pharmaceuticals involved in medication errors in 2007/08

Forty-four per cent of medication errors were acute exposures. A further 29% occurred where the substance was already being used as long-term medication. Seventeen per cent of errors involved a repeated exposure.

The severity of exposure may be assessed using the poisoning severity score (PSS). Where a severity score was recorded, most medication errors (81%) resulted in no clinical features whilst a further 17% caused only minor features, 1.3% were associated with moderate features and 0.3% were assessed as having severe features of poisoning.

Whilst the majority of medication errors occurred in the home, and most resulted in few adverse features, the potential to cause serious adverse effects must be remembered. All those who administer medication must remain vigilant to ensure that the correct medicine is given to the correct patient in the correct dose. The need for regular review of medications, careful prescribing and checking before drugs are administrated is emphasised.

4.4 Poisoning in Pregnancy

Of the 4456 telephone enquiries received by the NTIS in 2007/08, 279 enquiries concerned poisoning in pregnancy. The other NPIS units received a further 311 such enquiries. Some of these may have involved the same case. The enquiries made to the NTIS and NPIS were for advice on pharmaceutical agents taken in overdose or accidental or deliberate poisoning by other agents, i.e. chemicals, household products or food.

The types of products that were the subject of telephone enquiries to the NTIS on poisoning in pregnancy are shown in Figure 4.11; pharmaceuticals accounted for three-quarters of all enquiries. The five substances most commonly involved were paracetamol (121 enquiries), ibuprofen (23), aspirin (16), fluoxetine (8) and carbon monoxide (8).

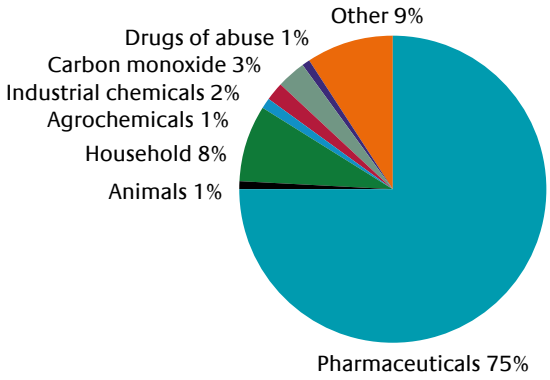


FIGURE 4.11 Types of products involved in telephone enquiries to the NTIS relating to poisoning in pregnancy in 2007/08

The ages of the women who were the subjects of these enquiries are shown in Figure 4.12 and the durations of gestation at the time of enquiry in Figure 4.13. Enquiries were slightly more common in relation to women in the first (37%) and second (35%) trimesters compared to the third (28%).

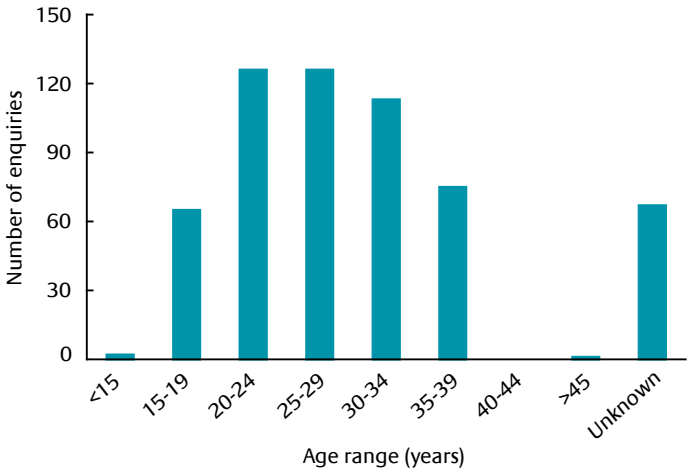


FIGURE 4.12 Age of poisoned pregnancy patients reported in telephone enquiries to the NTIS and NPIS in 2007/08

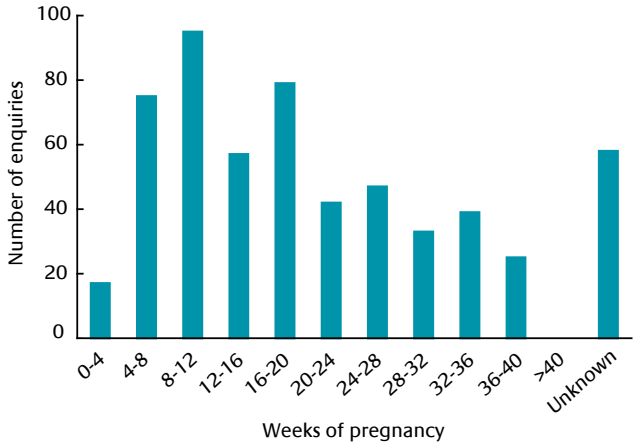


FIGURE 4.13 Duration of gestation in telephone enquiries relating to poisoning in pregnancy in 2007/08

Pregnancy outcomes

The NTIS follows up all enquiries relating to poisoning in pregnancy, when this is possible. These data are invaluable as there are currently very few published data available on which to base clinical management.

Between 1984 and 2008 the NTIS collected 2323 records of fetal outcome following poisoning in pregnancy (Table 4.2). Of these, 15% were terminated electively, spontaneous abortion occurred in 5.4% and 0.8% were affected by stillbirth or intrauterine death. These figures are not significantly different from those that would be expected for a healthy unexposed population. Of the 1825 live-born infants for whom information is available, 88 were reported as having a congenital malformation (4.8%, 95% CI 3.9–5.9), either major or minor. This figure is higher than the expected background rate of 2–3% in the general population but only slightly higher than that obtained from the NTIS follow-up of pregnancies where there was therapeutic exposure to drugs known to be non-teratogenic (3.7%).

Many of the NTIS data on pregnancy outcome following overdose have been published and/or included in the pregnancy monographs that are on TOXBASE. These include 12 of the monographs revised during 2007/08.

Poisoning with specific substances

NTIS data have been analysed for all specific agents commonly implicated in poisoning or overdose. An overview of the data collected by the NTIS for the top five substances is provided below.

Paracetamol

NTIS data on fetal outcome following maternal paracetamol overdose have been reviewed on several occasions, most recently in 2005. These data, involving 604 pregnancies and 474 live-born infants, demonstrated a rate of congenital malformation only slightly higher than the expected background rate (4.4%, 95% CI 2.8–6.8). No causal relationship could be identified between adverse fetal

TABLE 4.2 Pregnancy outcomes following poisoning (all substances)

Number of pregnancies/ live-born infants	Normal infants	Congenital malformations	Spontaneous abortion	Elective termination of pregnancy	Intrauterine death	Stillbirth
2313/1825	1737*	88	126	353	11	8

* 10 sets of twins.

TABLE 4.3 Effects of maternal treatment for paracetamol poisoning on fetal outcome

Treatment	Number of pregnancies	Normal infants	Congenital malformations	Spontaneous abortion or fetal death	Elective termination of pregnancy
Acetylcysteine	71	56	2	6	7
Methionine	16	11	–	–	5
Activated charcoal	25	21	–	2	2
Gastric lavage	44	30	4	2	8

outcome and maternal paracetamol concentration. Use of antidotes and other treatments for paracetamol poisoning have also been evaluated and the data obtained are reassuring about their safety during pregnancy (Table 4.3). These data, together with a critical appraisal of other available data, were included in a pregnancy monograph on paracetamol overdose which was accessed 1026 times in 2007/08. This makes it the fourth most accessed of all the pregnancy monographs on TOXBASE.

Aspirin

NTIS data on fetal outcome following maternal aspirin overdose were most recently published in 2007, where 90 prospective cases of confirmed overdose were followed up. For this group, overdose was defined as documented ingestion of more than the maximum daily therapeutic amount (4 g). The frequency of congenital malformations in live-born infants (2.8%, 95% CI 0.5–10.7) was not significantly higher than the background rate and no specific pattern of malformations was detected (Table 4.4).

TABLE 4.4 Pregnancy outcomes following aspirin overdose

Trimester	Number of pregnancies/ live-born infants	Normal infants	Neonatal problems	Congenital malformations	Elective termination of pregnancy	Spontaneous abortion	Intrauterine death
1st	34/19*	16	1	2	12	5	–
2nd	39/36†	32	4	–	4	–	–
3rd	15/15	14	1	–	–	–	–
Unknown	2/1	1	0	–	1	–	–
Total	**90/71**	**63**	**6**	**2**	**17**	**5**	**0**

* 2 sets of twins. † 1 set of twins.

TABLE 4.5 Pregnancy outcomes following ibuprofen overdose

Trimester	Number of pregnancies/ live-born infants	Normal infants	Neonatal problems	Congenital malformations	Elective termination of pregnancy	Spontaneous abortion	Intrauterine death
1st	32/20	15*	4	1	10	3	–
2nd	27/25	21	3	1	1	1	–
3rd	13/13	11	1	1	–	–	–
Total	72/58	47	8	3	11	4	–

* 1 set of twins.

Ibuprofen

The NTIS last published data on fetal outcome after ibuprofen overdose in 2003. To date, the NTIS has followed up 72 cases of ibuprofen overdose during pregnancy, defined as documented ingestion of more than the maximum daily therapeutic amount (2.4 g). The frequency of congenital malformations in live-born infants (5.2%, 95% CI 1.3–15.3) was not significantly higher than the background rate and no specific pattern of malformations has been observed (Table 4.5).

Fluoxetine

The NTIS last published data on outcomes following fluoxetine overdose in 2002, relating to 28 women followed up prospectively. There were 23 live-born infants, one of whom had neonatal problems and two were affected by congenital malformations. The rate of malformation (8.7%, 95% CI 1.5–29.5) is not significantly higher than the expected background rate.

Carbon monoxide

The NTIS last published data on carbon monoxide poisoning in pregnancy in 2003, including 131 women exposed to carbon monoxide during pregnancy. Severe toxicity occurred in seven of these, while 34 suffered moderate toxicity and 90 were asymptomatic. Twenty-six women (19.8%) had long-term exposures (over two weeks), four of whom were exposed throughout pregnancy, but there was no loss of consciousness and none had hyperbaric oxygen. There were five spontaneous abortions, eight elective terminations and 118 live-born infants including five with malformations (4.2%, 95% CI 1.6–10.1), a figure not significantly higher than the background rate. There were also six infants with neonatal problems.

An increased risk of adverse fetal outcomes following maternal drug overdose cannot be excluded for many substances. However, the data available for those substances most commonly involved in poisoning during pregnancy, many of which have been provided by the NTIS, do not suggest a substantial increase in the rate of congenital malformations or other fetal or neonatal problems. The availability of these data allows the NTIS to provide information on which women and the health care professionals looking after them can base their decisions. Data on the safety of antidotes allow the NTIS to recommend for most episodes that a pregnant woman should generally be treated for poisoning in the same way as a non-pregnant patient.

4.5 Pesticides

In previous years the NPIS has reported on selected pesticides but this year summary data only are included. Pesticide enquiries account for only about 2% of the NPIS workload. Data presented reflect enquiries to the NPIS and are an indirect assessment of overall exposure patterns.

Total numbers of exposures to five pesticide groups about which the NPIS received enquiries are shown in Figure 4.14 for the years 2004/05 to 2007/08, with pyrethroids being most common and the number of paraquat enquiries falling since 2004/05.

The poisoning severity score (PSS), where reported, is compared as percentages in Figure 4.15, with most incidents resulting in no symptoms or mild symptoms.

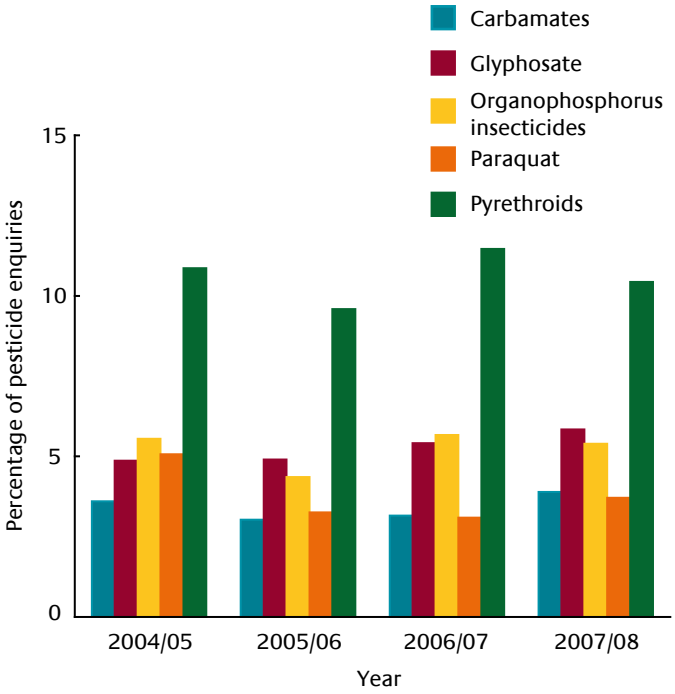


FIGURE 4.14 Five pesticide groups involved in telephone enquiries as a percentage of all pesticide enquiries for 2004/05 to 2007/08

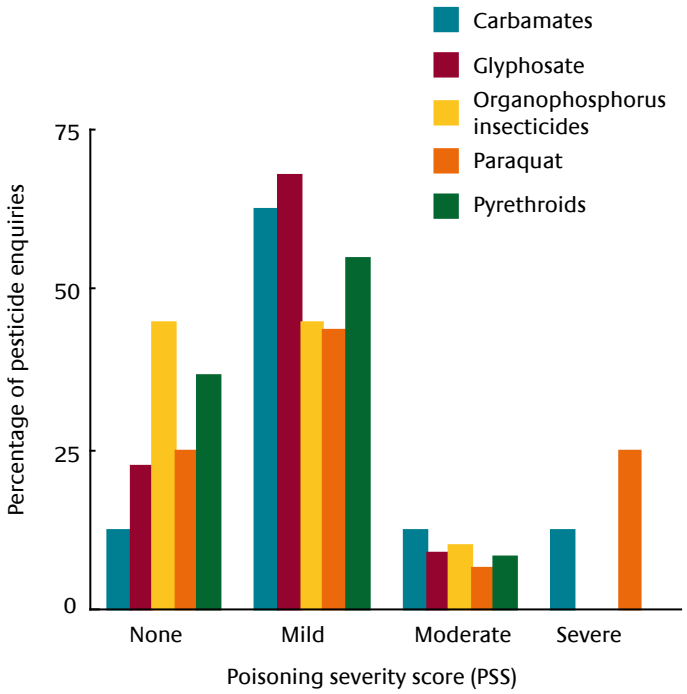


FIGURE 4.15 Percentage poisoning severity scores for exposures to five pesticide groups in telephone enquiries to the NPIS in 2007/08

Two deaths were reported, which both involved paraquat. A further two patients were said to have ongoing sequelae as a result of exposure to paraquat, while three more patients exposed to paraquat made a complete recovery. Additional follow-up data are available on seven patients exposed to one of the other four classes of pesticide. All seven patients made a complete recovery.

Pesticides account for only a small percentage of the NPIS workload but deaths are reported to the NPIS in most years, usually from paraquat. Home and garden preparations containing paraquat have not been marketed since May 2005 and paraquat was withdrawn from sale in the UK in July 2008, but the NPIS is likely to continue to be consulted about cases as stores of old product may remain available. Matters are complicated for enquirers as branded products that used to contain paraquat remain on sale, but with different active herbicide ingredients.

4.6 Poisoning with Toxic Alcohols

Toxic alcohols (methanol, ethylene and diethylene glycols) are contained in many antifreeze and screenwash preparations. This year the NPIS annual report is focussing on these chemicals because they are an important cause of morbidity and mortality and ingestion of even small amounts of pure substance may be highly toxic. These chemicals are also the second most commonly implicated in referrals to NPIS consultants during the year, with over 100 consultant referrals (see Section 3.2).

In recognition of the toxicity of these agents, the TOXBASE entry was revised during 2007/08 to emphasise the importance of prompt administration of antidotal therapy with fomepizole or ethanol in cases of suspected poisoning with these agents.

During 2007/08 the NPIS received 367 telephone enquiries regarding products containing toxic alcohols. In addition, there were 91 enquiries relating to antifreeze and 13 enquiries involving screenwash preparations where the ingredients were unknown. As would be expected, most exposures to these products (438 of 471, 93%) involved ingestion, with occasional enquiries relating to dermal (12) or eye (13) exposure or inhalation (20). Exposure occurred in the home in 86.2% of cases while 5.7% occurred at work. At the time of the enquiry, the poisoning severity score (PSS) was available in 228 cases and was severe in 30 (13%), moderate in 37 (16.2%) and minor in 60 (26.3%) patients.

Table 4.6 summarises the age distribution for the individual agents and shows that enquiries involving methanol or ethylene glycol occurred with similar frequency overall (179 and 173 enquiries, respectively). Most exposures occurred in those aged between 20 and 49 years and were accidental in 230 (48.8%) of the cases. Overall, the ratio of males to females was 1.75 : 1 (for the 457 cases where the gender was known), which may be due to greater use of these substances by men.

Poisoning with toxic alcohols is an important cause of morbidity and mortality and results in a number of consultant referrals. A problem identified on many occasions was the lack of a locally available assay for identification and quantification of these compounds. This complicates the process of clinical management and advice, and has prompted discussions with the UK Association of Clinical Biochemists on both assay availability and standardisation of units of measurement. In addition, many hospitals do not routinely stock antidotes for this group of poisons. The NPIS does advise on antidote stocking and availability, but it is not funded to supply antidotes nationally, which is the responsibility of primary care trusts and health care boards.

TABLE 4.6 Age of patients exposed in 2007/08 to methanol, glycols and to antifreeze and screenwash formulations where the ingredients were unknown

Patient age (years)	Methanol	Ethylene glycol	Diethylene glycol	Antifreeze	Screenwash
<5	26	8	1	4	1
5–9	5	4	0	6	0
10–19	12	3	1	7	2
20–29	15	39	1	22	2
30–39	30	41	1	16	3
40–49	23	48	2	16	0
50–59	10	12	3	4	4
60–69	16	7	2	10	0
70+	26	3	2	1	0
Unknown	10	14	2	5	1
Total	**173**	**179**	**15**	**91**	**13**

5 Conclusions

The review of the NPIS data for 2007/08 confirms that the service continues to work well.

The numbers of TOXBASE sessions continue to increase and telephone enquiries received by the NPIS units continue to decrease. The national rota for out-of-hours telephone enquiry answering and for NPIS consultant referrals continues to operate as specified.

Stakeholder feedback demonstrates a very high level of user satisfaction with the telephone information services provided by the NPIS and NTIS.

The agents most commonly involved in enquiries were pharmaceuticals, as in previous years, with paracetamol and ibuprofen the most frequently implicated. However, there were many enquiries about non-pharmaceutical agents. Toxic alcohols were the second most common reason for referral to an NPIS consultant.

This year's report illustrates some of the public health areas that NPIS data have the potential to influence. There has been an increase in the proportion of enquiries that involve cocaine. The increase in TOXBASE activity for ketamine, and TOXBASE and telephone activity for methamphetamine and benzylpiperazine, are also of concern, although these drugs are much less commonly encountered. Over the same period enquiries and accesses relating to MDMA (ecstasy) have declined as a proportion of overall activity, as has telephone workload relating to cannabis and amphetamines.

Whilst the majority of medication errors occurred in the home, and most (98%) resulted in few adverse features, the potential to cause serious adverse effects must be remembered.

An increased risk of adverse fetal outcomes following maternal drug overdose cannot be excluded for many substances; however, the data available for those substances most commonly involved in poisoning during pregnancy do not suggest a substantial increase in the rate of congenital malformations or other fetal or neonatal problems.

6 Recommendations

The NPIS intends to maintain its role as a world leader in the provision of accurate, timely and accessible advice on the clinical management of poisoning. To this end, a major priority for NPIS staff is the continued updating of the thousands of monographs on TOXBASE to ensure that they are current and of the highest possible quality.

The recommendations set for 2007/08 with their outcomes and new recommendations for 2008/09 are shown below.

Recommendations for 2007/08

1 To continue to develop stakeholder feedback mechanisms, including the use and content of TOXBASE

Outcome Stakeholder meeting held in January 2008

2 To continue to improve the platform on which TOXBASE operates in order to facilitate use by the many different professional groupings now availing themselves of NPIS facilities and support

Outcome Version of TOXBASE on new platform launched in spring 2008

3 To investigate and address the reasons for the recent reduction in accesses to pregnancy summaries on TOXBASE if the downward trend is not reversed in 2007/08

Outcome The number of TOXBASE accesses increased in 2007/08

4 To continue to develop UKPID to facilitate improved data sharing between the NPIS units

Outcome All units using UKPID by August 2007

5 To continue to develop training programmes and professional development objectives for all NPIS staff, building on the success of present activities

Outcome Four CPD days held at different units including NPIC Dublin

6 To use the information collected by the NPIS to support poisons prevention measures and for public health surveillance purposes

Outcome NPIS information used to inform drug policy and MHRA drug licensing; low toxicity poster issued to NHS medical professionals and others and is on the HPA website

7 To encourage public health measures to be taken by primary care trusts, health boards, community pharmacies and the pharmaceutical industry to minimise exposure to potential poisons in children (these might include repeated 'drug dump' and 'safe storage at home' campaigns)

Outcome NPIS annual report distributed to all directors of public health in England

8 To consider and act on funded recommendations of the 2007 clinical governance review

Outcome Funded recommendations including telephone networking, call recording and provision of CPD have been taken forward

Recommendations for 2008/09

1 To institute electronic call recording by all NPIS units

2 To develop stakeholder feedback mechanisms for TOXBASE

3 To develop stakeholder feedback mechanisms for consultant referrals

4 To develop a framework to provide simple advice on poisoning for the general public on the HPA website

5 To alert health care professionals to new NTIS advice via the National Electronic Library for Medicine

6 To modernise the teratology database to facilitate better follow-up and surveillance

7 To seek funding to improve the functionality of UKPID in line with the wider needs of the HPA and NPIS

APPENDIX A

National and International Appointments of NPIS Staff

Members of the NPIS have a role in supporting many important aspects where their knowledge of toxicology is relevant, both nationally and internationally. These include advisory roles to international and national bodies, including government, as well as academic activities.

The range of roles presented below is included to provide a flavour of these activities and indicate the wider 'added value' of the NPIS, both to the UK and internationally.

NPIS Birmingham

Dr SM Bradberry

INTERNATIONAL JOURNALS

Senior Editorial Board Member: Clinical Toxicology, representing the European Association of Poison Centres and Clinical Toxicologists

ADVISORY COMMITTEES

Member: Pesticide Incident Appraisal Panel

UK ACADEMIC ACTIVITIES

Joint Course Organiser: Clinical Pharmacology and Toxicology Module (Module 2) of the MSc (Toxicology), University of Birmingham

Dr JA Vale

INTERNATIONAL ACTIVITIES

Member: Advisory Board, Hong Kong Poisons Centre

INTERNATIONAL SOCIETIES

Immediate Past-President and Member: Executive Committee of the British Toxicology Society

Member: Scientific Committee, European Association of Poison Centres and Clinical Toxicologists

INTERNATIONAL JOURNALS

Review Editor: Clinical Toxicology

Editorial Board Chairman: Medicine

Editorial Board Member: Drugs

ADVISORY COMMITTEES

Chairman: Ministry of Defence Research Ethics Committee

Consultant: dstl Porton Down

Member: Expert Advisory Group on the Management of Casualties caused by Chemical Terrorism (Blain II)

UK ACADEMIC COMMITTEES

Joint Course Organiser: Clinical Pharmacology and Toxicology Module (Module 2) of the MSC (Toxicology), University of Birmingham

NPIS Cardiff

Professor PA Routledge

INTERNATIONAL ACTIVITIES

Associate Director: World Health Organization Clearing House for Chemical Incidents, Cardiff, Wales

INTERNATIONAL JOURNALS

Editorial Board Member: Adverse Reactions and Acute Poisoning Reviews

Editorial Board Member: Adverse Drug Reactions Bulletin

ADVISORY COMMITTEES

Chairman: UK Herbal Medicines Advisory Committee

Chairman: All-Wales Medicines Strategy Group

Consultant Advisor in Toxicology: to the Chief Medical Officer (Wales)

UK ACADEMIC ACTIVITIES

Council Member: British Pharmacological Society

External Advisory Board Member: Liverpool School of Biomedical Sciences

External Examiner in Medicine: University of Liverpool

Gold Medal Examiner in Medicine: University of London

Chairman: All-Wales Specialist Training Committee in Clinical Pharmacology

Course Director: Postgraduate Diploma/MSc Programmes in Medical Toxicology, Therapeutics and Occupational Health, Cardiff University

Medical Director: Yellow Card Centre (Wales)

Dr JP Thompson

INTERNATIONAL ACTIVITIES

Member: Advisory Board, Hong Kong Poisons Centre

INTERNATIONAL SOCIETIES

Chair: Human Toxicology Section of the British Toxicological Society

ADVISORY COMMITTEES

Chair: Appraisal Panel for Suspected Adverse Reactions to Veterinary Medicines

Member: Veterinary Products Committee

Royal College of Physicians representative: Royal College of Pathologists Specialist Advisory Committee for Toxicology

Member: Expert Advisory Group on the Management of Casualties caused by Chemical Terrorism (Blain II)

Member: Acute Exposure Guideline Levels Advisory Group, Health Protection Agency

UK ACADEMIC ACTIVITIES

Committee Member: Specialist Question Writing Group for Clinical Pharmacology and Therapeutics of the Royal College of Physicians

Course Coordinator: Certificate/Diploma/MSc in Medical Toxicology, Cardiff University

NPIS Edinburgh

Professor DN Bateman

INTERNATIONAL ACTIVITIES

Advisor: World Health Organization/International Programme on Chemical Safety

Member: International Advisory Committee IUTOX 2007 Montreal

INTERNATIONAL SOCIETIES

Board Member, Past-President and Scientific Committee Member: European Association of Poisons Centres and Clinical Toxicologists

INTERNATIONAL JOURNALS

Editor: European Journal of Clinical Pharmacology

Editorial Board Member: Human Toxicology UK

Senior Editorial Board Member: Clinical Toxicology

ADVISORY COMMITTEES

Member: Medicines and Healthcare products Regulatory Agency – Pharmacovigilance Expert Advisory Group

Member: Expert Advisory Group on the Management of Casualties caused by Chemical Terrorism (Blain II)

UK NHS NATIONAL COMMITTEES

Member: Scotland A Research Ethics Committee

Medical Director: Yellow Card Centre (Scotland)

Expert Toxicology Advisor: Scottish Executive

UK ACADEMIC ACTIVITIES

Member of Executive: British Toxicological Society

Member: British Pharmacology Society

Board Member: Joint Royal Colleges MRCP (Part 1) Examining Board

Board Member: Joint Royal Colleges MRCP (Part 1) Standard Setting Group

External Examiner: University of Newcastle upon Tyne

Mrs AM Good

INTERNATIONAL SOCIETIES

General Secretary: European Association of Poisons Centres and Clinical Toxicologists

Mr WJ Laing

UK NHS NATIONAL COMMITTEES

Working Group Member: Scottish Toxicology Interest Group

Dr HKR Thanacoody

UK ACADEMIC ACTIVITIES

Member: Question Writing Group: Joint Royal Colleges MRCP (Part 1) Examining Board

Member: Medicines and Healthcare products Regulatory Agency – Independent Scientific Advisory Committee

Dr WS Waring

INTERNATIONAL SOCIETIES

Secretary to the Organising Committee: European Association for Clinical Pharmacology and Therapeutics 2009 Meeting

INTERNATIONAL JOURNALS

Editorial Advisory Board Member: Recent Patents on Cardiovascular Drug Discovery

ADVISORY COMMITTEES

Clinical Advisor: Healthcare Commission

UK ACADEMIC ACTIVITIES

Examiner: MRCP Part 2 Clinical Examination (PACES)

Invited external PhD examiner: University of Cambridge

G(I)M Training Committee Member: Lister Postgraduate Institute South East of Scotland Deanery

Clinical Pharmacology and Therapeutics Representative: Medical and Radiology Education and Training Advisory Committee for South East of Scotland Deanery.

External Examiner: Certificate and Diploma in Clinical Pharmacology, Newcastle University.

Acute Medicine representative: Medicines Policies Committee, Lothian University Hospitals NHS Trust.

Royal College of Physicians representative: Specialist Advisory Committee in Toxicology, Royal College of Pathologists

NPIS Newcastle

Dr PR McElhatton

ADVISORY COMMITTEES

Member (as Reproductive Toxicology Expert): Advisory Committee on Pesticides *(to 2006)*

Member: Advisory Committee on Pesticides Medical Toxicology Panel *(to 2006)*

Specialist Advisor: National Collaborating Centre for Mental Health Guideline Development Group

Expert Member: Department of Health Advisory Committee on the Fetal Effects of Premature Alcohol Exposure

Professor SHL Thomas

INTERNATIONAL SOCIETIES

Board Member and Scientific Committee Chair: European Association of Poisons Centres and Clinical Toxicologists

Expert Panel Member: European Medicines Agency

INTERNATIONAL JOURNALS

Senior Editorial Board Member: Clinical Toxicology

Editorial Board Member: Pharmacoepidemiology and Drug Safety

International Editorial Board Member: British Journal of Clinical Pharmacology

ADVISORY COMMITTEES

Member: Medicines and Healthcare products Regulatory Agency – Pharmacovigilance Expert Advisory Group

Member: Technical Subcommittee, Advisory Council on the Misuse of Drugs

Member: Appraisal Committee A, National Institute for Health and Clinical Excellence

Member: Expert Advisory Group on the Management of Casualties caused by Chemical Terrorism (Blain II)

Ministry of Defence Research Ethics Committee

Ministry of Defence Advisory Group on Special Medical Countermeasures

UK NHS NATIONAL COMMITTEES

Director: Yellow Card Centre Northern and Yorkshire

Medical Director: Regional Drug and Therapeutics Centre, Newcastle

UK ACADEMIC ACTIVITIES

Examiner: MRCP Part 2 Clinical Examination (PACES)

Chair: Specialist Training Committee, Clinical Pharmacology and Therapeutics, Northern Deanery

Degree Programme Director: Certificate/Diploma in Therapeutics, Newcastle University

APPENDIX B

Publications by NPIS Staff in 2007/08

More than 130 contributions to the scientific literature were published in 2007/08 from the four NPIS units.

Peer-reviewed papers

Afshari R, Maxwell SR, Bateman DN. Hemodynamic effects of methadone and dihydrocodeine in overdose. Clin Toxicol 2007; 45: 763-772.

Baillie JK, Bates MG, Thompson AA, Waring WS, Partridge RW, Schnopp MF, Simpson A, Gulliver-Sloan F, Maxwell SR, Webb DJ. Endogenous urate production augments plasma antioxidant capacity in healthy lowland subjects exposed to high altitude. Chest 2007; 131: 1473–1478.

Bateman DN. Antidepressants. Medicine 2007; 35: 587–589.

Bateman DN. Antipsychotic drugs. Medicine 2007; 35: 594–595.

Bateman DN. Benzodiazepines. Medicine 2007; 35: 598.

Bateman DN. Carbon monoxide. Medicine 2007; 35: 604–605.

Bateman DN. Corrosives. Medicine 2007; 35: 609–611.

Bateman DN. Household products. Medicine 2007; 35: 620–621.

Bateman DN. Iron. Medicine 2007; 35: 624–625.

Bateman DN. Non-steroidal anti-inflammatory drugs. Medicine 2007; 35: 639.

Bateman DN. Opioids. Medicine 2007; 35: 640–642.

Bateman DN. Poisoning: focus on paracetamol. J Roy Coll Phys Edin 2007; 37: 332–334.

Bateman DN. The epidemiology of poisoning. Medicine 2007; 35: 537–539.

Bateman DN. EJCP and clinical toxicology: the first 40 years. Eur J Clin Pharmacol 2008; 64: 127–131.

Bateman DN. Need to know – poisoning. Pulse 2008; 28 February.

Bateman DN. New formulation of paraquat: a step forward but in the wrong direction? PloS Medicine 2008; 5: 0185–0186. Editorial.

Bateman DN, Eddleston M. Clinical pharmacology: the basics. The Foundation Years 2007; 3: 235–239.

Bird SB, Sutherland TD, Gresham C, Oakeshott J, Scott C, Eddleston M. OpdA, a bacterial organophosphorus hydrolase, prevents lethality in rats after poisoning with highly toxic organophosphorus pesticides. Toxicology 2008; 247: 88–92.

Blenkinsopp A, Wilkie P, Wang M, Routledge PA. Patient reporting of suspected adverse drug reactions: a review of published literature and international experience. Br J Clin Pharmacol 2007; 63:148–156.

Bradberry SM. Acetone. Medicine 2007; 35: 581.

Bradberry SM. Copper. Medicine 2007; 35: 608.

Bradberry SM. Mercury. Medicine 2007; 35: 632.

Bradberry SM. Methaemoglobinaemia. Medicine 2007; 35: 552–553.

Bradberry SM. Ricin. Medicine 2007; 35: 576–577.

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