

Estimating the prevalence and incidence of pesticide-related illness presented to General Practitioners in Great Britain

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London School of Hygiene and Tropical Medicine
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The aim of this study was to investigate the nature and extent of pesticide-related illness presenting to and diagnosed by General Practitioners (GPs). A screening checklist was completed by GPs for patients over the age of 18. Patients were classified as eligible for a detailed interview if: exposure was specifically mentioned by patients; there were serious acute symptoms; the patient had newly occurring flu type, respiratory, gastrointestinal, skin, eye or acute neurological symptoms and the GP thought that symptoms were not definitely not related to pesticide exposure.

Checklists were completed for 59320 patients from 43 practices and 1335 interviews were carried out. The annual prevalence and incidence of illness reported to GPs because of concern about pesticide exposure were 0.07% and 0.04% respectively (42 and 24 patients). The annual prevalence and incidence of consultations where symptoms were diagnosed by GPs as likely to be related to pesticide exposure were 0.01% and 0.003% respectively, with estimates of prevalence and incidence of symptoms possibly related to pesticide-related symptoms being 2.7% and 1.64%. Although small these estimates give relatively large number of consultations annually. Limited information on actual chemicals and active ingredients of pesticides restricted the study's ability to establish a definite causal relationship between pesticide exposure and symptoms.

There was widespread use of pesticides in the home environment but unsatisfactory use of product labels and precautionary measures, and storage and disposal of pesticides were also poor. Among the patients who were interviewed, the risk of patients being categorised by their GP as having symptoms possibly compared to unlikely to be related to pesticide exposure was associated with home use of pesticides and also with change of use of several other chemicals in the home in the week before the consultation.

The amount of data and the effort required to obtain it suggests that it would not be feasible to use the same methods more generally in GB for monitoring pesticide related illness reported and diagnosed in Primary Care.

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EXECUTIVE SUMMARY

Introduction

Pesticides are designed to destroy or control unwanted organisms and as such have the clear potential to cause toxic effects at sufficiently high exposure. Although they have been shown to have acute health effects, these usually occur as a result of accidental or deliberate abuse of pesticides. Existing systems in the UK that collect data on incident illness associated with exposure to pesticides focus on acute episodes of ill-health such as poisonings caused by either misuse or abuse. **Much less is known about the incidence of ill-health due to low-levels of pesticides and in the UK there is no current surveillance scheme within primary care.**

The aim of this study was to fill this gap in knowledge and in particular:

- To estimate the annual national incidence of illness presented to and diagnosed by GPs as pesticide related.
- To present the incidence data by health effects, exposure circumstances, pesticide type and pesticide function.
- To advise on whether the initial analysis suggests any associations between specific pesticide products and diseases, symptoms or syndromes.
- To make recommendations on the potential for, feasibility of, and practicalities of setting up permanent arrangements to collect data on pesticide related illness from this source.

Methodology

The study was carried out in general practices that are part of the General Practice Research Framework (GPRF), an organisation of almost 1100 general practices throughout the UK involved in epidemiological and health service research. Information about the study and an invitation to participate was sent to all GPs on the GPRF database. In each general practice a named GP was responsible for the project and the day to day management was undertaken by a named research practice nurse. Not all GPs in each practice participated. All GPs retained clinical responsibility for their patients.

Each participating GP completed a one page screening checklist for each patient aged 18 years or over who consulted during a surgery session. GPs were requested to try and do this for at least 2 sessions per week during a year of data collection, with sessions occurring on different days and in both mornings and afternoons to ensure representation of patient consulting patterns. The checklist was used to identify patients who attended because of concern about exposure to pesticides, with or without reporting symptoms, and those consulting with symptoms that were unusual for the patient and that, in the opinion of the GP were possibly related to pesticide exposure. The data from the checklists were entered into a suite of bespoke programs on laptop computers. An algorithm then selected patients who were eligible for an invitation to an in-depth interview with the research nurse. Patients were eligible to be invited for interview if:

- They attended because of concern about exposure
- They had serious acute symptoms and the GP did not think that these were definitely not the result of pesticide exposure

- They had flu type, respiratory, gastro-intestinal, skin, eye or neurological symptoms, which were unusual for the patient and that their GP thought were NOT definitely not related to pesticide exposure
- They had flu type, respiratory, gastro-intestinal, skin, eye, neurological or other symptoms which were not unusual for the patient but which the GP thought were likely or possibly related to pesticide exposure

The interview questionnaire consists of 5 major sections on:

- A) Occupational exposure, including applying and mixing pesticides
- B) Amateur use at home and in the garden
- C) Hobbies and leisure
- D) Other suspected exposure to pesticides
- E) Demographic, medical and miscellaneous information

All the questions focussed on exposures and events that occurred in the week before the symptoms appeared. Information on exposures at work, home and in other situations was collected, together with other information on non-pesticide exposures and confounders of potential relevance. Information was collected on use of pesticides in veterinary and human medicines as well as those controlled under the Pesticide Regulations.

Two pilot phases were carried out before the main study: a pre-pilot phase carried out in Northern Ireland to test the feasibility of the GP administered checklist; a pilot study in 9 practices in England and Wales to pilot both the use of the checklist and the interview questionnaire. Some changes were made for the main study to improve the accuracy of the responses and to ensure that questions could not be omitted inadvertently and to improve the clarity of some of the sections.

Ethical approval was obtained through one of the UK Multi-centre Research Ethics Committees (Wales) and research governance approval was obtained from all the relevant Primary Care Organisations.

Statistical methods included descriptive analyses together with univariable and multivariable logistic regression modelling to assess the association between risk factors and potential pesticide-related illness using robust standard error estimation to take account of clustering of patients within GP practices.

After data collection was completed a short follow-up questionnaire was sent to each participating GP to assess the ease with which they completed the checklist and to investigate the criteria they used to categorize the symptoms of each presenting patient as possibly or likely to be related to pesticide exposure. 86 GPs replied from 32 of the 43 practices. When deciding when to use the category 'possible', only one GP used only the criterion of pesticides being mentioned whereas 16 (18.6%) of the 'likely' category used this criterion alone. The possible category thus appears to have been chosen mainly on the basis of general consideration of symptoms and activities rather than specific discussion about pesticides.

Analyses were therefore carried out using the following definition of the likelihood of the symptoms being due to pesticide exposure:

High likelihood: (i) the patient reported exposure to pesticides and GP's opinion is NOT unlikely or definitely not related to pesticide exposure or (ii) the patient did not report exposure but the GP thought the symptoms were likely to be related to pesticide exposure

Medium likelihood: the patient did not specifically report exposure to pesticides but the GP thought that the symptoms could possibly be related to pesticide exposure

Low likelihood: the GP thought that the symptoms were unlikely to be or definitely not related to pesticide exposure

Results

Checklists were completed for 59320 patients from 43 practices in Great Britain (157 GPs and 7 nurse practitioners participated) and 1335 interviews were carried out. Key results from the study are:

Incidence and prevalence of illness reported to and diagnosed by GPs as pesticide related.

- An estimate of the annual prevalence of consultations because of concern by the patient about pesticide exposure is given by the proportion of all consultations by such patients, 0.07% (42/59320) (95% CI 0.05, 0.09).
- An estimate of the annual incidence of consultations because of concern by the patient about pesticide exposure is given by the proportion of all consultations by such patients who presented with symptoms that were unusual for them, 0.04% (24/59320) (95% CI 0.02, 0.06).
- GPs thought that very few patients had symptoms that were likely to be related to pesticide exposure (20 patients (0.03%); 13 of these also themselves reported exposure).
- GPs also thought that 1599 (2.7%, 95% CI 2.6, 2.8) patients had symptoms that were possibly related to pesticide exposure.
- Among patients who did not consult the GP directly because of their own concern about exposure to pesticides, the overall estimate of the annual prevalence of consultations (i.e. all those symptomatic) for which the GP thought the symptoms were likely to be related to pesticide exposure was 0.01% (7/59278) (95% CI 0.003, 0.02). Similarly the annual prevalence of consultations among such patients for which the GP though the symptoms were possibly related to pesticide exposure was 2.7% (1581/59278) (95% CI 2.5, 2.8).
- Among patients who did not consult the GP directly because of their own concern about exposure to pesticides, the estimates of annual incidence (i.e. newly occurring cases and excluding those whose symptoms were not unusual for the patient i.e. chronic) of consultations for which the GP thought the symptoms were likely or possibly related to pesticide exposure were 0.003% (2/59278) (95% CI 0, 0.008) and 1.6% (972/59278) (95% CI 1.5, 1.7) respectively.
- In 2001 approximately 221 million people aged 16 years or more are estimated to have consulted a GP. The estimate of an annual incidence of 0.04% for consultations made by patients because of concern about pesticides thus gives an annual estimate of 88400 consultations. The annual incidence of 0.003% for those patients not consulting because of concern about pesticide exposure but for whom the GP thought their symptoms were likely to be related to pesticide exposure gives an annual estimate of 6630 consultations.

Eligibility for interview

- 8% of the 59320 patients consulting were eligible for an invitation for interview

- Of the 4741 eligible patients 44% (2060 patients) refused to be interviewed. Of those who did not actively refuse (2681 patients), 50% agreed to an interview invitation and were interviewed (1335 patients).

Results from the interviews

- 60% of those interviewed had some kind of employment. In the week before their symptoms developed 37% of these employed patients reported occupational exposure to dust and fibres, 27% to disinfectants, 26% to cleaning fluids, 16% to gas and fumes, 11% to glues and epoxy resins, 14% to excessive heat and 13% to excessive noise.
- 92 patients (11% of the 806 who had an occupation) reported pesticide exposure during their occupation in the week before their symptoms developed, 38% of whom worked in agricultural jobs or jobs where pesticides might be expected to be used.
- The distribution of symptoms was similar between those patients who used pesticides occupationally, those who did not use pesticides occupationally and those patients who were not employed with the exception of flu-like symptoms where the proportions were 13%, 7.5% and 2.3% respectively. The small proportion of flu-like symptoms for those not in employment may reflect a high proportion of retired people who may have received a flu vaccination
- 10% of those using pesticides occupationally had neither arms nor legs covered during pesticide use.
- 41% (547) of interviewed patients had used at least one pest control chemical in and around their home in the week before their symptoms occurred (20.5% used 2 or more).
- The most common substances applied at home were insecticides (31%), herbicides (22%) other pesticides (mostly slug pellets) (17%) and veterinary and medicinal use pesticides (17.9%).
- Almost a third (32.9%) of the pesticides were applied at home with an aerosol or spray, 25.2% as a liquid and 20.6% as pellets or granules.
- Of the 547 home pesticide users 65.4% (358 patients) used no personal protective measures, although 284 (51.9%) reported that their arms and legs were covered during application.
- Sixty three percent of patients using pest control chemicals at home reported that they either followed the label exactly (44.6%) or used it as guidance (18.8%) to decide on the quantity of pesticide to use. Of those storing pesticides at home, the majority stored them in the kitchen and/or in the garage or shed.
- 61.5% reported that they never disposed of pesticides and 25.5% disposed of them in the household rubbish bin. Relatively few reported that they used a chemical waste disposal site (2.2%) or other waste disposal site (7.1%).
- Pesticide use in this study occupationally was higher during the autumn/winter season than the spring/summer season. Pesticide use at home in this study was lower in the autumn/winter season than the spring/summer season. However, in general in the UK pesticide use on crops occurs more often in spring and summer.
- 36 patients reported an additional incident potentially related to pesticide exposure, 11 of whom reported that they were exposed to spray drift.

- 359 (26.9%) of patients reported that they had suffered major stresses during the four weeks before their interview.

Relationship of symptoms to pesticide exposure

- Among patients who did not consult the GP because of their own concern about pesticide exposure 41% of those using home pesticides were classified by their GP at the initial consultation as having symptoms possibly related to pesticide exposure, compared to 27.7% of those who did not use home pesticides.
- The overall distribution of symptoms did not appear to differ between those using pesticides at home and those who did not use home pesticides in the week before their symptoms occurred.
- Of 322 patients who used only one type of pesticide at home in the week before their symptoms occurred there was a tendency for those only using herbicides to have more neurological and skin symptoms than those using other types of pesticides. However, neurological symptoms have been more often associated in other studies with exposure to insecticides and fumigants.
- Those using a pesticide in the home in the form of powder or pellet had fewer gastrointestinal problems than those using a spray or a liquid; those using powders had more skin problems; those using pellets (mainly for slugs) had more respiratory problems. Inhalation of metaldehyde, the active ingredient of many slug pellets may cause increased tracheobronchial secretions, although this is unlikely to have occurred from the use of solid form pellets.
- The distribution of symptoms was similar for area of residence (rural, suburban, urban) and for proximity to farmland.
- There was tendency for an increased occurrence of respiratory symptoms among home pesticide users who also changed brand, quantity or frequency of usage of other potentially hazardous chemicals at home, particularly disinfectants, turpentine, air freshener and toiletries, compared to the non home pesticide users who also changed the usage of the same chemicals.
- The risk of patients being classified as having medium likelihood (categorised by their GP at screening as having symptoms possibly related to pesticide exposure) compared to being classified as having low likelihood (categorised by their GP as unlikely to have or definitely not having symptoms related to pesticide exposure) of symptoms related to pesticide exposure was investigated in relation to other variables.
 - An increased risk was estimated for occupational and home use of pesticides, living over 1 km from farmland or railway line or over 100m from a landfill site, and change of use in the week before symptoms occurred of several chemicals hazards at home.
 - Multivariable analyses including each of the chemical hazards at home in turn showed that these exposures did not substantially confound the risk associated with home or occupational use of pesticides; the risk associated with changed use of paint, toiletries and white spirit remained significantly raised.
 - In a multivariable model including occupational and home use of pesticides, age, gender, proximity of farmland and area of living (urban, suburban, rural) the only significant increase was in association with home use of pesticides (OR = 1.91 (95 % CI 1.49 – 2.45)).

Discussion

The study achieved a good representation of both the GP practices and numbers of GPs in Great Britain, and also the patients consulting GPs over an average of a year. The practices were well spread geographically throughout GB between urban, suburban and rural areas and between different areas of deprivation, with a range of practice sizes. The distribution of symptoms in the study overall closely mirrors the general pattern of symptoms occurring at GP consultations within GB and the UK. The average number of surgeries held per week per practice at which data were collected was 2.4 over the study period. In the UK generally the average number of surgery sessions held weekly by GPs is about 8. The study thus included about 30% of the consulting workload of each participating GP.

50% of those who did not actively refuse an interview were interviewed. Information was obtained in the interview on the use of and contact with pesticides occupationally, at home and during leisure and other activities. Data on key non-pesticide exposures that could potentially contribute to the symptoms and other confounding variables were also collected.

Overall the results from this study suggest that the incidence of ill health presenting to and diagnosed in Primary Care as related to pesticides in GB is small relative to other types of ill health. There are no results from directly comparable studies, particularly for chronic health effects. In 2004, of 62 pesticide incidents which involved allegations of ill-health investigated by the Health and Safety Executive's Pesticides Incidents Appraisal Panel (PIAP) only 1 was confirmed and 14 thought likely to be linked to pesticide exposure. In 2005/2006 there were 169 hospital episodes of accidental poisoning by and exposure to pesticides, 93% of which were emergency admissions and 70% occurred to children under the age of 15 years. Although the prevalence and incidence estimates from our study are small the estimate of an annual incidence of 0.04% for consultations made by patients because of concern about pesticides could potentially give an annual estimate of 88400 consultations i.e. approximately 1700 per week for people aged 16 years or over. Similarly the annual incidence of 0.003% for those patients not consulting because of concern about pesticide exposure but for whom the GP thought their symptoms were likely to be related to pesticide exposure translates to an annual estimate of 6630 consultations i.e. about 128 per week for people aged 16 years or over. These estimates must be considered circumspectly because of uncertainties and assumptions made in this study. For example, we assume that an unusual symptom in our study refers to a newly occurring symptom and that if the symptom is not unusual for the patient it relates to a recurring chronic problem, e.g. asthma, chronic respiratory disease etc.

Very few patients had used pesticides during their occupation in the week before symptoms occurred. The high figure of over 40% of all those interviewed using home pesticides might have arisen partly as an artefact of the algorithm used to select patients as being eligible for an interview. For example, GPs may have discussed home use of pesticides when deciding to categorise the patient as having symptoms that were possibly related to pesticide exposure. However, this is unlikely since only half these patients reported use of pesticides at home during their interviews.

The high use of household pesticides in the UK has also been found in a survey of a sample of parents from the Avon Longitudinal Study of Parents and Children where 93% had used at least one pesticide product in the last year.

Limitations of the study include: the lack of a general random sample of patients due to the deliberate screening out of asymptomatic patients, those with ongoing chronic problems and those whose symptoms, in the opinion of the GP, were definitely not related to pesticide exposure; a high proportion (44%) of refusals of those invited for interview; limited information on actual chemicals and active ingredients of pesticides; no routine confirmation of exposure to pesticides through biological tests. The study was thus limited in its ability to define a definitive pesticide-related case of ill-health. However, other systems in the US and the UK also use some

element of self-reporting and expert judgement, particularly in defining a possible case. The establishment of a definite causal relationship from these systems, as in our study, would thus require careful consideration.

A clear outcome from the study is that it would not be feasible to use the same methods more generally in GB. The project required constant monitoring, and motivation and encouragement of the practices to obtain the numbers of checklists and interviews that were completed. Both the amount of data collected and the effort required to obtain it would be infeasible as part of a routine monitoring system. The importance of incorporating environmental health into primary care education and practice has been recognised in other countries such as the US. In the UK, a report in 2001 showed that none of the GP morbidity recording schemes routinely recorded occupation although it would be feasible to add procedures to obtain this information. It would theoretically be possible potentially to extend these systems to include collection of environmental exposures. However, consideration needs to be given as to what type and form this information should take and the utility of establishing links between this information and disease outcome data.

Conclusions

The results from this study suggest that the annual prevalence (0.07%) and incidence (0.04%) of consultations with GPs by people aged 18 years or over because of concern about pesticide exposure is small. Similarly for those people who did not consult the GP directly because of concern about exposure to pesticides the estimates of the annual prevalence and incidence of consultations where symptoms were diagnosed as likely to be related to pesticide exposure were also small (0.01% and 0.003% respectively). Estimates of prevalence and incidence of possible pesticide-related symptoms were 2.7% and 1.64% respectively. Although small these estimates translate to relatively large number of consultations annually. However, information on actual chemicals and active ingredients of pesticides was limited and there was no routine confirmation of exposure to pesticides through biological tests. The study was thus limited in its ability to establish a definite causal relationship between pesticide exposure and symptoms presented in Primary Care. There was widespread use of pesticides in the home environment but almost 40% of those using them in this study did not use the product label even as guidance, very few used personal precautionary measures and storage and disposal of pesticides was far from ideal. The risk of patients being classified as having medium likelihood of having symptoms related to pesticide exposure compared to those classified as having low likelihood of having symptoms related to pesticide exposure was associated with home use of pesticides and also with a change of use of several other chemicals in the home in the week before the consultation. A clear outcome from the study is that it would not be feasible to use the same methods more generally in GB for monitoring pesticide related illness reported and diagnosed in Primary Care

1 INTRODUCTION

Under the Food and Environment Protection Act (FEPA) 1985 a pesticide is defined as “any substance, preparation or organism prepared or used, among other uses, to protect plants or wood or other plant products from harmful creatures; or to render such creatures harmless”. Herbicides, fungicides, insecticides, rodenticides, soil-sterilants, wood preservatives and surface biocides, amongst others, are included within this definition (PSD/HSE, 2001). Such products typically consist of numerous ingredients, including the active ingredient(s), which provide the pesticidal activity, and a variety of other ingredients incorporated to enhance the activity, persistence and/or delivery of the active ingredient.

Information on accidental or deliberate misuse of pesticides can be obtained from the NHS Hospital Episode Statistics (<http://www.hesonline.nhs.uk>). In the financial year 2005-2006 there were 169 episodes of accidental poisoning by and exposure to pesticides; of these 97% were admitted as inpatients, 93% were emergency admissions, 54% were male, and 70% occurred to children under the age of 15 years. There were also 109 episodes of intentional self poisoning by and exposure to pesticides; of these 90% were admitted as inpatients, 88% were emergency admissions, 60% were male, and 84% were aged between 15 and 59 years. In addition there were 6 episodes due to assault by pesticides and 7 other poisonings by and exposure to pesticides with undetermined intent.

Pesticide users can be sub-divided into amateur, professional and industrial users. Published data on the frequency or magnitude of pesticide applications by amateurs is sparse. The use of pesticides is thus widespread and the concomitant risks depend on their toxicity, and duration and frequency, as well as level of exposure. Exposure may be incidental and may be almost continuous. This is true for workers and the general public, i.e. people who are considered as bystanders (ICPS, 2000).

Pesticides are designed to destroy or control unwanted organisms and as such have the clear potential to cause toxic effects at sufficiently high exposure. Although pesticides have undoubted acute health effects, these usually occur as a result of accidental or deliberate misuse. Pesticides, pesticide products and related chemicals have been found to have a wide range of health effects. These include: mutagenic substances, carcinogens or probable carcinogens, endocrine disrupters, reproductive toxic substances and neurotoxic substances, (IEH 1999; IEH 2000). The effect of low-level, long-term exposure has been of recent concern, with the OP pesticides as a group receiving a great deal of medical research interest, particularly with regard to their potential effects on farmers using sheep dips. A survey of people who had reported ill-health associated with veterinary medicines to the Veterinary Medicines Directorate found that chronic fatigue syndrome was common, and that higher chronic fatigue scores were associated with higher exposure to organophosphate pesticides (Tahmaz et al 2003). A recent paper summarises the general views held: acute exposure to high doses of an OP may be associated with some long-term adverse health effects; balance of evidence concerning chronic exposures to low levels of OPs does not support the existence of clinically significant neuropsychological effects, neuropsychiatric abnormalities or peripheral nerve dysfunction (Costa, 2006). However, a review of studies of more general pesticide exposed populations highlights several studies of moderate pesticide exposure associated with increased prevalence of neurotoxic symptoms and changes in neurobehavioural performance and suggests that studies with improved exposure assessment are needed together with consideration of the role of genetic susceptibility (Kamel & Hoppin, 2004).

Health surveillance and health screening form an integral part of any effective health care system. Surveillance is the ongoing, systematic collection, analysis, and interpretation of health

data essential to the planning, implementation, and evaluation of public health practice (Baker & Matte, 1999). To be effective, surveillance needs to be linked with preventive action, and in the case of occupational health, these actions should be directed not only at the individual or affected group, but also at the responsible workplace factors. There are no current GP surveillance schemes that identify an illness as possibly due to pesticide exposure. The Royal College of General Practitioners (RCGP) Weekly Return Service reports the number of new episodes of illness seen each week in 90 general practices. However, the presenting conditions, for example, rash, vomiting, neurological symptoms, rather than the possible causes are recorded. It is most well known for monitoring of influenza. The 60 practices contributing to the RCGP Fourth National Study which resulted in the 1991-1992 Morbidity Statistics from General Practice were asked to record an "external cause" code for injuries and poisoning but this was not always done and there are no data relevant to pesticide related illness (McCormick *et al.*, 1995). Similarly, the Department of Health Key Health Statistics from General Practice 1996, analysing data from the 288 general practices in England and Wales contributing to the General Practice Research Database (GPRD), does not report pesticide related illness (Office of National Statistics, 1998). Data on pesticide related illness would not be available even from a more detailed search of the GPRD.

None of these sources can relate their data to individual patients and could not therefore seek further information from the patients. A pilot monitoring system by the Pesticide Monitoring Unit of the National Poisons Information Service carried out in the West Midlands and Trent Regional Health Authorities using freepost 'green cards' completed by GPs reported about 1000 cases over 2 years, but only 17% of these were thought to be definitely or likely to be due to pesticide exposure, with nearly two thirds of these considered to be mild illness.

To monitor cases of pesticide-related illness and associated exposures dealt with by GPs requires the development of systems to prompt the GP to recognise and record relevant information and if appropriate for further information to be collected from the patient outside the initial consultation. This current study was therefore designed to fill the gap in knowledge concerning pesticide-related illness presenting in primary care and to assess the feasibility of setting up a system to monitor the incidence of this.

2. AIMS AND OBJECTIVES OF THE STUDY

The aims of the study were:

- To estimate the annual national incidence of illness diagnosed by GPs as pesticide related.
- To estimate the annual national incidence of illness presented to GPs by patients as pesticide related.
- To present the incidence data by health effects, exposure circumstances, pesticide type and pesticide function.
- To advise on whether the initial analysis suggests any associations between specific pesticide products and diseases, symptoms or syndromes.
- To make recommendations on the potential for, feasibility of, and practicalities of setting up permanent arrangements to collect data on pesticide related illness from this source.
- To disseminate the findings through presentation and publication.

3 METHODOLOGY

3.1 OVERVIEW OF THE STUDY DESIGN AND CONDUCT

The study was carried out initially by the MRC Institute for Environment and Health (IEH) and for the last year of the project by Imperial College London (ICL), in collaboration with the MRC General Practice Research Framework (GPRF) and with the London School of Hygiene & Tropical Medicine (LSHTM). Epidemiological, statistical and toxicological aspects of the study were carried out by IEH, ICL and LSHTM. The project fieldwork was conducted through the GPRF which is an organisation of almost 1100 general practices throughout the UK involved in epidemiological and health service research. The network covers over 9% of UK practices giving access to 12% of the population. The GPRF also provided a medical advisor and support to the practice nurses and GPs. In each general practice a named GP was responsible for the project and the day to day management was undertaken by a named research practice nurse. Not all GPs in each practice always participated in the study. All GPs retained clinical responsibility for their patients. The research team met regularly throughout the project and many meetings included the HSE project officer and other HSE staff who thus contributed to the overall study design and conduct.

The study was designed to last for at least a year in each participating practice so that data could be collected over all seasons to take account of the use of different pesticides throughout the year.

A more detailed description of the design of the research instruments is given in sections 3.2 and the pilot phases in section 3.3. Briefly, the study involved participating GPs identifying patients with a possible pesticide-related illness and/or reported exposure. These patients were then invited for an interview with a research nurse at which detailed information on pesticide use in occupational and home environments plus data on potential confounding and other related factors was collected.

A flow chart of the study procedure is given in Figure 1. GPs completed a brief checklist for all patients over 18 years consulting during a specified period. The checklist was used to identify patients who reported exposure to pesticides, with or without reporting symptoms, and those consulting with symptoms possibly related to exposure. At this stage patients were not informed about the study although throughout the duration of the study a notice was displayed in the surgery informing all patients that the practice is a member of the GPRF and that patients might be contacted about participation in research. The notice explained that patients had the right not to be involved or included and asked them to make the practice aware if this is their wish.

All the checklists were entered by a designated research nurse, employed by the practice, onto a suite of bespoke programs on laptop computers. The program assigned study numbers to all patients and identified those eligible for further investigation according to an agreed algorithm (see section 3.3). The practice research nurse then checked whether patients had asked not to be included in research, excluded those patients, and then provided information about the study to the remaining eligible patients and invited them to attend the surgery for a detailed interview about their symptoms and possible exposure to various environmental factors. Replies were entered onto the laptop and appointments made for those who respond that they were willing to attend for interview.

At the interview the nurse further explained the purpose of the study, obtained the consent of the patient and, for those who consented, a detailed questionnaire (see 3.2) was administered to further explore symptoms and possible exposure to pesticides. The data were collected directly onto dedicated laptop computers with the laptop positioned so that the patient could see the screen. The GP was informed if exposure to particular pesticides was suspected and the patient had consented for this information to be passed on.

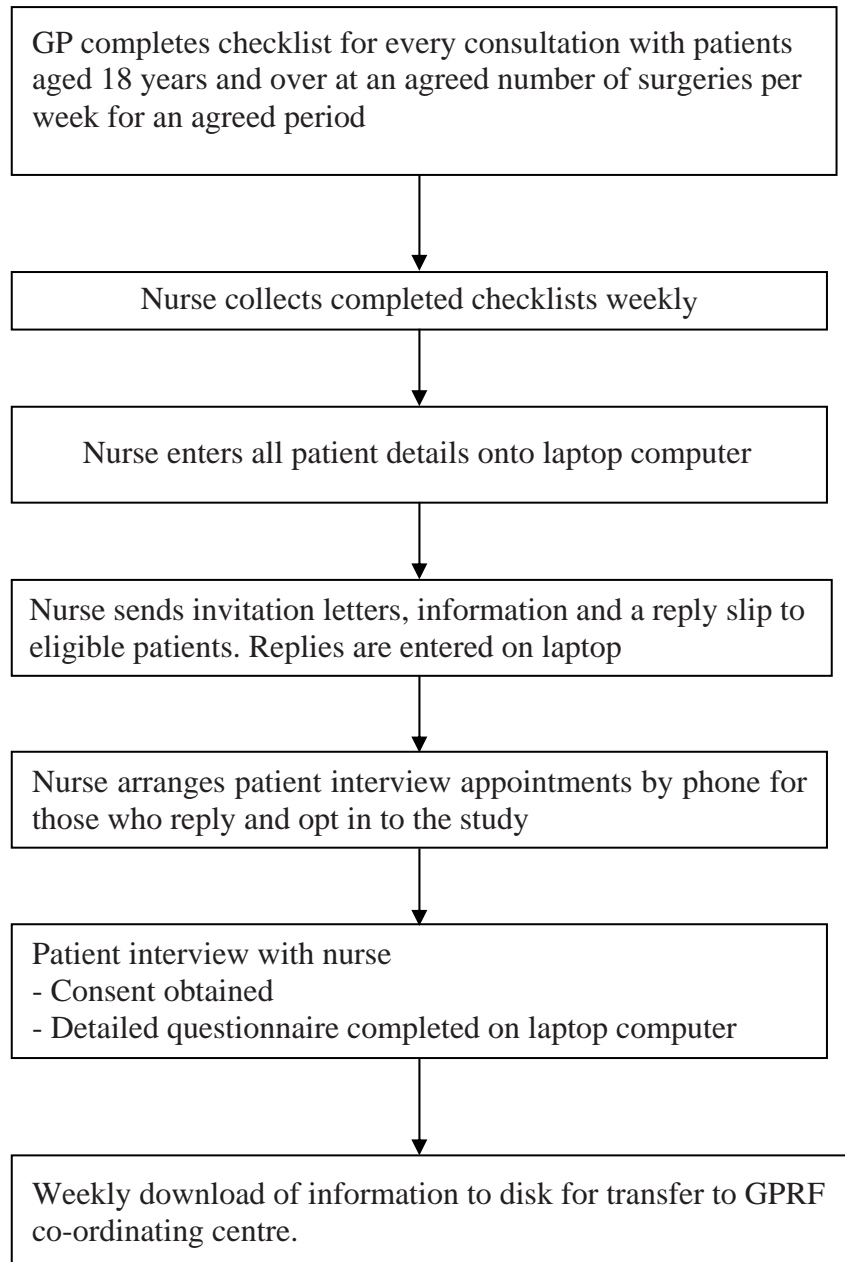


Figure 1 Flow chart of study procedures

3.2 DESIGN OF THE RESEARCH INSTRUMENTS

There are some existing measures to help GPs in the diagnosis and treatment of pesticide poisoning. For example, the Department of Health have produced a handbook that includes sections on those groups of pesticides that have appreciable acute toxicity and which are known from clinical experience to be responsible for cases of clinical poisoning. The handbook also covers briefly those veterinary medicines that contain active ingredients that are recognised as pesticides. However, it is unlikely that many GPs are familiar with the content of this handbook.

The project was concerned both with patients who consulted to report recent pesticide exposure, with or without current symptoms, and with patients who presented with symptoms that the GP considered could potentially be related to a (possible) recent pesticide exposure. All categories of pesticide users could consult, although it was thought that acute severe illness related to high exposure was likely to lead to presentation and treatment in secondary care.

There are several challenges in surveillance of pesticide related illness in general practice:

- The list of symptoms that could result from low-level exposure to pesticides is very long and encompasses many symptoms related to other factors/conditions which present commonly in general practice.
- Sensitive and specific biological tests to confirm exposure to most pesticides are not readily available. In addition, when tests are available their interpretation may be limited due to the impact of variable times since exposure on measured values. The patient may be unaware of exposure.
- GPs tend generally to treat symptoms and not to ascertain the cause of the symptoms.
- Most GPs, presented with a patient reporting such symptoms, in the absence of reported exposure to pesticides, do not routinely consider the possibility of pesticide exposure. Any surveillance system must therefore encourage the GP to consider further a possible relationship. This must be done without over-prompting leading to high proportions of patients being identified as having symptoms possibly related to pesticide exposure.

3.2.1 Checklist design

During the first 3 months of the study an in-depth investigation of appropriate literature was carried out to inform the development of the research instruments. There was considerable discussion at that stage as to the amount of information that it would be possible for a busy GP to collect during a routine appointment, how to identify symptoms that would be the focus of the study and how much detail to include in the interview questionnaire. The suggestion was that the initial screening checklist to identify patients to be interviewed would be administered over the telephone by the practice nurse.

During the second 3 months of the study there were a number of meetings and consultations with clinical toxicologists, directors of the UK Poisons Units, experts on pesticides, medical practitioners and the Advisory Committee on Pesticides (ACP) to discuss the study methodology and to consider the feasibility of using biological tests. It was decided to administer a screening checklist by the GP during a normal appointment. It was agreed that a pre-pilot phase should be undertaken to test this procedure, in order to gain some understanding of the numbers of eligible patients likely to be recruited – see section 3.3. Following the pre-pilot phase a few minor alterations were made to the checklist.

After consultation with a number of clinical toxicologists it was agreed that, in the absence of any other pathology, the following symptoms could possibly be attributable to recent exposure to pesticides:

- Serious and acute symptoms such as blurring of vision, vertigo, respiratory compromise

- any of the following acute symptoms or their combination particularly if, in the GP's view, they were unusual for that particular patient:
 - flu type
 - respiratory
 - gastrointestinal
 - skin
 - eye
 - neurological

It was also agreed that it would be important to record if a patient specifically mentioned exposure to pesticides and also to capture any acute symptoms, although it was recognised that most patients with acute symptoms would probably go to an accident and emergency department rather than their GP.

The final version of the checklist is shown in Appendix 1.

3.2.2 Interview questionnaire design

The questionnaire was developed with the advice of toxicologists and other experts on pesticides and review of previously used questionnaires. Customised software was developed by the GPRF co-ordinating centre that incorporated electronic data checking at the time of capture for plausibility, consistency and completeness.

The questionnaire consists of 5 major sections on:

- A) Occupational exposure, including applying and mixing pesticides
- B) Amateur use at home and in the garden
- C) Hobbies and leisure
- D) Other suspected exposure to pesticides
- E) Demographic, medical and miscellaneous information

A copy of the screens from the computerised interview is given in Appendix 2.

All the questions focussed on exposures and events that occurred in the week before the symptoms appeared. A series of exposure information at work, home and in other situations is collected, together with other information on non-pesticide exposures and potential confounders (A confounding factor one that is associated with the disease and differently distributed over various exposure groups). It should be noted that information has also been collected on use of pesticides in veterinary and human medicines e.g. head lice treatments, because the active ingredients contained in some pesticides controlled under the Pesticide Regulations may also be found in both of these and these may also use other chemicals that the general public might group under the common term 'pesticides'.

Section A collects information on pesticide exposure experienced during work, primarily from patients who are currently employed, but for those not in employment, information on exposure during voluntary work is collected. Details are asked about applying and mixing pesticides during work, including formulations, frequency and duration of potential exposure, substance(s) including chemical and/or brand name and use of personal protective.

Section B, use in the home and community, asks similar questions on the use and mixing of pesticides, and also includes questions on occurrences of professional pest control in the home and on the storage and disposal of pesticides at home.

Section C consists of four questions on hobbies and leisure activities during which exposure to hazardous materials or pesticides might have occurred.

Section D was designed to ensure that any pesticide-related incident, not already recorded under Section A to C was captured. In particular it was designed to include incidents such as accidental exposures from spray drift and incidents occurring in public places and near farmland.

Section E collects demographic and personal information on the patient. Some questions on the nature of symptoms, date of onset and duration are included together with questions on potential confounding and effect modifying factors such as other exposures at home and work, smoking and alcohol use, type of residence and residential area.

3.3 PILOT PHASES

3.3.1 Pre-pilot phase

Although Northern Ireland is not included in the main study it was agreed with the HSE that the pre-pilot phase to investigate the feasibility of a GP administered checklist could be carried out there as only one ethical approval application was required. The pre-pilot phase took place between March and June 2003 over about 6 weeks. The GPs in four practices in Northern Ireland completed a short form after every consultation session to enable us to gather information on practical aspects of the study. The GPs were enthusiastic and provided useful feedback on the format and administration of the forms. The pre-pilot phase was also useful for informing the criteria for recruitment into the study by providing us with a clearer idea of the proportion of patients consulting their GP with certain types of symptoms. 343 checklists were completed. Only one patient reported any exposure to pesticides. The pre-pilot phase enabled an algorithm to be developed for selecting patients who were then eligible for invitation for an interview for use in the pilot study.

3.3.2 Pilot study

Following the pre-pilot phase the checklist and interview questionnaire were finalised and ethical approval for both the pilot and the main study was submitted in July 2003 and received by September 2003 (see section 3.4). Ten practices were recruited for the pilot study and the local ethical approval committees were informed about the study. During the summer of 2003 the requirement to obtain research governance approval from the Primary Care Organisations (PCO) came into force and approval was received for 9 practices. The pilot study took place between January and July 2004, the 9 practices being spread throughout the UK (1 in Wales, 2 in the north, 2 in the north east, 2 in the south east and 2 in the south west). (PCO approval was not received for one recruited practice by the end of the pilot phase). The practices started at varying times depending on when research governance approval was received. 3902 checklists were completed in the 9 clinics, an average of 151.7 checklists per week carried out in 369 surgeries. For the pilot study we asked practices to complete as many checklists as they felt could and we were not prescriptive as to the number of surgeries per week in which the study should be carried out. This resulted in a wide range of rates of checklists per week.

The following algorithm for selecting patients for invitation for an interview was trialled during the pilot study:

- Patient reported exposure
- or
- Serious or acute symptoms with no obvious pathology
- or

- At least one of 6 specific symptoms when the symptom is unusual for that individual and GP report of exposure not definitely not.

3902 checklists were completed in the pilot study. Of these 234 (6%) were eligible for interview. Of those eligible, 80 (34%) refused to be interviewed, 61 (26%) were interviewed and 93 (40%) had not responded by the end of the pilot phase. Of the 234 eligible patients only 2 reported exposure to pesticides and both were thought likely by the GP to have symptoms likely to be related to pesticide exposure. However, the GPs thought that 76 (32.5%) had symptoms that were possibly related to pesticide exposure. In addition, there were 35 patients in the pilot study, who according to the GP had symptoms possibly related to pesticides exposure, who were not eligible for interview according to the criteria used for the pilot study, 32 of them because their symptoms were not unusual for them and 3 because they did not have any of the 6 specifically mentioned symptoms.

The mean age of the eligible and non-eligible patients was similar, 53 and 54 respectively. However, those who completed an interview were older on average (59.7 years) than the non responders (47.4 years) and refusals (54.6 years). More women (37) than men attended for interview (24).

During the pilot study there was some confusion about which part of the questionnaire to complete regarding occupation and the occupational section was incorrectly completed for several patients who had retired in several interviews. Several patients reported the use of at least one pesticide product during their occupation and 26 had used at least one pest control chemical at home (the majority reporting using it more than usual) during the week before their symptoms developed.

3.4 CHANGES TO THE DESIGN FOR THE MAIN STUDY FOLLOWING THE PILOT PHASES

Following the pilot study a number of alterations were made to both the checklist and the interview questionnaire to improve the accuracy of the responses, to ensure that questions could not be omitted inadvertently and to improve the clarity of some of the sections.

3.4.1 Checklist questionnaire

Because of the 35 patients who during the pilot study according to the GP had symptoms possibly related to pesticides exposure but were not eligible for interview (as described in 3.3.2), it was decided to expand the eligibility criteria for the main study so that a patient automatically became eligible for an interview if the GP thought that the patient's symptoms were likely or possibly related to pesticide exposure even if the symptoms were not one of the 6 specified ones or they were not unusual for the patient. On the basis of the pilot study it was estimated that this would potentially increase the eligibility rate by up to 1% (35/3902).

Gender was included in the revised checklist questionnaire.

3.4.2 Eligibility criteria

The algorithm developed for the pilot study was refined and patients were eligible to be invited for interview if:

- They reported exposure
- They had serious acute symptoms and the GP did not think that these were definitely not the result of pesticide exposure
- They had flu type, respiratory, gastro-intestinal, skin, eye or neurological symptoms, which were unusual for the patient and that their GP did not think were not definitely not the result of pesticide exposure

- They had flu type, respiratory, gastro-intestinal, skin, eye, neurological or other symptoms which were not unusual for the patient but which the GP thought were likely or possibly related to pesticide exposure

3.4.3 Interview questionnaire

Some of the sections in the interview questionnaire were identified during the pilot study as being unclear and amendments were made to improve these. This mainly involved minor changes to the wording of the instructions of some questions. The most important change concerned questions A1 – A3 at the beginning of the section that aims to capture data on occupation and occupational exposure to pesticides – see Appendix 2 for computer screens of the final questionnaire. In order to avoid the problem encountered in the pilot study when this section was incorrectly filled in for people who were not in employment, the section was redesigned. The instructions in the training manual were expanded to explain that occupation can be full or part time, can take place when someone is officially retired or is a student and that the home can also be the place of work. As described in section 3.2.2, the occupational questions were changed to ask whether someone is in paid or unpaid employment, what they do and how long they have been doing it.

It was also noted that some of the dates entered into the questionnaires were not feasible and thus rules were introduced into the computer based screening checklist and interview questionnaire programs to avoid this problem in the main study. A check on gender was also introduced into the interview questionnaire. Extra rules were also introduced in the questionnaire program to avoid unnecessarily ambiguous or missing answers for a number of questions that could be potentially important for the final analyses.

3.4.4 Recruitment of patients

In the pilot study, on average approximately 10 checklists were completed for each surgery session. To ensure a continuous flow of eligible patients for interview in the main study, as a starting point it was decided to ask the practice nurse in each participating practice to ensure that each full time GP completed checklists for a minimum of 2 sessions per week and each part time GP a minimum of 1 session per week.

About 40% of the eligible patients in the pilot study did not respond to the invitation to attend for interview. The wording of the invitation letter was therefore made more persuasive. The Chairman of the Ethics Committee was approached to obtain approval for sending reminder invitation letters to non-responders, a process that was not approved in the original ethical application. In the pilot study, respondents tended to be older retired patients and housewives. This indicated potential difficulties in contacting patients to arrange an interview appointment and/or problems in patients being able to attend during working hours. Permission was also obtained from the Chairman of the Ethics Committee to carry out the interview over the telephone.

It was important to ensure that duplicate interviews did not take place, for example, if a patient became eligible more than once because of a repeat visit to the practice but a different doctor completed another checklist. Nurses were thus instructed not to invite a patient more than once if the patient had consulted more than once within a short period of time for the same illness and more than one checklist had been completed. However, a consultation could be considered as a separate episode if there was a gap of at least two weeks between consultations and it was clearly for a new problem.

3.5 SELECTION AND RECRUITMENT OF GENERAL PRACTICES

Although the composition of the GPRF does not mirror that of UK general practices overall, there are sufficient practices of all types and in all areas to provide representative practice samples and to give the ability to gross up to give nationally representative results with

reference to demographic characteristics and agricultural practices. Of particular relevance to this project is that 14% of the practices are in areas classified by the Office of National Statistics as remote rural and 17% are in mixed urban/rural areas. Information about the study and an invitation to participate was sent to all GPs on the GPRF database initially. Following a positive response, agreement from all the practice partners was sought and one GP was named as the designated contact. Additional recruitment initiatives focussed on (i) for practical reasons, practices within Primary Care Trusts (PCT) for which research governance had already been approved and (ii) given the nature of the research, additional practices in rural and semi-rural areas.

3.6 NURSE TRAINING

At each participating practice, the GPRF research nurse, usually the practice nurse, was responsible for managing the study on a day-to-day basis. The nurses were generally trained centrally in a series of day training sessions. Each training session consisted of a series of short talks explaining the process of administering the checklists, entering these onto the laptop, registering those eligible for interview, inviting those eligible for interview, carrying out the interview, backing up of the data and transferring the data to the GPRF. This was followed by hands-on practice entering data into the interview questionnaire and carrying out an interview. The issue of obtaining accurate information on exposure during occupation or at home was highlighted. Nurses were reminded to enter checklists into the computer weekly and send invitations to eligible patients within a week. Nurses were also asked to contact patients who were willing to participate within a week of their reply. Reminder letters were also to be sent to eligible patients if they did not reply to the first invitation letter within 2 weeks.

During the project any back-up training or additional support was provided by the GPRF regional training nurses, 12 senior nurses based throughout England and Wales. These nurses were responsible for quality control during the study ensuring standardisation and checking that the practice was fulfilling all the requirements of research governance. The regional training nurses are managed by the senior nurse manager at the GPRF co-ordinating centre, who also provided general help and support to the practices throughout the study.

Practices were provided with all the stationery necessary for the study, including, checklists, patient information leaflets, invitation letters and envelopes and also a laptop for the study on which the interview program had been installed.

3.7 MONITORING DURING DATA COLLECTION

Constant contact was maintained with the individual practices throughout the data collection phase with regular phone calls, letters and newsletters. The flow of incoming data, both checklists and interview eligibility and completion rates, was monitored every two weeks. Data were also checked for inconsistencies. The research team met monthly to discuss the progress of the study and to ensure that practices were contacted appropriately to sort out problems and to maintain the flow of data.

The interview questionnaire was designed so that inaccurate or impossible responses and non-completion of questions were kept to a minimum. However, some problems with inconsistencies or impossible dates occurred which required development of special computer software to correct and/or contact with practices to correct individual data entries.

3.8 ETHICAL AND GOVERNANCE ISSUES

Ethical approval was obtained from the Northern Ireland Ethics Committee for the pre-pilot phase of the study and from the UK Multi-centre Research Ethics Committee (MREC) for the pilot and main study. Local Research Ethics Committees covering the places of residence of the possible patients were informed of the study. Copies of the patient invitation letter, information sheet and consent form are shown in Appendix 3.

During the summer of 2003 the requirement to obtain research governance approval from the Primary Care Organisations (PCO) came into force. This was a new requirement and was not incorporated into the original protocol. Unlike the process of obtaining ethical approval there was initially no standard procedure for obtaining research governance, with PCOs differing greatly in their requirements, for example, some only requiring a copy of the MREC documentation and others requiring completion of a lengthy complex form. It was also often difficult when the requirement was first introduced to discover who was responsible for this within each PCO. The major effort put into this process by the GPRF contributed to the setting up of a database containing details of contact points, PCO requirements and forms that is now available on the NHS website. A standard PCO approval form has now also been introduced. The necessity to obtain PCO approval added greatly to the work of the study and caused a major delay in the start of both the pilot and main study.

3.9 STATISTICAL METHODS

Statistical analyses were carried out using statistical software Stata version 9.2. The annual prevalence of patients reporting pesticide exposure to GP was estimated as the proportion of all consultations for which patients consulted because of concern about pesticide. For the estimation of annual incidence only patients whose symptoms were considered by the GP as unusual i.e. a new occurrence were included. The annual prevalence of consultations for which the GP thought the symptoms were likely or possibly related to pesticide exposure were calculated separately by taking the proportions of such consultations (omitting those where pesticide exposure was directly reported to the GP) of all consultations. Ninety five percent confidence intervals were estimated using the normal approximation.

Exploratory analyses were carried out using cross tabulations to assess the relationships between specific symptoms and syndromes and the type and nature of pesticides and/or pesticide products and other potential confounding variables and effect modifiers. Among others, exposure to harmful chemicals, area of living, activities of the individuals during the preceding week before their symptoms developed and the use of personal protective equipment were considered as potential confounders.

Univariable and multivariable logistic regression modelling, using robust standard error estimation to take account of clustering of patients within GP practices, was carried out to assess the effect of risk factors and/or confounders on the likelihood of pesticide related ill health occurring.

4 RESULTS FROM THE SCREENING CHECKLIST AND INTERVIEW RESPONSE

Key tables and results are presented in section 4, with additional tables being given in a separate supplement.

4.1 PARTICIPATING PRACTICES

A total of 43 practices participated in the study between November 2004 and July 2006. 157 GPs and 7 nurse practitioners from these practices participated (not all GPs in each practice participated). The practices began the study at different times depending on when they were recruited, when PCO approval had been obtained and completion of training. The mean number of weeks participating was 52.6 but this ranged from 3 weeks to 81 weeks. Several practices withdrew at various times during the data collection period. Reasons given for withdrawal included illness of the research nurse or GP, changes of GPs resulting in replacements being unwilling to participate and heavy practice workloads.

The practices were spread throughout the UK and a map indicating their locations is given in Appendix 4. Five practices were situated in industrial areas, 13 in cities or urban areas including outer London and metropolitan districts, 12 in mixed urban and rural areas including new towns and sea side resorts, and 13 were in rural areas. Fourteen of the practices were located in areas with a high (more deprived) Carstairs index score (>0.595), 19 in areas with a medium score (-1.998 to 0.594), and 10 in areas with a low score (more affluent) (< -1.998). The number of partners in the practices ranged from 1 to 8 or more, with practice sizes ranging from about 4000 patients to over 13000.

For each practice Table 1 gives the numbers of checklists completed, eligible patients, interviews completed and refusals. 59320 checklists were completed in the main study over 5446 GP surgery sessions. The rate of checklists per surgery session ranged between 5 and 22 but with the majority of practices being similar to the average 10.9 (Supplementary Table 1). Checklists were completed for 35381 females (59.6%) and 23939 males (40.4%).

4.2 ELIGIBILITY FOR INTERVIEW INVITATION

Table 1 shows that 4741 patients were identified by the algorithm described in section 3 as eligible for invitation for interview. The overall mean eligibility rate was 8% although this varied considerably between practices. 150 eligible patients were not invited for interview because the GP indicated that they should not be approached.

Of the 59320 patients for whom checklists were completed, the numbers who were eligible for interview according to the different eligibility criteria were:

Patient consulted because of exposure	42 (0.07%, 0.9% of all eligible)
Patient had serious acute symptoms that the GP did not think could not be the result of pesticide exposure	483 (0.8%, 10% of all eligible)
Patient had named symptoms, unusual for the patient that the GP did not think could not be the result of pesticide exposure	3547 (6%, 75% of all eligible)
Patient had symptoms the GP thought likely or possibly related to pesticide exposure	669 (1.13%, 14% of all eligible)

Exposure was reported by patients in 24 of the practices involved in the study (Supplementary Table 2).

4.3 RESPONSE TO INTERVIEW INVITATION

Table 1 also gives details of the response to the invitation to attend for interview. 1335 (28.2 % of those eligible and 49.8% of those who did not refuse) of the 4741 eligible patients completed the interview, 2060 (43.5 %) refused to be interviewed and 1346 (28.4 %) had not replied by the end of the study.

Supplementary Table 3 gives the age distribution of the participants by gender and by eligibility and response to an interview invitation. On average, non-responders and those who refused to be interviewed were younger than those who were not eligible and those who completed the interview. The mean ages of women and men who refused to be interviewed or did not respond were similar. However, the women who completed an interview were on average younger than the men who completed an interview. Slightly fewer men (91.3%) were not eligible for an interview than women (92.5%). Of those who were eligible (2072 men and 2669 women) slightly more men refused to be interviewed (44%) than women (43%) or did not respond (29.1% versus 27.8%).

Table 1 Eligibility for interview and interview completion

<i>Practice</i>	<i>Number of completed</i>		<i>Eligible for interview</i>		<i>Interviews completed</i>			<i>Refusal</i>	
	<i>checklist</i>	<i>number</i>	<i>number</i>	<i>%</i>	<i>number</i>	<i>% of those eligible</i>	<i>% of those not refusing</i>	<i>number</i>	<i>% of those eligible</i>
1	67	3	3	4.5	0	0	0	0	0
2	168	62	62	36.9	1	1.6	1.8	5	8.1
3	1,936	65	65	3.4	24	36.9	100.0	41	63.1
4	2,727	233	233	8.5	94	40.3	100.0	139	59.7
5	526	59	59	11.2	12	20.3	100.0	47	79.7
6	664	50	50	7.5	7	14.0	18.9	13	26.0
7	240	42	42	17.5	10	23.8	23.8	0	0.0
8	181	15	15	8.3	1	6.7	20.0	10	66.7
9	1,400	225	225	16.1	96	42.7	100.0	129	57.3
10	1,833	252	252	13.7	81	32.1	100.0	171	67.9
11	2,713	143	143	5.3	70	49.0	54.3	14	9.8
12	2,565	79	79	3.1	33	41.8	97.1	45	57.0
13	3,842	895	895	23.3	198	22.1	29.7	228	25.5
14	1,325	19	19	1.4	7	36.8	43.8	3	15.8
15	129	2	2	1.6	0	0.0	0.0	0	0.0
16	2,179	118	118	5.4	48	40.7	55.8	32	27.1
17	1,771	31	31	1.8	8	25.8	25.8	0	0.0
18	848	69	69	8.1	25	36.2	64.1	30	43.5
19	1,977	16	16	0.8	6	37.5	37.5	0	0.0
20	3,019	132	132	4.4	35	26.5	94.6	95	72.0
21	185	2	2	1.1	1	50.0	50.0	0	0.0
22	1,563	167	167	10.7	43	25.7	69.4	105	62.9
23	1,775	89	89	5.0	22	24.7	88.0	64	71.9
24	836	39	39	4.7	5	12.8	15.6	7	17.9
25	1,076	72	72	6.7	31	43.1	66.0	25	34.7
26	2,124	164	164	7.7	31	18.9	18.9	0	0.0
27	1,390	32	32	2.3	17	53.1	100.0	15	46.9
28	2,347	195	195	8.3	38	19.5	79.2	147	75.4
29	2,755	162	162	5.9	59	36.4	79.7	88	54.3
30	240	20	20	8.3	6	30.0	60.0	10	50.0
31	484	127	127	26.2	24	18.9	18.9	0	0.0
32	836	9	9	1.1	0	0.0	-	9	100.0
33	605	52	52	8.6	25	48.1	55.6	7	13.5
34	104	7	7	6.7	3	42.9	42.9	0	0.0
35	74	3	3	4.1	0	0.0	-	3	100.0
36	1,756	482	482	27.4	128	26.6	42.4	180	37.3
37	2,444	192	192	7.9	61	31.8	98.4	130	67.7
38	1,204	14	14	1.2	6	42.9	54.5	3	21.4
39	119	1	1	0.8	0	0.0	0.0	0	0.0
40	3,510	6	6	0.2	4	66.7	100.0	2	33.3
41	3,077	242	242	7.9	34	14.0	55.7	181	74.8
42	151	19	19	12.6	3	15.8	37.5	11	57.9
43	555	135	135	24.3	38	28.1	59.4	71	52.6
Overall	59,320	4741	4741	8.0	1335	28.2	49.8	2060	43.5

The distribution of symptoms of all 59320 patients is given in Table 2 according to their eligibility for interview status. About a quarter of all the patients were non symptomatic, i.e. visiting the GP for another reason. Of those that were eligible for an interview invitation about a quarter were visiting the GP for skin symptoms and a further quarter for respiratory symptoms. The proportion of patients with symptoms other than the six specified is much higher in the ineligible group than among patients who were eligible due mainly to the eligibility criteria.

Table 2 Symptoms of patients according to their eligibility status

<i>Symptoms</i>	<i>All patients</i>		<i>Not eligible for interview</i>		<i>Eligible for interview</i>	
	<i>No.</i>	<i>% of all symptoms</i>	<i>No.</i>	<i>% of all symptoms</i>	<i>No.</i>	<i>% of all symptoms</i>
<i>Neurological</i>	786	1.8	430	1.1	356	7.5
<i>Eye</i>	998	2.2	709	1.8	289	6.1
<i>Skin</i>	5460	12.2	4280	10.7	1180	24.9
<i>Gastrointestinal</i>	3881	8.7	3137	7.8	744	15.7
<i>Respiratory</i>	6002	13.4	4741	11.8	1261	26.6
<i>Flu-type</i>	928	2.1	663	1.7	265	5.6
<i>Multiple of above</i>	820	1.8	546	1.4	274	5.8
<i>Other than above</i>	25954	57.9	25583	63.8	371	7.8
		<i>% of all patients</i>		<i>% of all patients</i>		<i>% of all patients</i>
<i>Symptomatic</i>	44829	75.6	40089	73.4	4740	99.98
<i>Not symptomatic</i>	14491	24.4	14490	26.6	1	0.02
<i>Total</i>	59320		54579		4741	

The symptoms recorded on the checklist for the patients who were eligible for interview, according to their response to attend for interview, are given in Supplementary Table 4. The distributions of symptoms are similar in all three groups.

On each checklist GPs were asked to record their opinion of whether the patient's symptoms were likely, possible, unlikely to be or definitely not related to pesticide exposure. 20 patients overall were thought likely by the GP to have symptoms related to pesticide exposure. However, the GPs thought that 1599 (2.7% overall) had symptoms that were possibly related to pesticide exposure (33.7% of all eligible patients). 18557 patients (31.3% overall) were thought by the GP to have symptoms that were unlikely to be related to pesticide exposure (3120 (65.8%) of eligible patients).

Only 8 of the 20 patients whose symptoms were thought by the GP to be likely to be due to pesticide exposure were interviewed with a further 8 refusing. 29% of those in both the possible and unlikely categories were interviewed. The proportion on those refusing to be interviewed was higher in the unlikely category (47%) compared to those in the possible category (36%).

The symptoms of the 42 people who reported exposure to pesticides at their consultation were as follows: neurological 3; eye 2; skin 12 (1 acute); gastrointestinal 1; respiratory 12 (5 acute); flu type illness 2; multiple symptoms 7 (2 acute); not applicable 1; other 2.

The GP thought the symptoms were likely to be related to exposure to pesticides for 13 of these 42 patients and possibly related for a further 18.

4.4 INCIDENCE AND PREVALENCE OF SYMPTOMS RELATED TO PESTICIDE EXPOSURE

Table 3 gives the numbers of patients for whom checklists were completed by whether they were asymptomatic or symptomatic, whether their symptoms were unusual and by the GP's opinion as to the likelihood of the symptoms being related to pesticides.

Table 3 Numbers of patients by GP's opinion about symptoms

<i>Reason for Consultation</i>	<i>Symptoms</i>		<i>GP's opinion on likelihood of symptoms being pesticide-related</i>				
			<i>Likely</i>	<i>Possible</i>	<i>Unlikely</i>	<i>Definitely not</i>	<i>Total</i>
<i>Because of exposure</i>	<i>Asymptomatic</i>		0	0	0	0	1
	<i>Symptomatic</i>	<i>Not unusual</i>	2	4	6	1	13
		<i>Unusual</i>	10	11	3	0	24
		<i>Not known</i>	1	3	0	0	4
	<i>Total</i>	13	18	9	1	42	
<i>Exposure not reported</i>	<i>Asymptomatic</i>		0	0	0	0	14490
	<i>Symptomatic</i>	<i>Not unusual</i>	5	528	13451	20207	34191
		<i>Unusual</i>	2	972	4165	4020	9159
		<i>Not known</i>	0	81	932	425	1438
		<i>Total</i>	7	1581	18548	24652	59278
<i>Overall total</i>		20	1599	18557	24653	59320	

The average number of weeks for the study was 52.6 i.e. about a year. Estimates of annual incidence and prevalence can thus be derived from Table 3. For example, an estimate of the annual prevalence of consultations because of concern by the patient about pesticide exposure is given by the proportion of all consultations by such patients i.e. 0.07% (42/59320) (95% CI 0.049, 0.092). An estimate of the annual incidence (i.e. new cases) of consultations because of concern by the patient about pesticide exposure is given by the proportion of all consultations by such patients for whom symptoms were unusual i.e. newly occurring and not chronic i.e. 0.04% (24/59320) (95% CI 0.024, 0.057). For those people who did not consult the GP directly because of concern about exposure to pesticides, the overall estimate of the annual prevalence (i.e. all those symptomatic) of consultations made to GPs for which the GP thought the symptoms were likely to be related to pesticide exposure is extremely small, 0.01% (7/59278) (95% CI 0.003, 0.02), with a prevalence estimate of those with symptoms thought by the GP to be possibly related to pesticide exposure being 2.7% (1581/59278) (95% CI 2.54, 2.79). The comparable incidence estimates (ignoring those whose symptoms were not unusual for the patient i.e. chronic) are 0.003% (2/59278) (95% CI 0, 0.008) and 1.64% (972/59278) (95% CI 1.54, 1.74) respectively.

5 GP FOLLOW-UP QUESTIONNAIRE

After data collection was completed a short follow-up questionnaire was sent to each participating GP to assess the ease with which they completed the checklist and to investigate the criteria they used to categorize the symptoms of each presenting patient as possibly or likely to be related to pesticide exposure (Appendix 5). A good response was achieved with 86 GPs replying from 32 of the 43 practices. These practices submitted 38628 checklists, 65% of the total. It is thought that some of the non responding GPs may no longer work in the large practices. The majority of the practices from which we had no response were small practices with only one participating GP in the study. 74 of the GPs reported that they found the checklist easy and quick to complete, 9 reported that they found it difficult to complete and 3 did not complete this question.

Although we asked the GPs to tick only one box in the two questions investigating the criteria for categorizing likely or possible pesticide exposure, many ticked more than one. Table 4 gives the responses to these two questions.

Table 4 Basis of GP opinion concerning possible or likely pesticide-related symptoms

<i>Basis of decision</i>	<i>Doctor's opinion</i>	
	<i>Possibly</i>	<i>Likely</i>
<i>Symptoms only</i>	20	13
<i>Activities only</i>	10	9
<i>Combination of above two</i>	41	35
<i>Pesticide was mentioned regardless of symptoms and/or activities</i>	1	16
<i>Pesticide mentioned + symptoms</i>	1	1
<i>Pesticide mentioned + activities</i>	1	4
<i>Pesticide mentioned + combination</i>	8	2
<i>Other</i>	2	3
<i>No response*</i>	2	3
	86	86

* one GP did not respond to either question

When deciding when to use the category 'possible', only one GP used only the criterion of pesticides being mentioned whereas 16 (18.6%) of the 'likely' category used this criterion alone. The possible category thus appears to have been chosen mainly on the basis of consideration of symptoms and activities, although 11 (12.8%) of the GPs also used these in combination with a mention of pesticides. Pesticide exposure alone does not appear to have been part of the decision to use the category possible.

Analyses were therefore carried out using the following definition of the probability of the symptoms being due to pesticide exposure:

High likelihood: (i) the patient reported exposure to pesticides and GP's opinion is NOT unlikely or definitely not related to pesticide exposure or (ii) the patient did not report exposure but the GP thought the symptoms were likely to be related to pesticide exposure

Medium likelihood: the patient did not specifically report exposure to pesticides but the GP thought that the symptoms could possibly be related to pesticide exposure

Low likelihood: the GP thought that the symptoms were unlikely to be or definitely not related to pesticide exposure

Only 38 (0.06%) patients overall were classified in the High likelihood group and only 19 (1.4% of those interviewed) of these attended for interview. A further 1581 patients overall (2.7%)

were classified in the Medium likelihood group with 442 (33.1% of those interviewed) attending for interview. The remainder 97.3% overall and 65.5% of those interviewed were classified in the Low likelihood group. The percentages of males and females are similar in the Low likelihood and Medium likelihood categories. However, of the 25 (0.1%) men and 13 (0.04%) women who were classified as High likelihood only 10 (1.8% of those interviewed) men and 9 (1.2% of those interviewed) women agreed to be and were interviewed.

It appears from the follow-up questionnaire that the decision by the GPs to use the category 'possibly related to pesticide exposure' was often based on a discussion of both symptoms and activities, but less often included a discussion on specific pesticide exposure. Eligibility for invitation for an interview thus included some consideration of broad exposures. However, it was decided that comparisons between the possible and unlikely categories could be made with regard to many of the detailed responses in the interview questionnaire, particularly those addressing use of pesticides at work and in the home.

6 RESULTS FROM THE INTERVIEWS

6.1 OCCUPATION AND USE OF PESTICIDES

Occupations

Section A of the questionnaire focused on obtaining information on occupations and possible exposure to pesticides through their occupation – see Appendix 2. Patients were asked whether they were currently employed and if not whether they did voluntary work. They were then asked what they did and for how long they had been doing this. 60.4% (806) of interviewed patients reported having an occupation of some kind, and 92 of them reported some kind of pesticide exposure (2 of these patients mixed pesticides but did not apply them). The occupations of these 92 patients were grouped into three categories: ‘agricultural’, including farming, gardening, and horticulture; ‘non-agricultural pesticide use’ i.e. could potentially use pesticides in their occupation which was not an agricultural one; all other occupations (Table 5).

Table 5 Occupational grouping by gender among patients who used pesticides occupationally in the week before symptoms developed

<i>Occupation</i>	<i>Female number</i>	<i>%</i>	<i>Male number</i>	<i>%</i>	<i>Total number</i>	<i>%</i>
<i>Agriculture</i>	5	16.1	22	36.1	27	29.4
<i>Could use pesticide</i>	4	12.9	4	6.6	8	8.7
<i>Other occupations</i>	22	71.0	35	57.4	57	61.9
<i>All</i>	31	100	62	100	92	100

Almost the third of those who reported pesticide use through their occupation had a job that was classified as agricultural, with more among men (36%) than women (16%).

Occupational hazards

Patients were asked about whether they had had contact during their occupation with a range of hazards (question A4), how many days a week they typically came into contact with them and whether they had more use or contact with them than usual in the week before consultation. This information was collected to assess whether exposure to other work hazards might confound any apparent relationship between illness and pesticide exposure. Table 6 shows the reported use of these hazards, subdivided by whether the patient used pesticides or not as part of their occupation. Over a third of patients with an occupation reported exposure to dust and fibres, with over a quarter reporting exposure to disinfectants and cleaning fluids. Between 10 and 20% of patients reported exposure to solvents, glues and epoxy resins, gas and fumes, and excessive noise or heat. Forty six patients (5.7% of all patients with occupation) reported occupational contact with pest-control chemicals with 12 of them (25.5%) more use than usual. Nineteen (2.4% of all patients) had occupational contact with lawn-care chemicals with 5 of them (26.3%) reporting more use than usual. The only other hazard where more than quarter of the patients reported more use was excessive heat. Generally less than half of the 92 people who applied pesticides during their occupation reported exposure to other hazards with the exception of dust which was reported by about 60% of those who also used pest control chemicals (Supplementary Table 5).

Table 6 Contact with hazards at work in the week before symptoms developed

<i>Hazards</i>	<i>Number applying pesticides occupationally</i>	<i>Number not applying pesticides occupationally</i>	<i>Total numbers¹</i>	<i>% of 806 occupied</i>	<i>Number (% of users) using hazards more than usual in the week before symptoms occurred</i>	
<i>Solvents</i>	22	78	100	12.4	5	(5.0)
<i>Disinfectant</i>	40	181	221	27.4	14	(6.3)
<i>Degreaser</i>	23	55	78	9.7	5	(6.3)
<i>Acid</i>	11	28	39	4.8	3	(7.7)
<i>Cleaning fluid</i>	45	166	211	26.2	14	(6.6)
<i>Glue/epoxy</i>	11	76	87	10.8	6	(6.9)
<i>Lead/mercury</i>	10	15	25	3.1	4	(15.4)
<i>Dust/fibre</i>	57	240	297	36.8	31	(10.4)
<i>Gas/fume</i>	36	95	131	16.3	13	(9.9)
<i>Radiation</i>	3	17	20	2.5	3	(14.3)
<i>Pest control</i>	26	20	46	5.7	12	(25.5)
<i>Lawn care</i>	12	7	19	2.4	5	(26.3)
<i>Other poison</i>	13	15	28	3.5	4	(14.3)
<i>Excessive noise</i>	28	83	111	13.8	7	(6.3)
<i>Excessive heat</i>	17	84	103	12.8	28	(27.2)
<i>Vibration</i>	18	42	60	7.4	3	(4.9)

¹ Not all patients reported contact with hazardous materials but those who did could tick more than one hazard so the total will not sum to 806

Symptoms

Table 7 gives the distribution of symptoms for those who did and did not apply pesticides occupationally, together with the figures for interviewees who did not have an occupation. The distribution of symptoms is similar between the three groups with the exception of flu-like symptoms where the proportion is great for those who applied pesticides occupationally. The small proportion of flu-like symptoms for those not in employment may reflect a high proportion of retired people who may have received a flu vaccination. Supplementary table 5 shows the distribution of symptoms for exposure to each hazard given in question A4 (see Table 4 above), subdivided by application or not of pesticides during occupation. The interpretation of the distribution of symptoms is limited by small numbers for some exposures, but there is a general similarity between hazards and between the 2 groups defined by pesticide application.

Table 7 Distribution of symptoms by application of pesticides during occupation

<i>Symptoms</i>	<i>Does not apply pesticides occupationally</i> <i>Number (%)</i>	<i>Applies pesticides occupationally</i> <i>Number (%)</i>	<i>No occupation</i> <i>Number (%)</i>	<i>Total</i> <i>Number (%)</i>
<i>Neurological</i>	46 (6.4)	8 (8.9)	48 (9.1)	102 (7.6)
<i>Eye</i>	49 (6.8)	4 (4.4)	39 (7.4)	92 (6.9)
<i>Skin</i>	179 (25.0)	23 (25.6)	124 (23.4)	326 (24.4)
<i>Gastrointestinal</i>	94 (13.1)	9 (10.0)	78 (14.7)	181 (13.6)
<i>Respiratory</i>	176 (24.6)	23 (25.6)	162 (30.6)	361 (27.0)
<i>Flu-like</i>	54 (7.5)	12 (13.3)	12 (2.3)	78 (5.8)
<i>Multiple</i>	52 (7.3)	4 (4.4)	30 (5.7)	86 (6.4)
<i>Other</i>	66 (9.2)	7 (7.8)	36 (6.8)	109 (8.2)
<i>Total</i>	716 (100)	90 (100)	529 (100)	1335 (100)

Ninety patients had applied at least one pest control chemical during their work in the week before consultation, 59 men (10.6% of all men interviewed) and 31 women (4% of all women interviewed). The majority had applied only 1 pesticide but 32 patients (35.6%) (23 (39%) men, 9 (29%) women) had applied 2 or more (Table 8).

Application of pesticides during occupation

Table 8 Number of pest control chemicals used occupationally

<i>No. of pesticide used</i>	<i>No. of patients</i>	<i>% of users</i>
<i>1</i>	58	64.4
<i>2</i>	15	16.7
<i>3</i>	7	7.8
<i>4</i>	7	7.8
<i>5</i>	3	3.3
<i>Total</i>	90	100

The types of pest control chemicals reported were categorised into those regulated under the Pesticide Regulations (herbicides, insecticides, fungicides, rodenticides, wood treatments, other) and pesticides that were regulated for veterinary or medicinal use. The occupational use of these different categories is given in Table 9. The table gives the number of patients who ticked the pest control chemicals given in question A5. The most frequently used pest control chemicals were herbicides, wood treatments, and veterinary and medicinal pesticides.

Table 9 Type of pesticides used occupationally

<i>Pesticide</i>	<i>Number</i>	<i>% of user</i>
<i>Herbicides</i>	20	22.2
<i>Insecticides</i>	17	18.9
<i>Fungicide</i>	18	20.0
<i>Rodenticide</i>	12	13.3
<i>Wood treatment</i>	22	24.4
<i>Other</i>	9	10.0
<i>Veterinary or medicinal use</i>	26	28.9
<i>Total</i>	124*	

*Some patients reported the use of more than one type

In question A6 we asked the name and formulation of pest control chemical used. The formulations patients used for the different pest control chemicals, coded from the names given and categorised using the same categories as in Table 9 are given in Table 10. The most frequently used pest control chemicals were herbicides, insecticides and veterinary and medicinal pesticides. Almost half were in liquid form and a quarter was aerosols and sprays.

Table 10 Formulation by type of pesticide used occupationally

<i>Pesticide*</i>	<i>Formulation</i>							<i>Total number (%)</i>
	<i>Aerosol or spray</i>	<i>Liquid</i>	<i>Gas</i>	<i>Powder</i>	<i>Wax/block</i>	<i>Pellets or granule</i>	<i>Other</i>	
<i>Herbicide</i>	6	16	0	1	0	2	0	25 (22.7%)
<i>Insecticide</i>	13	9	0	3	0	0	1	26 (23.6%)
<i>Fungicide</i>	2	4	1	3	0	0	1	11 (10%)
<i>Rodenticide</i>	0	0	0	1	0	7	2	10 (9.1%)
<i>Other</i>	0	0	0	0	0	3	1	4 (3.6%)
<i>Wood treatment</i>	2	10	0	0	0	0	0	12 (10.9%)
<i>Veterinary or medicinal use</i>	3	11	0	0	1	0	7	22 (20%)
<i>All</i>	26 (23.6%)	50 (45.5%)	1 (0.9%)	8 (7.3%)	1 (0.9%)	12 (10.9%)	12 (10.9%)	110** (100%)

* Type of pesticide was derived from the specific names patients reported

** A patient might have reported more than one name and formulation within the same type of pesticide

Table 11 shows that a wide range of application methods were used, with a hand held sprayer or pouring a liquid being most common, either on their own or together with other methods. The other methods included using a brush, dropper, cream, drench or drenching gun and oral dosing.

Thirty four people did not use any protective equipment (Table 12). Wearing gloves (fabric/leather or chemical), boots or normal work overalls were most often used. Other methods included 14 reports of other types of gloves including latex and rubber gloves.

Table 11 Number of patients using different application methods

<i>Application methods</i>	<i>Number of patients</i>
<i>Other method</i>	28
<i>Pouring liquid</i>	22
<i>Dipping animals</i>	2
<i>Powder duster</i>	2
<i>Distribute tablets</i>	12
<i>Injection</i>	1
<i>Seed treatment</i>	2
<i>Antifouling treatment</i>	1
<i>Wood treatment</i>	5
<i>Bait trap</i>	7
<i>Fogger</i>	2
<i>Hand held sprayer</i>	38
<i>Backpack sprayer</i>	9
<i>Tractor</i>	4

Table 12 Protective equipment used

<i>Protective equipment</i>	<i>Number of patients</i>
<i>None</i>	34
<i>Disposable respirator</i>	6
<i>Reusable respirator</i>	4
<i>Air-fed hood/visor</i>	2
<i>Fabric/leather gloves</i>	16
<i>Normal work overall</i>	20
<i>Chemical protective gloves</i>	14
<i>Chemical protective overall</i>	6
<i>Face shield</i>	11
<i>Hood</i>	3
<i>Rubber boots</i>	14
<i>Rubber apron</i>	1
<i>Other</i>	22

Fifty five patients reported that their arms and legs were covered during application with a further 18 reporting that only their legs were covered and 3 reporting that only their arms were covered.

Table 13 shows the distribution of patients belonging to different likelihood categories of having pesticide-related symptoms, using the classification derived from the checklists, according to whether pesticides were applied occupationally.

Table 13 Occupationally applied pest control chemicals by likelihood of having pesticide related symptoms

<i>Likelihood of pesticide related</i>	<i>Did not apply pesticides occupationally</i>		<i>Applied pesticides occupationally</i>		<i>Total</i>
	<i>number</i>	<i>%</i>	<i>number</i>	<i>%</i>	
<i>Low likelihood</i>	457	63.8	51	56.7	508
<i>Medium likelihood</i>	253	35.3	33	36.7	286
<i>High likelihood</i>	6	0.8	6	6.7	12
<i>Total in occupation</i>	716		90		806

Six of those who applied pesticides as part of their occupation were classified as havin a high likelihood of being exposed to pesticides (6.7% of all who reported occupational pest control use) compared with 0.8% of those who did not use pesticides occupationally.

Mixing of pesticides during occupation

Fourteen patients reported mixing at least 1 pesticide as part of their occupation in the week before consultation, 2 of whom were not involved in the application. The majority mixed only 1 pesticide. Eight of these patients did not use any protective equipment. Other pesticide-related activities that patients reported as part of their occupation in the week before consultation, included maintenance and cleaning of equipment used to mix or apply pesticides (15 patients), handling or cleaning clothes contaminated with pesticides (14 patients) and transporting pesticides (6 patients). None of the patients were involved in manufacturing or formulating pesticides. Fourteen patients reported that they were licensed pesticide applicators.

Eighty six patients (10.7% of 806 with an occupation) stated that colleagues had reported similar symptoms around the same time of the consultation; only 7 of these 86 patients had occupationally applied or mixed pest-control chemicals.

6.2 CONTACT WITH PESTICIDES IN HOME AND COMMUNITY ENVIRONMENTS

Location

Of the 1335 patients interviewed, 323 (24.2%) lived in urban areas, 489 (36.6%) in suburban areas and 523 (39.2%) lived in rural areas. This reflects the areas in which the practices were located (see Appendix 4). The distance of patients from farmland, chemical plant, landfill site, heavy traffic and/or a railway line is given in Supplementary Table 6. Very few patients reported living near a chemical plant or landfill site, although a large proportion responded that they did not know. 58.5% of patients lived less than 1 km from farmland reflecting the high proportion of rural and suburban areas of residence. However, the same proportion reported living within 1km of heavy traffic.

Use of potentially hazardous substances in the home

Patients were asked about the use of some chemicals and other materials in their home, e.g. various cleaning materials, paint, etc (Question B5, Appendix 2), and whether, in the week before consultation, they had changed their normal use i.e. had used them more frequently, in larger quantities or had used a different brand (Supplementary Table 7). The majority of patients, approximately 90% or more, did not report any changes in use. However, the most common changes were use of a different brand or more frequent use than normal.

Professional pesticide treatment in the home

Twenty four patients reported that there had been some professional pest control or timber treatment in or around their home in the week before consultation. The treatments were for weeds and vegetation problems (6), woodworm (2), mice or rats (3), insects (4), mould (2) and 7 others, including replacing floor and ceiling timbers, timber treatment and use of creosote. The formulations of the professionally used pest control treatments were liquid (6), spray (8), granules or pellets (6), aerosol (1), dust/powder (1), wax block (1), and 3 did not know. Seventeen treatments were applied outside and 18 indoors.

Pesticide use by patients in the home

547 (41% of those interviewed) patients had used at least one pest control chemical in and around their home during the week before consultation (table 14) with similar rates for men and women.

Table 14 Pest control chemicals used at home in the week before consultation

<i>Number of pesticides</i>	<i>Men</i>		<i>Women</i>		<i>All patients</i>	
	<i>number</i>	<i>%</i>	<i>Number</i>	<i>%</i>	<i>number</i>	<i>%</i>
<i>0</i>	314	56.3	474	61.0	788	59.0
<i>1</i>	112	20.1	162	20.9	274	20.5
<i>2</i>	59	10.6	87	11.2	146	10.9
<i>3</i>	29	5.2	32	4.1	61	4.6
<i>4</i>	26	4.7	16	2.1	42	3.2
<i>5</i>	9	1.6	5	0.6	14	1.1
<i>6</i>	4	0.7	1	0.1	5	0.4
<i>7</i>	3	0.5	0	0.0	3	0.2
<i>9</i>	1	0.2	0	0	1	0.07
<i>10</i>	1	0.2	0	0	1	0.07
Total	558	100	777	100	1335	100

Table 15 gives the number of patients who used different type of pest control and whether it had been applied more than usual. The most frequently used pest control chemicals were slug and snail pellets and weed killer, followed by aphid and greenfly killer, tick and flea control, wasp and fly killer, and ant and cockroach killer. For all but three of these chemicals over half the patients reported that they had used it more than usual.

Table 15 Pest control chemical use at home

<i>Pest-control chemical</i>	<i>Number of patients</i>	<i>% of users</i>	<i>Reported more use</i>	<i>%</i>
<i>Weed killer</i>	131	23.9	74	56.5
<i>Kill root/nettles etc</i>	60	11.0	32	53.3
<i>Kill aphids/greenfly etc</i>	89	16.3	47	52.8
<i>Kill wasp/fly</i>	78	14.3	43	55.1
<i>Kill ant/cockroach etc</i>	80	14.6	57	71.3
<i>Fungicidal paint</i>	7	1.3	5	71.4
<i>Mould/mildew treatment</i>	48	8.8	30	62.5
<i>Tick/flea control</i>	98	17.9	44	44.9
<i>Head lice treatment</i>	17	3.1	11	64.7
<i>Insect repellent</i>	35	6.4	20	57.1
<i>Other animal repellent</i>	12	2.2	9	75.0
<i>Rat/mouse poison</i>	30	5.5	16	53.3
<i>Slug/snail pellets</i>	149	27.2	81	54.4
<i>Creosol/cuprinol</i>	57	10.4	42	73.7
<i>Dry rot treatment</i>	2	0.4	2	100.0
<i>Kill algae/lichen/moss</i>	15	2.7	7	46.7
<i>Intestinal worm treatment</i>	55	10.1	22	40.0
<i>Other</i>	22	4.0	15	68.2

These chemicals were further grouped in a similar way to those in the occupational section i.e. those regulated under the Pesticide Regulations (herbicides, insecticides, fungicides, rodenticides, other), wood treatments and pesticides that were regulated for veterinary or medicinal use (Supplementary Table 8). More than half the pesticides used at home were herbicides or insecticides with other pesticides (mainly slug pellets) and veterinary or medicinal pesticides also being widely used (Table 16). Almost a third were applied as an aerosol or spray, a quarter of them as liquid and 21% were formulated as pellet.

Table 16 Formulation by type of pest control used at home

<i>Pesticide*</i>	<i>Formulation</i>							<i>Total Number (%)</i>
	<i>Aerosol or spray</i>	<i>Liquid</i>	<i>Gas</i>	<i>Powder</i>	<i>Wax/block</i>	<i>Pellets or granules</i>	<i>Other</i>	
<i>Herbicide</i>	97	51	22	0	2	15	3	190 (22.0)
<i>Insecticide</i>	136	50	59	5	2	3	9	264 (30.5)
<i>Fungicide</i>	30	8	3	0	0	0	1	42 (4.9)
<i>Rodenticide</i>	0	0	1	0	2	13	1	17 (2.0)
<i>Wood treatments</i>	0	51	0	1	1	0	1	54 (6.2)
<i>Other</i>	0	3	1	0	0	139	0	143 (16.5)
<i>Veterinary or medicinal use</i>	22	55	6	2	0	8	62	155 (17.9)
<i>All</i>	285 (32.9)	218 (25.2)	92 (10.6)	8 (0.9)	7 (0.8)	178 (20.6)	77 (8.9)	865** (100)

* Type of pesticide was derived from the specific names patients reported ** A patient might have reported the same type of pesticide more than once

Pesticide mixing by patients in the home

Fewer patients (111) reported mixing pest-control chemicals at home than applying them (Table 17), although the frequency was higher in men than women.

Table 17 Pest control chemicals mixed at home in the week before symptoms occurred

<i>Number of pesticides</i>	<i>Men</i>		<i>Women</i>		<i>All patients</i>	
	<i>Number</i>	<i>% users</i>	<i>Number</i>	<i>% users</i>	<i>Number</i>	<i>% users</i>
<i>0</i>	175	71.7	261	86.1	436	79.7
<i>1</i>	55	22.5	37	12.2	92	16.8
<i>2</i>	12	4.9	4	1.3	16	2.9
<i>3</i>	2	0.8	1	0.3	3	0.6
<i>Total</i>	244	100	303	100	547	100

Use of protective measures

Of the 547 home pesticide users 65.4 % (358) used no personal protective equipment when applying the chemicals. However, 124 (22.7%) used rubber gloves, either alone or with other measures, 32 (5.9%) used fabric or leather gloves and 19 (3.5%) used rubber boots. Over half (284 (51.9%)) reported that their arms and legs were covered when applying chemicals, with a further 136 (24.9%) covering their legs only. 86 (15.7%) had neither arms nor legs covered.

Sixty three percent of patients using pest control chemicals at home reported that they either followed the label exactly (44.6%, 244 patients) or used it as guidance (18.8%, 103 patients) to decide on the quantity of pesticide to use, and a further 38% (210 patients) used their previous experience. 207 patients (15.5%) said they did not store pesticides at home. Of those who did, the majority stored them in the kitchen and/or in the garage or shed.

61.5% reported that they never disposed of pesticides and 25.5% disposed of them in the household rubbish bin. Relatively few reported that they used a chemical waste disposal site (2.2%) or other waste disposal site (7.1%).

Use by and symptoms of other people in the vicinity of the home

Although most patients reported that they were not aware of use of pesticides in their home or gardens by other people e.g. family members, neighbours or a local authority within 50m of their home, 95 patients (7.1% of all those interviewed) reported use within all 3 categories, 67 (5%) reported use by neighbours and 39 (2.9%) reported use by a local authority. This highlights the awareness of the patients to these issues but does not indicate that the event actually occurred.

106 patients reported that someone else in the household had developed similar symptoms to themselves, although only 39 of these patients reported use of pest control chemicals in the home.

Symptoms and use of pesticides at home

Table 18 gives the likelihood of having a pesticide related symptom derived from the checklist by whether pesticides were applied in the home. A higher proportion of those who were classified as having symptoms that had a high or medium likelihood of being related to pesticide exposure had applied pesticides at home in the week before consultation (233 patients (42.7%)) compared to those who had not applied pesticides at home (228 patients (29.0%)).

Table 18 Pest control chemicals applied at home by likelihood of having pesticides related symptoms

<i>Pesticide related</i>	<i>Did not apply pesticides</i>		<i>Applied pesticides</i>		<i>All</i>
	<i>Number</i>	<i>Column %</i>	<i>Number</i>	<i>Column %</i>	
<i>Low likelihood</i>	560	71.1	314	57.4	874
<i>Medium likelihood</i>	218	27.7	224	41.0	442
<i>High likelihood</i>	10	1.3	9	1.7	19
<i>Total interviewed</i>	788	100	547	100	1335

Of the 547 patients who used pesticides at home in the week before their symptoms developed, 322 (58.9% of all home pesticide users) used only one type of pesticide while 225 (41.1%) used two or more types. The symptoms these patients developed by category of pesticide, including multiple use, are shown in Table 19. In this table both the column percentages i.e. for each symptom the percentage in each category of pesticide use, and the row percentages i.e. for each pesticide the percentage of each symptom, are given.

The symptoms of those patients who did not report pesticide use at home during the week previous to their visit to the GP are also shown in the table. The proportions of patients showing eye, skin, gastrointestinal or respiratory symptoms are almost identical for patients who used or did not use pesticides at home. A slightly smaller proportion of the non users had neurological and a slightly higher proportion of them had multiple symptoms. However, almost twice as many of non users (7.2%) visited their GP because of flu symptoms compared with users (3.8%).

An examination of the column percentages shows that for every symptom the highest category of pesticide type was use of multiple pesticides (33% to 59%), followed, generally, by use of herbicides, insecticides and veterinary and medicinal pesticides. Using the row percentages the most common symptoms overall were skin (24.9%) and respiratory symptoms (26.0%) (row: total all users). Those using only a herbicide developed mainly neurological, skin and respiratory symptoms, 15.6%, 31.1% and 26.7% respectively. The majority of those using only insecticides had skin, gastrointestinal and respiratory symptoms (21.7%, 15.7% and 26.5% respectively). However, in other studies neurological symptoms have been associated most often with exposure to insecticides (Kamel & Hoppin 2004).

A similar table showing the distribution of symptoms by type of pest control chemical in patients who used the chemical either on its own or in combination with other pest control chemicals is given in Supplementary Table 9.

Table 19 Symptoms by type of pesticide used

Pest control type	Symptoms												Total Number (% All Users)															
	Neurological		Eye		Skin		Gastrointestinal		Respiratory		Flu-like			Other		Multiple symptoms												
	% All Users (Col %)	Row %	% All Users (Col %)	Row %	% All Users (Col %)	Row %	% All Users (Col %)	Row %	% All Users (Col %)	Row %	% All Users (Col %)	Row %		% All Users (Col %)	Row %	% All Users (Col %)	Row %											
Multiple use	23	41.8	10.2	23	59.0	10.2	60	44.1	26.7	26	36.1	11.6	52	36.6	23.1	10	47.6	4.4	21	40.4	9.3	10	33.3	4.4	225	(41.1)		
herbicide*	7	12.7	15.6	3	7.7	6.7	14	10.3	31.1	5	6.9	11.1	12	8.5	26.7	1	4.8	2.2	3	5.8	6.7	0	0.0	0.0	45	(8.2)		
insecticide*	7	12.7	8.4	6	15.4	7.2	18	13.2	21.7	13	18.1	15.7	22	15.5	26.5	3	14.3	3.6	6	11.5	7.2	8	26.7	9.6	83	(15.2)		
fungicide*	2	3.6	7.4	2	5.1	7.4	7	5.1	25.9	4	5.6	14.8	5	3.5	18.5	1	4.8	3.7	5	9.6	18.5	1	3.3	3.7	27	(4.9)		
rodenticide*	1	1.8	14.3	1	2.6	14.3	2	1.5	28.6	0	0.0	0.0	1	0.7	14.3	1	4.8	14.3	1	1.9	14.3	0	0.0	0.0	7	(1.3)		
Wood treatment.*	3	5.5	13.0	0	0.0	0.0	6	4.4	26.1	5	6.9	21.7	8	5.6	34.8	0	0.0	0.0	0	0.0	0.0	0	0.0	1	3.3	4.3	23	(4.2)
other* Veterinary or medicinal*	5	9.1	12.2	1	2.6	2.4	9	6.6	22.0	5	6.9	12.2	14	9.9	34.1	0	0.0	0.0	5	9.6	12.2	2	6.7	4.9	41	(7.5)		
7	12.7	7.3	3	7.7	3.1	20.8	14	14.7	20.8	14	19.4	14.6	28	19.7	29.2	5	23.8	5.2	11	21.2	11.5	8	26.7	8.3	96	(17.6)		
All users	55	100	10.1	39	100	7.1	136	100	24.9	72	100	13.2	142	100	26.0	21	100	3.8	21	100	9.5	30	100	5.5	547	(100)		
Non users	47	-	6.0	53	-	6.7	190	-	24.1	109	-	13.8	219	-	27.8	57	-	7.2	57	-	7.2	56	-	7.1	788			

*The only type of pest control chemical used

** Row % gives for each pest control measure, the % for each symptom

There were 305 patients who used one type of pesticide formulation only at home in the week 11 before their symptoms occurred (Table 20). The most frequent formulations used were a spray (122 patients, 40.0% of single formulation users) or liquid (99 patients, 32.5% of single formulation users). Those using powder or pellets had fewer gastrointestinal symptoms than those using sprays or liquids. However, those using a powder had a higher proportion of skin problems and pellet users had more respiratory problems. A similar table showing the symptoms by formulation of the pesticides, where combinations of formulations could occur is given in Supplementary Table 10.

Table 20 Symptoms by formulation of pesticide used at home

<i>Symptoms</i>	<i>Formulation</i>								<i>Total No.</i>
	<i>Spray*</i>		<i>Liquid*</i>		<i>Powder*</i>		<i>Pellet*</i>		
	<i>No.</i>	<i>%**</i>	<i>No.</i>	<i>%**</i>	<i>No.</i>	<i>%**</i>	<i>No.</i>	<i>%**</i>	
<i>Other</i>	13	10.7	5	5.1	0	0.0	8	14.3	26
<i>Neurological</i>	16	13.1	12	12.1	3	10.7	7	12.5	38
<i>Eye</i>	6	4.9	6	6.1	4	14.3	1	1.8	17
<i>Skin</i>	29	23.8	22	22.2	9	32.1	13	23.2	73
<i>Gastrointestinal</i>	20	16.4	16	16.2	3	10.7	5	8.9	44
<i>Respiratory</i>	30	24.6	28	28.3	6	21.4	18	32.1	82
<i>Flu-type</i>	2	1.6	5	5.1	1	3.6	2	3.6	10
<i>Multiple</i>	6	4.9	5	5.1	2	7.1	2	3.6	15
<i>All</i>	122	100	99	100	28	100	56	100	305

*The only formulation used, **% of All

The distribution of symptoms among patients living in different residential areas (urban, suburban, rural) is also similar, including those who used or did not use pesticide at home the week before their visit to the GP (Table 21). There are, however, slightly more patients with skin symptoms among those who live in urban areas and slightly fewer patients with skin symptoms who live in rural areas and also used pesticides at home. Similarly, the distribution of symptoms by proximity to a farmland was very similar among patients who used or did not use pest control chemicals during the previous week they visited their GP (Supplementary Table 11).

Table 21 Symptoms by their place of residence and by pesticide use at home

<i>Symptoms</i>	<i>Did not use pesticide at home</i>						<i>Used pesticide at home</i>					
	<i>Place of residence</i>			<i>Place of residence</i>			<i>Place of residence</i>			<i>Place of residence</i>		
	<i>Urban</i>	<i>Suburban</i>	<i>Rural</i>	<i>Urban</i>	<i>Suburban</i>	<i>Rural</i>	<i>Urban</i>	<i>Suburban</i>	<i>Rural</i>	<i>Urban</i>	<i>Suburban</i>	<i>Rural</i>
<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>	
<i>Other</i>	21	11.7	18	5.5	18	6.4	17	11.9	14	8.7	21	8.6
<i>Neurological</i>	5	2.8	20	6.1	22	7.9	17	11.9	8	5.0	30	12.3
<i>Eye</i>	8	4.4	24	7.3	21	7.5	10	7.0	12	7.5	17	7.0
<i>Skin</i>	46	25.6	85	25.9	59	21.1	43	30.1	44	27.3	49	20.2
<i>Gastrointestinal</i>	24	13.3	51	15.5	34	12.1	14	9.8	19	11.8	39	16.0
<i>Respiratory</i>	52	28.9	88	26.8	79	28.2	31	21.7	46	28.6	65	26.7
<i>Flu-type</i>	12	6.7	18	5.5	27	9.6	3	2.1	7	4.3	11	4.5
<i>Multiple</i>	12	6.7	24	7.3	20	7.1	8	5.6	11	6.8	11	4.5
<i>All</i>	180	100	328	100	280	100	143	100	161	100	243	100

Table 22 gives the distribution of symptoms among patients who reported a change in use of potentially hazardous substances at home by whether they used pesticides at home or not. Although the number of patients who reported some sort of change in use of hazardous materials is small there is a tendency for an increased proportion of respiratory symptoms among patients who also used pesticides. In particular, use of pesticides at home, together with use of disinfectants, cleaning materials, turpentine, air freshener, toiletries, stain remover, furniture renovation materials, oil or grease and insulation material give an increased proportion of respiratory symptoms. Many of these would be volatile substances or in the form of sprays or aerosols.

Table 22 Symptoms by change in use of hazardous chemicals at home among pesticide users and non users

<i>Symptoms</i>	<i>Did not use pesticide at home</i>											
	<i>Laundry detergents</i>				<i>Disinfectant</i>				<i>Hazardous chemical use</i>			
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>Cleaning materials</i>	<i>Turpentine</i>	<i>Polish</i>	<i>Air freshener</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
<i>Other</i>	4	7.0	3	5.5	5	9.4	10	17.5	4	10.0	7	9.6
<i>Neurological</i>	2	3.5	4	7.3	2	3.8	2	3.5	3	7.5	3	4.1
<i>Eye</i>	4	7.0	3	5.5	1	1.9	4	7.0	2	5.0	4	5.5
<i>Skin</i>	18	31.6	12	21.8	15	28.3	14	24.6	17	42.5	13	17.8
<i>Gastrointestinal</i>	9	15.8	9	16.4	10	18.9	10	17.5	7	17.5	12	16.4
<i>Respiratory</i>	12	21.1	13	23.6	12	22.6	10	17.5	8	20.0	18	24.7
<i>Flu-type</i>	4	7.0	4	7.3	2	3.8	3	5.3	2	5.0	8	11.0
<i>Multiple</i>	4	7.0	7	12.7	6	11.3	4	7.0	2	5.0	8	11.0
<i>All</i>	57	100	55	100	53	100	57	100	40	100	73	100
<i>Used pesticide at home</i>												
<i>Other</i>	6	9.7	7	13.5	7	12.1	9	14.5	4	12.1	4	6.3
<i>Neurological</i>	6	9.7	5	9.6	2	3.4	3	4.8	2	6.1	3	4.7
<i>Eye</i>	5	8.1	2	3.8	3	5.2	2	3.2	1	3.0	3	4.7
<i>Skin</i>	14	22.6	9	17.3	9	15.5	16	25.8	13	39.4	14	21.9
<i>Gastrointestinal</i>	8	12.9	9	17.3	14	24.1	8	12.9	4	12.1	10	15.6
<i>Respiratory</i>	13	21.0	16	30.8	15	25.9	17	27.4	6	18.2	20	31.3
<i>Flu-type</i>	3	4.8	2	3.8	5	8.6	2	3.2	1	3.0	4	6.3
<i>Multiple</i>	7	11.3	2	3.8	3	5.2	5	8.1	2	6.1	6	9.4
<i>All</i>	62	100	52	100	58	100	62	100	33	100	64	100

Table 22 (Continued) Symptoms by change in use of hazardous chemicals at home among pesticide users and non users

<i>Did not use pesticide at home</i>												
<i>Symptoms</i>	<i>Paint</i>		<i>Toiletries</i>		<i>Stain remover</i>		<i>Furniture renovation</i>		<i>Oil or grease</i>		<i>Insulation or lagging materials</i>	
	N ^o	%	N ^o	%	N ^o	%	N ^o	%	N ^o	%	N ^o	%
<i>Other</i>	9	13.2	6	11.8	4	15.4	4	14.8	2	11.1	5	15.2
<i>Neurological</i>	3	4.4	1	2.0	2	7.7	2	7.4	2	11.1	1	3.0
<i>Eye</i>	3	4.4	5	9.8	3	11.5	2	7.4	2	11.1	2	6.1
<i>Skin</i>	16	23.5	19	37.3	5	19.2	4	14.8	2	11.1	6	18.2
<i>Gastrointestinal</i>	10	14.7	5	9.8	5	19.2	3	11.1	4	22.2	6	18.2
<i>Respiratory</i>	15	22.1	7	13.7	2	7.7	8	29.6	3	16.7	9	27.3
<i>Flu-type</i>	8	11.8	5	9.8	2	7.7	2	7.4	2	11.1	2	6.1
<i>Multiple</i>	4	5.9	3	5.9	3	11.5	2	7.4	1	5.6	2	6.1
<i>All</i>	68	100	51	100	26	100	27	100	18	100	33	100
<i>Used pesticide at home</i>												
<i>Other</i>	13	16.3	6	9.7	4	15.4	3	14.3	1	5.3	2	5.3
<i>Neurological</i>	3	3.8	6	9.7	1	3.8	2	9.5	0	0.0	3	7.9
<i>Eye</i>	4	5.0	5	8.1	1	3.8	1	4.8	1	5.3	1	2.6
<i>Skin</i>	22	27.5	14	22.6	7	26.9	2	9.5	4	21.1	12	31.6
<i>Gastrointestinal</i>	9	11.3	8	12.9	6	23.1	3	14.3	4	21.1	5	13.2
<i>Respiratory</i>	19	23.8	13	21.0	5	19.2	8	38.1	5	26.3	12	31.6
<i>Flu-type</i>	3	3.8	3	4.8	1	3.8	1	4.8	2	10.5	2	5.3
<i>Multiple</i>	7	8.8	7	11.3	1	3.8	1	4.8	2	10.5	1	2.6
<i>All</i>	80	100	62	100	26	100	21	100	19	100	38	100

6.3 CONTACT WITH PEST CONTROL CHEMICALS THROUGH HOBBIES AND LEISURE ACTIVITIES

The third section of the questionnaire (section C) addressed hobbies and leisure activities. Patients were asked what hobbies they undertook and also whether they had contact with a range of materials through their hobbies or leisure activities (Table 23). A very large number of hobbies and other activities were recorded with most patients reporting more than one activity. Sports activities, walking (including dog walking), cycling, use of computers and many other indoor pursuits were mentioned. 355 patients (26.6% of those interviewed) reported gardening among their hobbies.

Table 23 Chemicals contacted through hobbies and leisure activities in the week before symptoms occurred

<i>Chemical</i>	<i>Contact reported</i>		<i>More than usual</i>	
	<i>number</i>	<i>% of interviewed</i>	<i>number</i>	<i>%</i>
<i>Solvents</i>	58	4.3	17	29.3
<i>Disinfectants</i>	91	6.8	10	11.0
<i>Degreasers</i>	36	2.7	7	19.4
<i>Acids</i>	12	0.9	5	41.7
<i>Other cleaning agents</i>	83	6.2	13	15.7
<i>Glues or epoxies</i>	83	6.2	23	27.7
<i>Lead or mercury</i>	9	0.7	2	22.2
<i>Dust or fibres</i>	166	12.4	41	24.7
<i>Paints</i>	92	6.9	41	44.6
<i>Solder</i>	18	1.4	5	27.8
<i>Engine oil</i>	50	3.8	18	36.0
<i>Other</i>	50	3.8	14	28.0

Almost 13% of the patients reported that they had had contact with dust or fibres through hobbies the week before their symptoms developed, and over 5% had contact with paints, cleaning agents, glues and/or disinfectant. Between 11% and 45% of those who reported contact with chemicals reported that they had come into contact with them more than usual that week.

Patients were also asked about participation in certain activities during the week before symptoms developed in which pesticide exposure could potentially have occurred. Table 24 gives the responses, together with the relationship between symptoms and these activities.

Table 24 Participation in activities and the reported effect on symptoms

	<i>Patients</i>				<i>Symptoms</i>			
	<i>number</i>	<i>% interviewed</i>	<i>started</i>		<i>got worse</i>		<i>not related</i>	
			<i>number</i>	<i>%</i>	<i>number</i>	<i>%</i>	<i>number</i>	<i>%</i>
<i>Walking in the countryside</i>	566	42.4	21	3.7	36	6.4	356	62.9
<i>Aeroplane flight abroad</i>	97	7.3	14	14.4	11	11.3	47	48.5
<i>Swimming in lake or river</i>	38	2.9	5	13.2	2	5.3	21	55.3
<i>Visiting public park</i>	393	29.4	7	1.8	8	2.0	274	69.7
<i>Playing golf</i>	62	4.6	2	3.2	3	4.8	37	59.7
<i>Visiting sports field</i>	133	10.0	3	2.3	5	3.8	85	63.9
<i>Visiting farm</i>	207	15.5	13	6.3	5	2.4	116	56.0

The most common activity undertaken was walking in the countryside but only 3.7% of those participating in this activity reported that their symptoms started then and 6.4% said they got

worse. Almost one third of those interviewed had visited a public park but the majority (69.7%) reported that their symptoms were not related to this.

In addition, patients were asked whether they could think of any other activity that might have been related to their symptoms. 301 patients reported an activity or made a comment about what they thought might have caused or contributed to their symptoms. Many comments confirmed the lack of a suspected association by the patient with pesticides. For example, effects of heat and sunburn, stress related activities, eating suspect food. However, some activities would have potentially involved exposure to pesticides, e.g. dipping sheep, using treated wood, lambing, handling animals, gardening.

6.4 OTHER INCIDENTS POTENTIALLY RELATED TO PESTICIDE EXPOSURE

This section was included to capture any other incident of exposure to pest-control chemicals that the patient might recall and that was neither occupational nor did it occur in their home environment. Only 36 patients reported such an incident, 11 occurrences in a field or farmland or garden, 6 at home (handling contaminated clothing), 4 at another place of occupation, 1 in a public area and 14 other locations. The latter included occurrences of spraying at work e.g. carpets, by the council, abroad, at a vet, whilst driving past farmland, in other people's houses. 18 patients reported that the incident occurred indoors and 18 outdoors. Sixteen people reported that they had entered into or touched the affected area, 11 that they were exposed to spray drift, 6 had handled contaminated clothing, 6 were applying the pest control chemical and 4 were mixing the chemical. 18 patients reported breathing in the chemical, 14 had skin contact and 4 had eye contact. Most (29, 80.6%) were not wearing any protective equipment at the time of the incident.

Seven of the 36 patients reported that they washed their hands within 10 minutes of the incident occurring, three between 10 and 30 minutes, 3 between 30 and 60 minutes, 8 between 1 and 4 hours, 5 after more than 4 hours and 10 did not remember. One of the patients had a shower within 30 min of the incident occurring, 7 had one between 1 and 4 hours after the incident, 16 after more than 4 hours and 12 did not remember.

18 patients did not provide or did not know the name of the product involved in the incident and in general the name provided was often generic e.g. weed killer, flea treatment.

6.5 OTHER INFORMATION ABOUT THE PATIENT

The ethnicity of the patients was an optional question. However, all the patients answered this question. 1321 (98.95%) of those interviewed described themselves as white, with only 5 black participants, 3 Asian, 3 Chinese and 3 mixed.

523 patients said they visited the GP because of new symptoms occurring, 567 because of existing symptoms worsening, 181 because of both and 64 for other reasons. The time elapsed between consultation and the interview varied. On average patients were interviewed 35 days after visiting their GP (minimum 4 and maximum 276 days, with a median of 29 days and inter-quartile range of 21 - 42 days). By the time of the interview 360 patients said their symptoms had disappeared, 607 patients said they had improved, 292 patients thought they were the same and 76 patients said their symptoms had worsened since they visited the GP. Table 25 shows the responses regarding changes in symptoms at work, home and at the weekends. The majority of patients had not noticed any change in their symptoms relating to these occasions, although there was a tendency for symptoms to improve at home and get worse at work.

Table 25 Changes in symptoms related to work, home and at weekends

	<i>Reported symptoms change</i>					
	<i>at work</i>		<i>at home</i>		<i>at weekends</i>	
	<i>number</i>	<i>%</i>	<i>number</i>	<i>%</i>	<i>number</i>	<i>%</i>
<i>Better</i>	68	5.1	196	14.7	155	11.6
<i>Worse</i>	129	9.7	108	8.1	78	5.8
<i>No change</i>	945	70.8	996	74.6	1057	79.2
<i>No response</i>	193	14.5	35	2.6	45	3.4
<i>Total</i>	1335	100	1335	100	1335	100

At interview, patients were asked the date when the onset or worsening of their symptoms occurred. 115 patients reported that they consulted their GP the same day as their symptoms started, 1119 patients reported that their symptoms started before their consultation, 61 reported that their symptoms worsened after their consultation and 40 patients did not remember. Among those who reported that their symptoms started before their consultation 762 patients reported an onset date earlier than 7 days before their visit to the GP.

Patients were asked if they had come into contact with any food, beverages or other substance to which they were sensitive or caused them to have an allergic reaction. The majority of patients reported no such contact (1174(87.9%)), 78 (5.8%) did not know and 82 (6.1%) responded positively. There was a wide range of substances mentioned including bread and/or yeast products (8), chocolate (5), cigarette smoke (2), spicy food (4), dairy products (5).

Over a quarter of interviewed patients (359 (26.9%)) reported that they had suffered a major stress during the four weeks before the interview.

Tables 26 and 27 give the responses regarding alcohol consumption and smoking,

Table 26 Units of alcohol consumed in an average week

<i>Units</i>	<i>Number</i>	<i>%</i>
<i>None</i>	406	30.4
<i>1-7</i>	585	43.8
<i>8-14</i>	204	15.3
<i>15-21</i>	78	5.8
<i>22-28</i>	32	2.4
<i>29+</i>	28	2.1
<i>No response</i>	2	0.2

Table 27 Cigarettes smoked on an average day

	<i>Number</i>	<i>%</i>
<i>None</i>	1143	85.6
<i>1-10</i>	97	7.2
<i>11-20</i>	66	4.9
<i>21-40</i>	27	2.0
<i>41-60</i>	1	0.07
<i>No response</i>	1	0.07

189 patients had someone else in their household who smoked and 124 of these patients were not themselves smokers.

6.6 ANALYSIS BY SEASON

Analyses were carried out for two seasons (i) spring/summer (April, May, June, July, August, September) and (ii) autumn/winter (October, November, December, January, February, March). Tables 28 and 29 show the occupational and home use of pesticides, respectively. The proportion of patients using pesticides occupationally was higher in the autumn/winter season than the spring/summer season. In contrast home use was greater in the spring/summer than autumn/winter. In general in UK agriculture the peak usage of pesticides, although depending on the crop, occurs during spring and summer, see the Pesticide usage reports at: (www.csl.gov.uk/newsAndResources/resourceLibrary/articles/puskm/imdex.cfm).

Table 28 Occupational pesticide use by season

<i>Season</i>	<i>number</i>	<i>Pesticide use</i>				<i>Total</i>
		<i>No</i>	<i>yes</i>	<i>% all</i>	<i>% all</i>	
<i>Spring/summer</i>	326	45.5	42	46.7	368	
<i>Autumn/winter</i>	390	54.5	48	53.3	438	
<i>All</i>	716	100	90	100	806	

Table 29 Home pesticide use by season

<i>Season</i>	<i>number</i>	<i>Pesticide use</i>				<i>Total</i>
		<i>No</i>	<i>yes</i>	<i>% all</i>	<i>% all</i>	
<i>Spring/summer</i>	267	33.9	323	59.0	590	
<i>Autumn/winter</i>	521	66.1	224	41.0	745	
<i>All</i>	788	100	547	100	1335	

Table 30 shows that there was no difference in the distribution of the categorisation of likelihood of being pesticides related between the two seasons.

Table 30 Seasonal distribution of probability of pesticide related illness

<i>Probability of pesticide related illness</i>	<i>Visit to GP</i>			
	<i>Spring/summer</i>	<i>%</i>	<i>Autumn/winter</i>	<i>%</i>
<i>Low likelihood</i>	27,424	97.02	30,277	97.50
<i>Medium likelihood</i>	823	2.9	758	2.4
<i>High likelihood</i>	19	0.07	19	0.06
<i>All</i>	28,266	100	31,054	100

6.7 MULTIVARIABLE MODELLING

Analyses using logistic regressions were carried out comparing patients in the medium likelihood category (symptoms categorised by the GP as possibly related to pesticides) with those in the low likelihood category (symptoms categorised by the GP as unlikely to be or definitely not related to pesticides). All patients who consulted because of concern about pesticide exposure were omitted from these analyses.

Table 31 gives some of the results. Univariable analyses showed increased risk for patients to be belong to the medium likelihood group compared with being in the low likelihood group for several variables, including being male, living over 1km from a farmland, from a chemical plant or from a railway line, over 100m from a landfill site, and a change in use in the week before symptoms for all 12 of the chemical hazards investigated. Statistically significantly positive associations were found for home use of pesticides, proximity of farmland over 1km compared with <100m, and a change in use of laundry detergent, white spirit, polish and varnish, paint, toiletries and furniture renovations. Statistically significant negative associations were found for both living in suburban or rural areas compared to living in urban area.

In multivariable models that included occupational and home use of pesticides, age and gender, and each of the 12 chemical hazards in turn, none of the 12 hazards altered the odds ratios for occupational or home use of pesticides substantially; the odds ratios for paint, toiletries and white spirit remained significantly raised. There was tendency for the odds ratios for occupational use of pesticides to decrease and for the odds ratios for home use of pesticides to increase slightly. These variables do not appear therefore to be confounding the relationship between occupational and home pesticide use.

In the multivariable model shown in Table 31, the only remaining significant associations were with home use of pesticides (increased) and with area of living (increased for urban). The increased effect of living over 1km from farmland, which is perhaps contrary to what might be hypothesised, disappears when the variable for area of living is also included in the model. This is because most of the patients living in urban areas lived further than 1km from farmland and approximately the same proportion of these patients used pesticides in the home (44.3%) as those living in rural areas (46.5%) where farmland was often within 100m of a patient's residence.

Table 31 Logistic regression models for likelihood of pesticide related illness for the 1316 patients who were interviewed

<i>Factors affecting pesticide related illness</i>		<i>Univariable models</i>			<i>Multivariable model</i>		
		<i>OR</i>	<i>CI</i>		<i>OR</i>	<i>CI</i>	
<i>Occupational pesticide use vs no use</i>		1.17	0.73	1.86	1.07	0.65	1.75
<i>Home pesticide use vs no use</i>		1.83	1.45	2.31	1.91	1.49	2.45
<i>Age (1 year increase)</i>		0.99	0.98	0.999	0.99	0.98	1.00
<i>Male vs female</i>		1.15	0.79	1.26	0.97	0.75	1.25
<i>Proximity of farmland</i>	<i>100m-1km vs <100m</i>	0.65	0.47	0.90	0.51	0.35	0.74
	<i>> 1km vs <100m</i>	1.79	1.36	2.35	0.91	0.60	1.37
	<i>don't know vs <100m</i>	0.59	0.22	1.62	0.43	0.15	1.26
<i>Proximity of chemical plant</i>	<i>100m-1km vs <100m</i>	0.91	0.19	4.39	-	-	-
	<i>> 1km vs <100m</i>	1.23	0.31	4.95	-	-	-
	<i>don't know vs <100m</i>	0.69	0.17	2.82	-	-	-
<i>Proximity of landfill</i>	<i>100m-1km vs <100m</i>	2.92	0.79	10.8	-	-	-
	<i>> 1km vs <100m</i>	1.84	0.60	5.64	-	-	-
	<i>don't know vs <100m</i>	1.38	0.44	4.35	-	-	-
<i>Proximity of heavy traffic</i>	<i>100m-1km vs <100m</i>	0.93	0.69	1.26	-	-	-
	<i>> 1km vs <100m</i>	0.80	0.59	1.07	-	-	-
	<i>don't know vs <100m</i>	0.53	0.14	1.95	-	-	-
<i>Proximity of railway</i>	<i>100m-1km vs <100m</i>	0.96	0.61	1.52	-	-	-
	<i>> 1km vs <100m</i>	1.41	0.91	2.16	-	-	-
	<i>don't know vs <100m</i>	0.84	0.39	1.82	-	-	-
<i>Area of living</i>	<i>suburban vs urban</i>	0.29	0.22	0.40	0.34	0.25	0.47
	<i>rural vs urban</i>	0.29	0.21	0.38	0.26	0.17	0.41
<i>Laundry detergent</i>	<i>change of use vs no change</i>	1.60	1.09	2.35			
<i>Disinfectant/bleach</i>	<i>change of use vs no change</i>	1.26	0.83	1.90			
<i>Cleaning agent</i>	<i>change of use vs no change</i>	1.43	0.96	2.14			
<i>White spirit</i>	<i>change of use vs no change</i>	1.60	1.09	2.35			
<i>Polish/varnish</i>	<i>change of use vs no change</i>	1.83	1.14	2.96			
<i>Air freshener</i>	<i>change of use vs no change</i>	1.25	0.87	1.81			
<i>Paint</i>	<i>change of use vs no change</i>	1.74	1.23	2.47			
<i>Toiletries</i>	<i>change of use vs no change</i>	1.85	1.20	2.85			
<i>Stain remover</i>	<i>change of use vs no change</i>	1.36	0.77	2.39			
<i>Furniture renovator</i>	<i>change of use vs no change</i>	1.86	1.06	3.32			
<i>Oil/grease</i>	<i>change of use vs no change</i>	1.12	0.56	2.24			
<i>Insulation material</i>	<i>change of use vs no change</i>	1.06	0.64	1.76			

7 SUMMARY OF MAIN FINDINGS FROM THE STUDY

Checklists were completed for 59320 patients from 43 practices in Great Britain (157 GPs and 7 nurse practitioners participated) and 1335 interviews were carried out. Key results from the study are:

Incidence and prevalence of illness reported to and diagnosed by GPs as pesticide related.

- An estimate of the annual prevalence of consultations because of concern by the patient about pesticide exposure is given by the proportion of all consultations by such patients, 0.07% (42/59320) (95% CI 0.05, 0.09).
- An estimate of the annual incidence of consultations because of concern by the patient about pesticide exposure is given by the proportion of all consultations by such patients who presented with symptoms that were unusual for them, 0.04% (24/59320) (95% CI 0.02, 0.06).
- GPs thought that very few patients had symptoms that were likely to be related to pesticide exposure (20 patients (0.03%); 13 of these also themselves reported exposure).
- GPs also thought that 1599 (2.7%, 95% CI 2.6, 2.8) patients had symptoms that were possibly related to pesticide exposure.
- Among patients who did not consult the GP directly because of their own concern about exposure to pesticides, the overall estimate of the annual prevalence of consultations for which the GP thought the symptoms were likely to be related to pesticide exposure was 0.01% (95% CI 0.003, 0.02). Similarly the annual prevalence of consultations among such patients for which the GP thought the symptoms were possibly related to pesticide exposure was 2.7% (95% CI 2.5, 2.8).
- Among patients who did not consult the GP directly because of their own concern about exposure to pesticides, the estimates of annual incidence of consultations for which the GP thought the symptoms were likely or possibly related to pesticide exposure were 0.003% (95% CI 0, 0.008) and 1.64% (95% CI 1.5, 1.7) respectively.
- In 2001 approximately 221 million people aged 16 years or more are estimated to have consulted a GP. The estimate of an annual incidence of 0.04% for consultations made by patients because of concern about pesticides thus gives an annual estimate of 88400 consultations. The annual incidence of 0.003% for those patients not consulting because of concern about pesticide exposure but for whom the GP thought their symptoms were likely to be related to pesticide exposure gives an annual estimate of 6630 consultations.

Eligibility for interview

- 8% of the 59320 patients consulting were eligible for an invitation for interview
- Of the 4741 eligible patients 44% (2060 patients) refused to be interviewed. Of those who did not actively refuse (2681 patients), 50% agreed to an interview invitation and were interviewed (1335 patients).

Results from the interviews

- 60% of those interviewed had some kind of employment. In the week before their symptoms developed 37% of these employed patients reported occupational exposure to dust and fibres, 27% to disinfectants, 26% to cleaning fluids, 16% to gas and fumes, 11% to glues and epoxy resins, 14% to excessive heat and 13% to excessive noise.
- 92 patients (11% of the 806 who had an occupation) reported pesticide exposure during their occupation in the week before their symptoms developed, 38% of whom worked in agricultural jobs or jobs where pesticides might be expected to be used.
- The distribution of symptoms was similar between those patients who used pesticides occupationally, those who did not use pesticides occupationally and those patients who were not employed with the exception of flu-like symptoms where the proportions were 13%, 7.5% and 2.3% respectively. The small proportion of flu-like symptoms for those not in employment may reflect a high proportion of retired people who may have received a flu vaccination
- 10% of those using pesticides occupationally had neither arms nor legs covered during pesticide use.
- 41% (547) of interviewed patients had used at least one pest control chemical in and around their home in the week before their symptoms occurred (20.5% used 2 or more).
- The most common substances applied at home were insecticides (31%), herbicides (22%) other pesticides (mostly slug pellets) (17%) and veterinary and medicinal use pesticides (17.9%).
- Almost a third (32.9%) of the pesticides were applied at home with an aerosol or spray, 25.2% as a liquid and 20.6% as pellets or granules.
- Of the 547 home pesticide users 65.4% (358 patients) used no personal protective measures, although 284 (51.9%) reported that their arms and legs were covered during application.
- Sixty three percent of patients using pest control chemicals at home reported that they either followed the label exactly (44.6%) or used it as guidance (18.8%) to decide on the quantity of pesticide to use. Of those storing pesticides at home, the majority stored them in the kitchen and/or in the garage or shed.
- 61.5% reported that they never disposed of pesticides and 25.5% disposed of them in the household rubbish bin. Relatively few reported that they used a chemical waste disposal site (2.2%) or other waste disposal site (7.1%).
- Pesticide use in this study occupationally was higher during the autumn/winter season than the spring/summer season. Pesticide use at home in this study was lower in the autumn/winter season than the spring/summer season. However, in general in the UK pesticide use on crops occurs more often in spring and summer.
- 36 patients reported an additional incident potentially related to pesticide exposure, 11 of whom reported that they were exposed to spray drift.
- 359 (26.9%) of patients reported that they had suffered major stresses during the four weeks before their interview.

Relationship of symptoms to pesticide exposure

- Among patients who did not consult the GP because of their own concern about pesticide exposure 41% of those using home pesticides were classified by their GP at the initial consultation as having symptoms possibly related to pesticide exposure, compared to 27.7% of those who did not use home pesticides.
- The overall distribution of symptoms did not appear to differ between those using pesticides at home and those who did not use home pesticides in the week before their symptoms occurred.
- Of 322 patients who used only one type of pesticide at home in the week before their symptoms occurred there was a tendency for those only using herbicides to have more neurological and skin symptoms than those using other types of pesticides. However, neurological symptoms have been more often associated in other studies with exposure to insecticides and fumigants.
- Those using a pesticide in the home in the form of powder or pellet had fewer gastrointestinal problems than those using a spray or a liquid; those using powders had more skin problems; those using pellets (mainly for slugs) had more respiratory problems. Inhalation of metaldehyde, the active ingredient of many slug pellets may cause increased tracheobronchial secretions, although this is unlikely to have occurred from the use of solid form pellets.
- The distribution of symptoms was similar for area of residence (rural, suburban, urban) and for proximity to farmland.
- There was tendency for an increased occurrence of respiratory symptoms among home pesticide users who also changed brand, quantity or frequency of usage of other potentially hazardous chemicals at home, particularly disinfectants, turpentine, air freshener and toiletries, compared to the non home pesticide users who also changed the usage of the same chemicals.
- The risk of patients being classified as having medium likelihood (categorised by their GP at screening as having symptoms possibly related to pesticide exposure) compared to being classified as having low likelihood (categorised by their GP as unlikely to have or definitely not having symptoms related to pesticide exposure) of symptoms related to pesticide exposure was investigated in relation to other variables.
 - An increased risk was estimated for occupational and home use of pesticides, living over 1 km from farmland or railway line or over 100m from a landfill site, and change of use in the week before symptoms occurred of several chemicals hazards at home.
 - Multivariable analyses including each of the chemical hazards at home in turn showed that these exposures did not substantially confound the risk associated with home or occupational use of pesticides; the risk associated with changed use of paint, toiletries and white spirit remained significantly raised.
 - In a multivariable model including occupational and home use of pesticides, age, gender, proximity of farmland and area of living (urban, suburban, rural) the only significant increase was in association with home use of pesticides (OR = 1.91 (95 % CI 1.49 – 2.45)).

8 DISCUSSION

Overall the results from this study suggest that the incidence and prevalence of pesticide related ill health presenting to and diagnosed in Primary Care in GB is extremely small relative to other types of ill health. Estimates of annual incidence include 0.003% (95% CI 0, 0.008) for consultations for which the GP thought the symptoms were likely to be related to pesticide exposure, 1.64% (95% CI 1.54, 1.74) for consultations for which the GP thought the symptoms were possibly related to pesticide exposure and 0.04% (95% CI 0.024, 0.057) for consultations made because of concern by the patient about pesticide exposure. Corresponding estimates of prevalence are 0.01% (95% CI 0.003, 0.02), 2.7% (95% CI 2.56, 2.83) and 0.07% (95% CI 0.049, 0.092) respectively.

There are no results from directly comparable studies, particularly for chronic health effects. The most recent figures from the HSE Pesticides Incident Report (HSE 2004) recorded that the Field Operations Directorate (FOD) of the HSE investigated 204 complaints of pesticide incidents, slightly more than the average number investigated over the previous 10 years. These included 62 incidents which involved allegations of ill-health and these were assessed by the HSE's Pesticides Incidents Appraisal Panel (PIAP). Only 1 was classified as confirmed and 14 were classified as likely by PIAP to be linked to pesticide exposure, all events occurring to members of the public. The HSE suggest that the proportion of confirmed and likely incidents may be increasing slightly since 2000, although the proportions are much lower than those reported in the 1990s.

In the UK, deaths from pesticide poisoning represent only about 1% of UK poisonings (Casey and Vale, 1994), with many being suicides. A 2 year feasibility survey carried out by the HSE of the database of licensed pesticide users found that 15% of users thought that they had been made ill or had an existing illness made worse by exposure to pesticides at work (<http://www.hse.gov.uk/pubns/pestuser.htm>). In the financial year 2005-2006 there were 169 hospital episodes of accidental poisoning by and exposure to pesticides (<http://www.hesonline.nhs.uk>); of these 93% were emergency admissions and 70% occurred to children under the age of 15 years. There were also 109 episodes of intentional self poisoning by and exposure to pesticides; of these 88% were emergency admissions and 84% were aged between 15 and 59 years.

In the US, an overall incidence rate for pesticide-related illness of 1.17 per 100,000 full time equivalents (FTE) was reported between 1998 and 1999 from the Sentinel Event Notification System for Occupational Risks programme (SENSOR), an acute occupational pesticide-related illness surveillance scheme run in 7 US States (Calvert et al 2004). The incidence rate among those employed in agriculture was higher (18.2/100,000 FTEs) than those employed in non-agricultural industries (0.53/100,000 FTEs).

Although the prevalence and incidence estimates from this study are small there are a very large number of consultations each year in GB. In 2001, the Royal College of GPs estimated that GPs in the UK carried out about 261 million consultations (221 million for people aged 16 years or more), equivalent to about 740000 people (1.3% of the population) consulting a GP every day (www.rcgp.org.uk/pdf/ISS_INFO_03_APRIL04.pdf). Although our study was based on people aged 18 years or more in GB the estimate of an annual incidence of 0.04% for consultations made by patients because of concern about pesticides translates to an annual estimate of 88400 consultations i.e. approximately 1700 per week for people aged 16 years or over. Similarly the annual incidence of 0.003% for those patients not consulting because of concern about pesticide exposure but for whom the GP thought their symptoms were likely to be related to pesticide exposure translates to an annual estimate of 6630 consultations i.e. about 128 per week for people aged 16 years or over.

These estimates must be considered circumspectly because of uncertainties and assumptions made in this study. For example, we assume that an unusual symptom in our study refers to a newly occurring symptom and that if the symptom is not unusual for the patient it relates to a recurring chronic problem, e.g. asthma, chronic respiratory disease etc. Although we were careful to exclude as far as possible repeat visits for the same episode of symptoms there may be occasional double counting. For confidentiality reasons the computerised information does not include patient names or NHS numbers.

Our study found that over 40% of those interviewed had used a pesticide in their home environment in the week before their symptoms developed. This high figure might have arisen partly as an artefact of the algorithm used to select patients as being eligible for an interview, if, for example, a GP specifically discussed home use of pesticides with the patient before deciding to categorise the patient as having symptoms that were possibly related to pesticide exposure. However, only half patients in the 'possible' category reported use of pesticides at home during their interviews, compared to 64% of those categorised as 'unlikely' by the GPs.

The high use of household pesticides in the UK has also been found in a survey of a sample of parents from the Avon Longitudinal Study of Parents and Children (ALSPAC) (Grey et al 2004). In this survey 93% had used at least one pesticide product in the last year. A high proportion of the parents in the ALSPAC study said they would follow the label when the product was unfamiliar (92%) and 77% said they would always follow the label exactly. This is in contrast to our study where only 50% of patients using home pesticides said they used the label as guidance to decide on the quantity of pesticide to use. An observational study in the UK found that few participants read the label, that they often found it hard to understand and that compliance with instructions was low (Weale and Goddard, 1998).

The majority of patients in our study stored their pesticide products indoors, including the kitchen, or in the garage or a shed, a similar finding to that of the ALSPAC survey. In both our study and the ALSPAC survey very few people used a waste disposal site to dispose of their unwanted pesticides. Use of personal protective measures was also low in both studies.

In our study there were few differences in the distribution of symptoms between patients who did or did not use pesticides either during their occupation or at home. There was a suggestion that those who had only used a herbicide at home had a high prevalence of neurological and skin symptoms compared to those who had only used another type of pesticide. There was also a higher prevalence of respiratory symptoms among those using home pesticides and a range of other domestic chemicals, some of which would have been in the form of sprays and aerosols.

In our study overall, of all those patients screened, 15.5% of those not asymptomatic had a respiratory problem (including flu-like symptoms). The same proportion of patients was estimated to consult their GP for respiratory condition problems in the UK in 2002 (General Practitioner Workload, RCGP Information Sheet No. 3). The corresponding figures from our study and those estimated by the RCGP respectively are: skin symptoms 12.2%, 10.9%; eye problems 2.2%, 4.5%; gastrointestinal (our study)/digestive system (RCGP) 8.7%, 7.2%; neurological (our study)/ nervous system (RCGP) 1.8%, 3.4%. Although in our study all participants were over 18 years old and the RCGP estimates include all ages the similarity of these figures suggests that our study closely mirrors the general symptom consulting patterns within GB and the UK.

As highlighted in section 4.1, the practices were well spread geographically throughout GB between urban, suburban and rural areas and between different areas of deprivation. There was also a range of practice sizes. Although not all partners in the practices participated in the study the average list size per partner was 2210, varying from under 1000 in a rural area to over 2500 in 2 city practices. The average list size in England and Wales was 1666 (General and Personal Medical Services Statistics England and Wales 30 Sept 2004, <http://www.dh.gov.uk/>).

As can be seen from Table 1 and Supplementary Table 1, the numbers of checklists completed varied between practices as did the length of time they carried out the study. Those practices with small numbers of checklists indicate practices that withdrew early on in the study for reasons outlined in section 4.1. The number of checklists completed in each practice depended on the number of partners participating and the number of surgery sessions held. As there was only one research nurse (almost always part-time) in each practice working on the study, we aimed to ensure a continuous flow of both checklists and interviews throughout the data collection period. Each full-time participating GP was thus asked to try and complete checklists for all patients aged over 18 years during at least two surgery sessions per week. The research nurse was asked to ensure that the sessions occurred on different days and in both mornings and afternoons to ensure representation of patient consulting patterns e.g. not always on Monday mornings or Friday afternoons when more acute or urgent consultations might take place. Although there was wide variation between practices, the average number of surgeries held per practice per week over the period of the study was 2.4. In the UK generally the average number of surgery sessions held weekly by all GPs is about 8. The study thus included about 30% of all of the consulting workload of each participating GP.

Considering all the above we feel that our study achieved a good representation of both the GP practices in GB and also the patients consulting GPs over a year.

The study is, however, limited in some aspects. It was felt that it would be too impractical and costly to try and interview in depth a random sample of patients consulting their GPs throughout a year at a large number of practices. We also wanted to gain some knowledge of GP diagnosing of pesticide-related illness. The screening checklist was thus designed to include this and to screen out patients a) who were asymptomatic b) consulting for on-going or chronic health problems c) whose symptoms, in the opinion of the GP, were definitely not related to pesticide exposure. This screening process reduced the proportion of patients eligible for an interview to 8%. When GPs were consulted during the design stage of the study it became clear that it was not appropriate to introduce the idea of potential pesticide exposure routinely into every patient consultation as this might alarm patients unduly and prolong the consultation. The GPs were thus asked to carry out their 'normal' consulting practice and to complete the checklists at the end of the consultation. A follow-up questionnaire was sent to GPs to obtain information on how they decided on their classification of the likelihood of pesticide-related illness. This confirmed that very few specifically discussed pesticides and that most made their decision on the basis of the symptoms of the patient and/or the activities carried out by the patient before the symptoms occurred.

A high proportion (44%) of those invited for interview refused to participate and this did not improve after we had received ethical approval to carry out interviews over the telephone. However, overall, 50% of those who did not refuse were interviewed. The interview questionnaire was fairly lengthy. It was felt that it was important to consider total exposure to pesticides from all sources. The interview thus attempted to capture these data. The information on actual chemicals and active ingredients of pesticides is, however, limited in this study as it was felt that patients would either not know this or be unable to recall it accurately. Assessing the human health risks from long-term, low-level pesticide exposure is complex due to the many possible variables and confounders that may affect the human response to pesticides (e.g. age, sex, diet, lifestyle, health status, exposure duration and concentration). Information was obtained in the interview on some key exposures, both occupationally and at home, that we were advised could potentially contribute to the symptoms for which data were collected. Exposure to several of these individually influenced the chance of being classified by the GP as a probable case.

No attempt was made to confirm routinely the potential exposure to pesticides through biological tests, as only rarely would the suspect chemical be known and a reliable and validated biomarker be available. The study was thus limited in its ability to define a definitive pesticide-

related case of ill- health. In the US SENSOR programme a case of pesticide- related illness or injury is classified as definite, probable, possible, suspicious, unlikely or having insufficient information. Assignment to these categories depends on the certainty of exposure, whether health effects consist of reported symptoms or those observed by a health professional and the extent to which the health effects are consistent with the known toxicology of the pesticide product. A definite case requires (1) laboratory, clinical or environmental evidence to corroborate exposure, (2) 2 or more abnormal signs developing new post exposure and/or test findings reported by a health professional and 3) that these should be characteristic for the pesticide or consistent with an exposure-health effect relationship based on known toxicology. Their possible case definition requires evidence of exposure based solely upon written or verbal reports, 2 or more new post exposure abnormal symptoms reported and 3) above.

PIAP define a case as confirmed if there are clinical symptoms typical of exposure to the cited pesticide formulation combined with either corroborating medical and/or biochemical evidence or evidence of overexposure. Their classification of a likely case is 'balance of evidence based on reported exposure circumstances, clinical symptoms and signs consistent with ill health due to exposure to cited pesticide formulation. Both the US and PIAP systems rely partly on expert opinion, particularly when defining possible cases. The establishment of a definite causal relationship from these systems, as in our study, would thus require careful consideration.

One of the aims of the UK study was to assess the implications for implementing such a system of data collection more widely. One clear outcome from the study is that it would not be feasible to use the same methods more generally. Although the GPRF has established a large database of practices potentially keen to carry out research, recruitment of enough practices, motivating and encouraging GPs and research nurses to maintain the data collection over a period of a year, and ensuring good response to interview invitations required a major effort from the research team throughout the whole study period. In addition, obtaining research governance approval from all the PCTs was a huge task and the PCTs also require regular updates on the progress of the study and many stipulate that they require not only a final report but a presentation of the results.

The importance of incorporating environmental health into primary care education and practice has been recognised in other countries. In the US the National Strategies for Health Care Providers: Pesticides Initiative and the national Environmental Public Health Tracking program have been launched (Wakefield 2003; Kass et al 2004). The former aims to raise awareness among general practitioners and nurses of potential exposures to pesticides. Cities like New York are investigating how to develop their capacities to track and link environmental public health indicators such as pesticide sales and applications, housing and building information and medical data.

In the UK, a report in 2001 showed that none of the GP morbidity recording schemes routinely recorded occupation although it would be feasible to add procedures to obtain this information (Souter 2001). A HSE funded study is currently on-going to explore this. It would be possible potentially to extend these systems to include collection of environmental exposures. However, consideration needs to be given as to what type and form this information should take and the utility of establishing links between this information and disease outcome data.

Conclusions

The results from this study suggest that the annual prevalence and incidence of illness reported to GPs because of concern about pesticide exposure is small (0.07% and 0.04% of GP consultations by people aged 18 years or over). Similarly for those people who did not consult the GP directly because of concern about exposure to pesticides the estimates of the annual prevalence and incidence of consultations where symptoms were diagnosed as likely to be related to pesticide exposure were also small (0.01% and 0.003% respectively) with estimates of prevalence and incidence of possible pesticide-related symptoms being 2.7% and 1.64%.

Although small these estimates translate to relatively large number of consultations annually. However, information on actual chemicals and active ingredients of pesticides was limited and there was no routine confirmation of exposure to pesticides through biological tests. The study was thus limited in its ability to establish a definite causal relationship between pesticide exposure and symptoms presented in Primary Care.

There was widespread use of pesticides in the home environment but more than half of those using them in this study did not follow the product label exactly, very few used personal precautionary measures and storage and disposal of pesticides was far from ideal. The risk to a patient of being categorised by the GP as having symptoms possibly related to pesticide exposure compared to being categorised as unlikely to have symptoms related to pesticide exposure was associated with home use of pesticides and also with a change of use of several other chemicals in the home in the week before the consultation. A clear outcome from the study is that it would not be feasible to use the same methods more generally in GB for monitoring pesticide related illness reported and diagnosed in Primary Care.

REFERENCES

- Baker EL & Matte TP (1994) *Surveillance for occupational hazards and disease*. In: Textbook of clinical occupational and environmental medicine. Eds Rosenstock L & Cullen MR, Philadelphia, USA, WB Saunders Co.
- Calvert GM, Plate DK, Das R et al (2004) Acute occupational pesticide-related illness in the US, 1998-1999: Surveillance findings from the SENSOR-pesticides program. *Am J Indust Med*, 45, 14-23
- Casey P & Vale JA (1994) Deaths from pesticide poisoning in England and Wales: 1945-1989. *Hum Exper Toxicol*, 13, 95-101
- Costa LG (2006) Current issues in organophosphate toxicology *Clinica Chimica Acta*, 366,1-13
- Grey CNB, Nieuwenhuijsen MJ, Golding J. (2004) The use and disposal of household pesticides. *Environ Research on line*: www.sciencedirect.com
- Health and Safety Executive.(2004) *Pesticide Incidents Report 1 April 2003 – 31 March 2004*. HSE.
- ICPS, TNO, GSF, IEH, and FIOH. Criteria to Establish Health-based Occupational Exposure Limits for Pesticides-Annex 1 to the Recommended Method-Report from the AOEL Workshop 2000.
- IEH (1999) *Indoor Air Quality: Pesticides in the Home*, IEH report for the Department of the Environment, Transport and the Regions, Leicester, UK, Institute for Environment and Health
- IEH (2000) *Criteria to Establish Health-based Occupational Exposure Limits for Pesticides*, IEH report under the Food, Agriculture and Fisheries programme for EU 4th Framework programme, Leicester, UK, Institute for Environment and Health
- Kamel F & Hoppin JA (2004) Association of pesticide exposure with neurologic dysfunction and disease. *Environ Health Perspec*, 112(9), 950-958
- Kass DE, Their AL, Leighton J, Cone JE & Jeffery NL. (2004) Developing a comprehensive pesticide health effects tracking system for an urban setting: New York City's approach. *Env Health Perspec*. 112(4), 1419-1423.
- McCormick A, Fleming D & Charlton J (1995) *Morbidity Statistics form General Practice: a Study Carried Out By the Royal College of General Practitioners, the OPCS and the Department of Health. Fourth National Study 1991-1992*, London, UK, HMSO
- Office of National Statistics (1998) *Key Health Statistics from General Practice: Analyses of Morbidity and Treatment Data, including Time Trends, England and Wales, 1996*, London, UK, Office for National Statistics
- PSD/HSE (2001) *Pesticides 2001 Your Guide to Approved Pesticides*. The Stationery Office, London
- Soutar CS (2001) Frequencies of disease presenting to general practitioners according to patients' occupation Contract Research Report 340/2001. Sudbury, UK, HSE Books
- Tahmaz N, Soutar A & Cherrie JW (2003) Chronic fatigue and organophosphate pesticides in sheep farming: a retrospective study amongst people reporting to a UK pharmacovigilance scheme *Ann Occup Hyg*, 47(4), 261-267
- Wakefield J (2003) Pesticides initiative: basic training for health care providers *Env Health Perspec*. , 111(10), A 520-522
- Weale VP & Goddard H (1998) *The Effectiveness of Non-Agricultural Pesticide Labelling* (Contract Research Report 161/1998), Sudbury, UK, HSE Books

APPENDIX 1: GP CHECKLIST

General practitioner based scheme for monitoring pesticide related illness

Name of Patient _____ DoB _____
 Today's date _____ AM or PM GP
 Initials _____

(Please Circle)

- | | No | Yes |
|--|--------------------------|--------------------------|
| 1 Is this patient consulting because of exposure only? | <input type="checkbox"/> | <input type="checkbox"/> |
| 2 Is this patient consulting because of exposure and related symptoms? | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 Is this patient symptomatic (for any reason)? | <input type="checkbox"/> | <input type="checkbox"/> |
| 4 Has this patient previously consulted for this problem within the last 3 days? | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 Does this patient have serious and acute symptom/s? (e.g. blurring of vision, vertigo, respiratory compromise etc) | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 Does this patient have one or more of the following symptoms? (please tick all that apply): | | |

- **Flu type symptoms**
- **Respiratory**
- **Gastrointestinal**
- **Skin**
- **Eye**
- **Acute neurological**
- **None of the above**

- | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| | No | Yes | Don't know | n/a |
| 7 Do you think the presenting symptoms are unusual for this particular patient? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | Likely | Possible | Unlikely | Definitely not |
| 8 In your opinion, how likely is it that the patient's symptoms are related to pesticide exposure? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

If eligible, is there any reason why this patient should not be invited to join the study? YES

APPENDIX 2 SCREENS FROM COMPUTERISED INTERVIEW QUESTIONNAIRE

GPRF / IEH Pesticides Study (Vn 1.6)

Save New Window Back Next Save Print Quit

Patient Interview

PLEASE READ OUT TO THE PATIENT BEFORE CONTINUING

Thank you for agreeing to this interview. During the interview I am going to ask you about any contact you might have had with certain chemicals, materials and other environmental factors. The questionnaire is intended to cover a wide variety of possible scenarios and therefore some questions may not be relevant to you and other questions may cover something you have already mentioned. Don't worry if you can't answer every question - just give as much detail as you can.

Guidance to completing the questionnaire

Please read out the instructions given at the beginning of each Section and each question.

If the answer is at the boundary between two overlapping categories tick the **higher** category. For example if the patient used a particular chemical for exactly 2 hours and the options are 1-2 hours, 2 - 4 hours and 4 hours or more, you should tick 2 - 4 hours.

If the patient is unable to answer a question requiring text (e.g. a product name) enter #.

Guidance for program navigation and usage

Use the Back and Next buttons on the toolbar to move through the question screens. Use the Save button at any time to stop the interview and save the data so you can return to it later. Depending on your answers, not all questions or sections of the interview are applicable, and may appear disabled or not be shown at all. The status of each question is indicated in the list at the right of the screen.

Answers are checked for completeness, consistency, and validity as you move forward through the interview. If any issues are detected a message will be displayed detailing them. These will need to be addressed before you can continue.

Pesticides Questionnaire

- A01.Employment
- A02.Occupation
- A03.Occupation Duration
- A04.Occupational Hazard
- A05.Chemical Application
- A06.Products Applied
- A07.Application Methods
- A08.Protective Equipment
- A09.Protective Clothing
- A10.Mixed Pesticides
- A11.Mixed Products
- A12.Protective Equipment
- A13.Protective Clothing
- A14.Licensed Applicator
- A15.Activities.Days
- A16.Colleague Symptom
- B01.Residence
- B02.Residence.Months
- B02.Residence.Years
- B03.Area
- B04.Proximity
- B05.Chemicals
- B06.Pest-Control Treatm
- B08.Pest Type
- B09.Treated Areas
- B10.Product Names
- B11.Product Formulation
- B12.Return Time
- B13.Pest-control usage
- B14.Products Applied
- B15.Protective Equipment
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies

LIVE database Z990001PX

GPRF / IEH Pesticides Study (Vn 1.6)

000

Please enter the date of the interview...

What is your date of birth?

A00 SECTION A - OCCUPATION

In Section A, I would like to ask you about whether you use, or come into contact with, potential health hazards through your occupation.

A01 Are you in either paid or unpaid employment?

no yes

Do you do any voluntary work?

no yes

A02 What do you do?

A03 For how long have you been doing this?

less than 1 year from 1 to 5 years more than 5 years

Pesticides Questionnaire

- A01. Employment
- A02. Occupation
- A03. Occupation Duration
- A04. Occupational Hazard
- A05. Chemical Application
- A06. Products Applied
- A07. Application Methods
- A08. Protective Equipment
- A09. Protective Clothing
- A10. Mixed Pesticides
- A11. Mixed Products
- A12. Protective Equipment
- A13. Protective Clothing
- A14. Licensed Applicator
- A15. Activities. Days
- A16. Colleague Symptom
- B01. Residence
- B02. Residence. Months
- B02. Residence. Years
- B03. Area
- B04. Proximity
- B05. Chemicals
- B06. Pest-Control Treatm
- B08. Pest Type
- B09. Treated Areas
- B10. Product Names
- B11. Product Formulation
- B12. Return Time
- B13. Pest-control usage
- B14. Products Applied
- B15. Protective Equipment
- B16. Protective Clothing
- B17. Chemical Quantity
- B18. Storage
- B19. Disposal
- B20. Proximity
- B21. Other People
- C01. Hobbies

LIVE database Z990001PX

GPRF / IEH Pesticides Study [Vn 1.6]

Save New Window Back Next Save First Quit

000

Please enter the date of the interview...

What is your date of birth?

A00 SECTION A - OCCUPATION

In Section A, I would like to ask you about whether you use, or come into contact with, potential health hazards through your occupation.

A01 Are you in either paid or unpaid employment?

no yes

Do you do any voluntary work?

no yes

A02 What do you do?

A03 For how long have you been doing this?

less than 1 year from 1 to 5 years more than 5 years

Pesticides Questionnaire

- A01. Employment
- A02. Occupation
- A03. Occupation Duration
- A04. Occupational Hazard
- A05. Chemical Application
- A06. Products Applied
- A07. Application Methods
- A08. Protective Equipment
- A09. Protective Clothing
- A10. Mixed Pesticides
- A11. Mixed Products
- A12. Protective Equipment
- A13. Protective Clothing
- A14. Licensed Applicator
- A15. Activities. Days
- A16. Colleague Symptom
- B01. Residence
- B02. Residence. Months
- B02. Residence. Years
- B03. Area
- B04. Proximity
- B05. Chemicals
- B06. Pest-Control Treatm
- B08. Pest Type
- B09. Treated Areas
- B10. Product Names
- B11. Product Formulation
- B12. Return Time
- B13. Pest-control usage
- B14. Products Applied
- B15. Protective Equipment
- B16. Protective Clothing
- B17. Chemical Quantity
- B18. Storage
- B19. Disposal
- B20. Proximity
- B21. Other People
- C01. Hobbies

LIVE database Z990001PX

GPRF / ICH Pesticides Study [Vn 1.6]

Print New Window Back Next Save Print Quit

A04 Please indicate any potential hazards that you used or came into contact with through your occupation in the week before your symptoms developed. If you answer 'yes' to any potential hazard please indicate how often you usually come into contact with it and whether you come into contact with it more than usual during that week.

Hazard	Any use or contact with these hazards in the week?		How many days use or contact in a typical week?				More use or contact than usual?			
	no	yes	none	<1	1	2-3	4+	no	yes	don't know
solvents	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
disinfectants	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
degreasers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
acids	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other cleaning fluids	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
glues or epoxies	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
lead or mercury	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
dusts or fibres	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
gases or fumes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
radiation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
pest-control chemicals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
lawn care chemicals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other poisons	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
excessive noise	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
excessive heat	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
vibrations	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other (specify)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

LIVE database Z990001PX

Pesticides Questionnaire

- A01. Employment
- A02. Occupation
- A03. Occupation Duration
- A04. Occupational Hazard
- A05. Chemical Application
- A06. Products Applied
- A07. Application Methods
- A08. Protective Equipment
- A09. Protective Clothing
- A10. Mixed Pesticides
- A11. Mixed Products
- A12. Protective Equipment
- A13. Protective Clothing
- A14. Licensed Applicator
- A15. Activities Days
- A16. Colleague Symptom
- B01. Residence
- B02. Residence Months
- B02. Residence Years
- B03. Area
- B04. Proximity
- B05. Chemicals
- B06. Pest-Control Treatments
- B08. Pest Type
- B09. Treated Areas
- B10. Product Names
- B11. Product Formulation
- B12. Return Time
- B13. Pest-control usage
- B14. Products Applied
- B15. Protective Equipment
- B16. Protective Clothing
- B17. Chemical Quantity
- B18. Storage
- B19. Disposal
- B20. Proximity
- B21. Other People
- C01. Hobbies

GPRF / IEH Pesticides Study (Vn 1.6)

A05 This question asks about any pest-control chemicals that you applied as part of your occupation during the week before your symptoms developed. Please indicate how many days (approximately) you spent applying each type of chemical and, if applicable, whether you applied the chemical more than usual during that week.

Type of Chemical	Days spent applying the chemical					More than usual?		
	none	1	2-3	4+	don't know	no	yes	don't know
herbicide (e.g. weed killer)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
insecticide (e.g. fly killer, ant poison)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
insect repellent	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
fungicide (e.g. mould or mildew treatment)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
rodenticide (e.g. rat poison)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ectoparasiticide (e.g. head lice, flea, tick treatment)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
treatment for internal worms (for animals)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
molluscicide (e.g. snails)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
soil sterilants	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
growth regulators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
tar oils	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
sulphur	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
seed treatment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
wood preservative	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other wood treatment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other (specify)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

LIVE database Z990001PX

Pesticides Questionnaire

- A01. Employment
- A02. Occupation
- A03. Occupation Duration
- A04. Occupational Hazard
- A05. Chemical Application
- A06. Products Applied
- A07. Application Methods
- A08. Protective Equipment
- A09. Protective Clothing
- A10. Mixed Pesticides
- A11. Mixed Products
- A12. Protective Equipment
- A13. Protective Clothing
- A14. Licensed Applicator
- A15. Activities Days
- A16. Colleague Symptom
- B01. Residence
- B02. Residence Months
- B02. Residence Years
- B03. Area
- B04. Proximity
- B05. Chemicals
- B06. Pest-Control Treatr
- B08. Pest Type
- B09. Treated Areas
- B10. Product Names
- B11. Product Formulation
- B12. Return Time
- B13. Pest-control usage
- B14. Products Applied
- B15. Protective Equipment
- B16. Protective Clothing
- B17. Chemical Quantity
- B18. Storage
- B19. Disposal
- B20. Proximity
- B21. Other People
- C01. Hobbies

GPRF / IEH Pesticides Study (Vn 1.3)

A06 Please list the names of the products you applied. If you do not know the product name please indicate what pests the chemical was used to control (e.g. ants, rats, greenfly etc.). Please indicate how much time (approximately) you spent applying the product during that week, the product formulation and whether you had to mix it yourself.

Product or pest name	Name of and total time (hours) applying the product				Mixed yourself	
	< ½	½-1	1-4	4+	no	yes
Omega10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Alphakill	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Bugoff	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tick the formulation used

Product or pest name	aerosol, spray	liquid	gas	powder	gel	wax blocks	pellets, granules	other
Omega10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alphakill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Bugoff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please specify other formulation(s)... # EMULSIFIABLECONCENTRATE PASTE

A750002PS

Pesticides Questionnaire

- A01. Occupation
- A02. Home Worker
- A03. Occupation Duration
- A04. Occupational Hazard
- A05. Chemical Application
- A06. Products Applied
- A07. Application Methods
- A08. Protective Equipment
- A09. Protective Clothing
- A10. Mixed Pesticides
- A11. Mixed Products
- A12. Protective Equipment
- A13. Protective Clothing
- A14. Licensed Applicator
- A15. Activities Days
- A16. Colleague Symptom
- B01. Residence
- B02. Residence Years
- B02. Residence Months
- B03. Area
- B04. Proximity
- B05. Chemicals
- B06. Pest-Control Treatr
- B07. Treatment Date
- B08. Pest Type
- B09. Treated Areas
- B10. Product Names
- B11. Product Formulation
- B12. Return Time
- B13. Pest-control usage
- B14. Products Applied
- B15. Protective Equipment
- B16. Protective Clothing
- B17. Chemical Quantity
- B18. Storage
- B19. Disposal
- B20. Proximity
- B21. Other People

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Select New Withdraw Back Next Save Fresh Quit

A07 Which application methods did you use? (tick all that apply)

tractor mounted sprayer backpack sprayer
 hand held sprayer mist blower/fogger
 bait trap wood treatment
 antifouling treatment pyrotechnic fumigation
 seed treatment injection
 distribute tablets/granules powder duster
 dipping animals pouring liquid
 other: please specify...

A08 What items of personal protective equipment, if any, were you wearing? (tick all that apply)

none disposable respirator re-usable respirator
 air-fed hood or visor fabric or leather gloves normal work overalls
 chemical protective gloves chemical protective overalls face shield
 hood rubber boots rubber apron
 don't know other: please specify...

A09 Were your arms and/or legs covered (either by protective equipment or normal clothing)?

arms only legs only arms and legs neither don't know

Pesticides Questionnaire

- A01. Employment
- A02. Occupation
- A03. Occupational Duration
- A04. Occupational Hazard
- A05. Chemical Application
- A06. Products Applied
- A07. Application Methods
- A08. Protective Equipment
- A09. Protective Clothing
- A10. Mixed Pesticides
- A11. Mixed Products
- A12. Protective Equipment
- A13. Protective Clothing
- A14. Licensed Applicator
- A15. Activities. Days
- A16. Colleague Symptom
- B01. Residence
- B02. Residence. Months
- B02. Residence. Years
- B03. Area
- B04. Proximity
- B05. Chemicals
- B06. Pest-Control Treatm
- B08. Pest Type
- B09. Treated Areas
- B10. Product Names
- B11. Product Formulation
- B12. Return Time
- B13. Pest-control usage
- B14. Products Applied
- B15. Protective Equipment
- B16. Protective Clothing
- B17. Chemical Quantity
- B18. Storage
- B19. Disposal
- B20. Proximity
- B21. Other People
- C01. Hobbies

LIVE database Z990002PZ Harrison Ford 01/01/1980 M 14/06/2004 - DOOLITTLE

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Select New Withdraw Back Next Save Print Quit

A10 In the week before your symptoms developed did you mix any pesticides as part of your occupation?
 no yes

A11 Please specify the products and the time you spent mixing them. If you do not know the name of the product(s) please indicate what pests the chemical was used to control (e.g. ants, rats, greenfly, mould etc.).

Product (or pest) name	Total time (hours) mixing the product			
	<1/2	1/2-1	1-4	4+
greenfly	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
wasp	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A12 What items of personal protective equipment, if any, were you wearing? (tick all that apply)

none disposable respirator re-usable respirator
 air-fed hood or visor fabric or leather gloves normal work overalls
 chemical protective gloves chemical protective overalls face shield
 hood rubber boots rubber apron
 don't know other: please specify...

A13 Were your arms and/or legs covered (either by protective equipment or normal clothing)?
 arms only legs only arms and legs neither don't know

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Select New Withdraw Back Next Save Print Quit

A14 Are you a licensed pesticide applicator?
 no yes

A15 This question lists some activities that you may have been involved in as part of your occupation in the week before your symptoms developed. Please indicate how long (approximately) you were involved in each activity and whether you had been involved in it more than usual during that week.

Activity	Number of days involved					More than usual?		
	none	1	2-3	4+	don't know	no	yes	don't know
Maintenance or cleaning of equipment used to mix or apply pest-control chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Handling or cleaning clothes contaminated with pest-control chemicals	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manufacture or formulation of pest-control chemicals	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transportation of pest-control chemicals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A16 Did any of your colleagues develop similar symptoms to you?
 no yes don't know

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GPRF / ICH Pesticides Study (Vn 1.6)

B00 SECTION B - HOME AND COMMUNITY

In Section B, I would like to ask about your home and the area where you live. In particular I would like to ask about potential hazards that you may have come into contact with in and around your home.

B01 Tick the box that best describes your current place of residence.

low-rise flat/maisonette tower block mobile/temporary home
 farmhouse terraced semi-detached
 detached other: please specify...

B02 Approximately how long have you lived there?

20 Years 00 Months

B03 Tick the box that best describes the area where you live.

inner city urban area suburban area rural area

B04 Approximately how far is your home from each of the following?

	less than 100m	100m-1km	more than 1km	don't know
farmland	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
chemical plant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
landfill site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
heavy traffic	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
railway line	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pesticides Questionnaire

- A01. Employment
- A02. Occupation
- A03. Occupation Duration
- A04. Occupational Hazard
- A05. Chemical Application
- A06. Products Applied
- A07. Application Methods
- A08. Protective Equipment
- A09. Protective Clothing
- A10. Mixed Pesticides
- A11. Mixed Products
- A12. Protective Equipment
- A13. Protective Clothing
- A14. Licensed Applicator
- A15. Activities. Days
- A16. Colleague Symptom
- B01. Residence
- B02. Residence. Months
- B02. Residence. Years
- B03. Area
- B04. Proximity
- B05. Chemicals
- B06. Pest-Control Treatment
- B08. Pest Type
- B09. Treated Areas
- B10. Product Names
- B11. Product Formulation
- B12. Return Time
- B13. Pest-control usage
- B14. Products Applied
- B15. Protective Equipment
- B16. Protective Clothing
- B17. Chemical Quantity
- B18. Storage
- B19. Disposal
- B20. Proximity
- B21. Other People
- C01. Hobbies

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B05 The following list contains some types of chemicals and materials that are commonly used in or around the home. I would like to ask you about any unusual use in the week before your symptoms developed. Please indicate any that you used more frequently than usual, in larger quantities than usual, or a different make or brand. (tick all that apply)

Chemical/Material	more frequently	larger quantity	different brand
laundry detergent	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
disinfectant or bleach	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other cleaning agents	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
white spirit or turpentine	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
polish or varnish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
air fresheners	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
paint	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
toiletries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
stain removers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
home or furniture renovation materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
oil or grease	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
insulation or lagging material	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B06 Was there any professional pest control or timber treatment in or around your home in the week before your symptoms developed? (e.g. fumigation, mould treatment etc.) Do not include non-chemical pest control methods such as traps, cages, sonic devices or electrocution devices.

no yes

Pesticides Questionnaire

- A01. Employment
- A02. Occupation
- A03. Occupation Duration
- A04. Occupational Hazard
- A05. Chemical Application
- A06. Products Applied
- A07. Application Methods
- A08. Protective Equipment
- A09. Protective Clothing
- A10. Mixed Pesticides
- A11. Mixed Products
- A12. Protective Equipment
- A13. Protective Clothing
- A14. Licensed Applicator
- A15. Activities. Days
- A16. Colleague Symptom
- B01. Residence
- B02. Residence. Months
- B02. Residence. Years
- B03. Area
- B04. Proximity
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- B06. Pest-Control Treatment
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- B10. Product Names
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- B12. Return Time
- B13. Pest-control usage
- B14. Products Applied
- B15. Protective Equipment
- B16. Protective Clothing
- B17. Chemical Quantity
- B18. Storage
- B19. Disposal
- B20. Proximity
- B21. Other People
- C01. Hobbies

LIVE database Z990001PX

GPRF / IEH Pesticides Study (Vn 1.6)

Select New Withdraw Back Next Save Print Quit

B07 This question is no longer used.

B08 What type of pests/problems was the treatment for? (tick all that apply)

weeds/roots/vegetation mould or mildew flying/crawling insects
 mice or rats woodworm don't know
 other: please specify...

B09 Where were the treated areas? (tick all that apply)

bedroom kitchen bathroom
 lounge/dining room other indoor area garden
 shed/garage/greenhouse other outdoor area don't know
 other: please specify...

B10 Please name the product(s) used, if known.

BRANDXWEEDKILLER BRANDYINSECTICIDE

B11 What was the product formulation? (tick all that apply)

liquid (aerosol) liquid (spray) liquid
 gel granules/pellets dust/powder
 wax blocks smoke/gas don't know
 other: please specify...

B12 Approximately how long after the application did you return to the treated area?

less than 6 hours 6 - 24 hours 24 - 48 hours
 48 hours or more don't remember

LIVE database Z990001PX

Start Novell-d... Novell Gr... GPRF / L... Pesticides Pesticide... Nurses M... 15:05

Pesticides Questionnaire

- A01.Employment
- A02.Occupation
- A03.Occupation Duration
- A04.Occupational Hazard
- A05.Chemical Application
- A06.Products Applied
- A07.Application Methods
- A08.Protective Equipment
- A09.Protective Clothing
- A10.Mixed Pesticides
- A11.Mixed Products
- A12.Protective Equipment
- A13.Protective Clothing
- A14.Licensed Applicator
- A15.Activities.Days
- A16.Colleague Symptom
- B01.Residence
- B02.Residence.Months
- B02.Residence.Years
- B03.Area
- B04.Proximity
- B05.Chemicals
- B06.Pest-Control Treatm
- B06.Pest Type
- B09.Treated Areas
- B10.Product Names
- B11.Product Formulation
- B12.Return Time
- B13.Pest-control usage
- B14.Products Applied
- B15.Protective Equipment
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies

GPRF / IEH Pesticides Study (Vn 1.6)

Select New Withdraw Back Next Save Print Quit

B13 The following list contains pest-control chemicals that you may have used in and around your home. Please indicate on how many days you used each type of chemical during the week before your symptoms developed and whether you used it more than usual that week. Do not include non-chemical pest control methods such as traps, cages, sonic devices or electrocution devices.

Chemical	Number of days using the chemical					More than usual?		
	none	1	2-3	4	don't know	no	yes	don't know
weed killer	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
treatments to kill roots, nettles, brambles, bracken or other vegetation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
treatments to kill aphids, greenfly, blackfly, whitefly, insect eggs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
wasp/bee killer	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
treatments to kill ants, cockroaches, silver weevils, woodlice or other insects	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
fungicidal paint	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
mould, mildew or rust fungus treatment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
tick or flea control (including flea collars)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
head lice treatment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
insect repellent	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other animal repellent	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
rat or mouse poison	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
slug or snail pellets	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
creosote, cuprol or other wood treatment or preservative	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
dog treatment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
treatment to kill algae, lichen, moss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
intestinal worm treatment (for pets)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other (specify)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

LIVE database Z990001PX

Start Novell-d... Novell Gr... GPRF / L... Pesticides Pesticide... Nurses M... 15:05

Pesticides Questionnaire

- A01.Employment
- A02.Occupation
- A03.Occupation Duration
- A04.Occupational Hazard
- A05.Chemical Application
- A06.Products Applied
- A07.Application Methods
- A08.Protective Equipment
- A09.Protective Clothing
- A10.Mixed Pesticides
- A11.Mixed Products
- A12.Protective Equipment
- A13.Protective Clothing
- A14.Licensed Applicator
- A15.Activities.Days
- A16.Colleague Symptom
- B01.Residence
- B02.Residence.Months
- B02.Residence.Years
- B03.Area
- B04.Proximity
- B05.Chemicals
- B06.Pest-Control Treatm
- B06.Pest Type
- B09.Treated Areas
- B10.Product Names
- B11.Product Formulation
- B12.Return Time
- B13.Pest-control usage
- B14.Products Applied
- B15.Protective Equipment
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies

B14 Please list the names of the products used. If you do not know the product name indicate what pests the chemical was used to control (e.g. ants, rats, greenfly etc.). Please indicate how much time you spent using the product that week, the product formulation and whether you had to mix it yourself.

Name of and total time (hours) using the product					Mixed yourself	
Product or pest name	< ½	½-1	1-4	4+	no	yes
FLEAS GO AWAY	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
WEED DESTROYER	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tick the formulation used

Product or pest name	aerosol, spray	liquid	gas	powder	gel	wax blocks	pellets, granules	other
FLEAS GO AWAY	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
WEED DESTROYER	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please specify other formulation(s)...

FOAM

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Start Novell-delv... Novell Grou... GPRF / IEH... Pesticides Pesticides N... Nurses Man... 15:43

Pesticides Questionnaire

- A01.Employment
- A02.Occupation
- A03.Occupation Duration
- A04.Occupational Hazard
- A05.Chemical Application
- A06.Products Applied
- A07.Application Methods
- A08.Protective Equipmer
- A09.Protective Clothing
- A10.Mixed Pesticides
- A11.Mixed Products
- A12.Protective Equipmer
- A13.Protective Clothing
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- B14.Products Applied
- B15.Protective Equipmer
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies

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Select New Withdraw Back Next Save Fresh Quit

B15 What items of personal protective equipment, if any, were you wearing? (*tick all that apply*)

none
 fabric or leather gloves
 fabric apron or overall
 face mask
 rubber apron
 rubber boots
 rubber gloves
 don't know
 other: please specify...

B16 Were your arms and/or legs covered (either by protective equipment or normal clothing)?

arms only
 legs only
 arms and legs
 neither
 don't know

B17 How did you decide the quantity of chemicals to use? (*tick all that apply*)

friends recommendation
 professionals/sales staff recommendation
 followed the label exactly
 used the label as a guidance
 previous experience
 other: please specify...

Pesticides Questionnaire

- A01.Employment
- A02.Occupation
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- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies

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B10 Where do you store pest-control chemicals at home? *(tick all that apply)*

don't store any at home
 garage/shed
 kitchen
 other outdoor area
 other indoor area

B19 How do you dispose of unwanted pest-control chemicals? *(tick all that apply)*

never dispose of any
 household rubbish bin
 pour down sink or toilet
 empty into street/drain
 pour on/bury in garden
 give away
 chemical disposal site
 other waste disposal site
 other: please specify...

B20 If you are aware of any of the following uses of pest-control chemicals during the week before your symptoms developed please tick the relevant statement(s). *(tick all that apply)*

other non-professional use in your home or garden (e.g. by friends, neighbours etc.)
 use of pest-control chemicals within 50m of your home by a neighbour
 use of pest-control chemicals within 50m of your home by a local authority

B21 Did anyone else in your household develop similar symptoms to you?

no
 yes
 don't know

Pesticides Questionnaire

- A01.Employment
- A02.Occupation
- A03.Occupational Duration
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- B14.Products Applied
- B15.Protective Equipmer
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies

LIVE database Z990001PX

GPRF / ICH Pesticides Study (Vn 1.6)

Save Next Previous Back Next Save Print Quit

C00 SECTION C - Hobbies and Leisure
 In Section C I would like to ask about your hobbies and leisure activities.

C01 What hobbies do you have or leisure activities do you undertake?
 CYCLING DEEPSEADIVING RUNNING

C02 Please indicate any potentially hazardous materials that you came into contact with through hobbies or leisure activities in the week before your symptoms developed. (This could be through your own hobbies or someone else's - for example another member of your household). If you answer 'yes' to any material please indicate how often you usually come into contact with it and whether you came into contact with it more than usual that week.

Material	Any use or contact with these materials?		How many days use or contact in a typical week?					More than usual?		
	no	yes	none	<1	1	2-3	4+	no	yes	don't know
solvents	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
disinfectants	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
degreasers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
acids	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other cleaning agents	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
glues or epoxies	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
lead or mercury	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
dusts or fibres	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
paints	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
solder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
engine oil	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other (specify)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pesticides Questionnaire

- A01.Employment
- A02.Occupation
- A03.Occupation Duration
- A04.Occupational Hazard
- A05.Chemical Application
- A06.Products Applied
- A07.Application Methods
- A08.Protective Equipmer
- A09.Protective Clothing
- A10.Mixed Pesticides
- A11.Mixed Products
- A12.Protective Equipmer
- A13.Protective Clothing
- A14.Licensed Applicator
- A15.Activities.Days
- A16.Colleague Symptom
- B01.Residence
- B02.Residence.Months
- B02.Residence.Years
- B03.Area
- B04.Proximity
- B05.Chemicals
- B06.Pest-Control Treatm
- B08.Pest Type
- B09.Treated Areas
- B10.Product Names
- B11.Product Formulation
- B12.Return Time
- B13.Pest-control usage
- B14.Products Applied
- B15.Protective Equipmer
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies

LIVE database Z990001PX

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Select New Withdraw Back Next Save Finish QUR

C03 Please indicate whether you did any of the following activities during the week before your symptoms developed. If you answer 'yes' to any activity please indicate how your symptoms were related to the activity.

Activity	Done activity in the past 4 weeks?			How were symptoms related to activity?			
	no	yes	don't know	started	got worse	not related	don't know
walking/rambling in the countryside	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
aeroplane flight abroad	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
swimming in sea, stream, lake or river	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
visiting a public park	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
playing golf/pitch and putt/putting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
visiting any other sports field	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
visiting a farm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C04 Can you think of any other activity that may have been related to your symptoms?

no

yes: please specify...

Pesticides Questionnaire

- A01. Employment
- A02. Occupation
- A03. Occupation Duration
- A04. Occupational Hazard
- A05. Chemical Application
- A06. Products Applied
- A07. Application Methods
- A08. Protective Equipmer
- A09. Protective Clothing
- A10. Mixed Pesticides
- A11. Mixed Products
- A12. Protective Equipmer
- A13. Protective Clothing
- A14. Licensed Applicator
- A15. Activities/Days
- A16. Colleague Symptom
- B01. Residence
- B02. Residence Months
- B02. Residence Years
- B03. Area
- B04. Proximity
- B05. Chemicals
- B06. Pest-Control Treatm
- B08. Pest Type
- B09. Treated Areas
- B10. Product Names
- B11. Product Formulation
- B12. Return Time
- B13. Pest-control usage
- B14. Products Applied
- B15. Protective Equipmer
- B16. Protective Clothing
- B17. Chemical Quantity
- B18. Storage
- B19. Disposal
- B20. Proximity
- B21. Other People
- C01. Hobbies

LIVE database Z990002PZ Harrison Ford 01/01/1980 M 14/06/2004 - DOOLITTLE

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Select New Withdraw Back Next Save Finish Quit

D00 **SECTION D - Suspected exposure to pest-control chemicals**

In section D I would like to ask you about any incident - or incidents - of exposure to pest-control chemicals that you think may have been related to your symptoms *and that we have NOT already discussed*.

D01 Are you aware of any incident of exposure to pest-control chemicals DURING THE WEEK BEFORE YOUR SYMPTOMS DEVELOPED and that we have not already discussed?

no yes

D02 This question is no longer used.

D03 This question is no longer used.

D04 Where did the incident happen?

home (indoors) greenhouse/shed

garden/allotment public area (e.g. park, forest)

field/farmland other place of occupation (e.g. work, college)

storage site other: please specify...

B15. Protective Equipmer

- B16. Protective Clothing
- B17. Chemical Quantity
- B18. Storage
- B19. Disposal
- B20. Proximity
- B21. Other People
- C01. Hobbies
- C02. Hazards
- C03. Activities
- C04. Other Activity
- D01. Incident
- D04. Location
- D05. Activity
- D06. Indoors
- D07. Ventilation
- D08. Weather
- D09. Contact
- D10. Protective Equipmer
- D11. Protective Clothing
- D12. Wash
- D13. Products
- D14. Formulation
- D15. Pests
- E01. Sex
- E03. Region
- E04. Origin
- E05. Interviews
- E06. New Symptoms
- E07. Symptoms Worsenir
- E08. Symptoms Changed
- E09. Symptoms Occasior
- E10. Symptoms Onset
- E11. Foods
- E12. Stress
- E13. Alcohol
- E14. Cigarettes
- E15. Other Smokers

LIVE database Z990001PX

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D05 Please indicate what you were doing at the time of the incident and (approximately) how long you were involved in that activity by ticking one box for each statement.

Statement	Time spent (hours)				
	<½	½-1	1-4	4+	N/A
I was applying the chemical(s)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
I was mixing the chemical(s)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
I was loading the chemical(s)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
I was washing/maintaining contaminated equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
I was handling/washing contaminated clothing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
I was affected by spray-drift	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I entered/touched a recently treated area/surface	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D06 Did the incident occur indoors (e.g. home, greenhouse, office, other building) or outdoors?

indoors outdoors

D07 Please indicate the level of ventilation at the time of the incident.

no ventilation (e.g. doors and windows closed, no extractor fan)

some ventilation (e.g. doors or windows partially open or extractor fan on)

well ventilated (e.g. doors and windows fully open)

don't know

LIVE database Z990001PX

- B15.Protective Equipmen
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies
- C02.Hazards
- C03.Activities
- C04.Other Activity
- D01.Incident
- D04.Location
- D05.Activity
- D06.Indoors
- D07.Ventilation
- D08.Weather
- D09.Contact
- D10.Protective Equipmen
- D11.Protective Clothing
- D12.Wash
- D13.Products
- D14.Formulation
- D15.Pests
- E01.Sex
- E03.Region
- E04.Origin
- E05.Interviews
- E06.New Symptoms
- E07.Symptoms Worsenir
- E08.Symptoms Changed
- E09.Symptoms Occasior
- E10.Symptoms Onset
- E11.Foods
- E12.Stress
- E13.Alcohol
- E14.Cigarettes
- E15.Other Smokers

GPRF / ICH Pesticides Study [Vn 1.6]

D08 What were the weather conditions at the time of the incident? (tick all that apply)

hot/humid hot/dry light rain
 heavy rain still (no breeze) light breeze
 windy snowing don't know
 other: please specify...

D09 How did you come into contact with the chemical(s)? (tick all that apply)

swallowing breathing in contact with skin
 contact with eyes don't know other: please specify...

D10 What items of personal protective equipment, if any, were you wearing? (tick all that apply)

none fabric or leather gloves fabric apron or overall
 face mask rubber apron rubber boots
 rubber gloves don't know other: please specify...

D11 Were your arms and/or legs covered (either by protective equipment or normal clothing)?

arms only legs only arms and legs neither don't know

LIVE database Z990001PX

- B15.Protective Equipmen
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies
- C02.Hazards
- C03.Activities
- C04.Other Activity
- D01.Incident
- D04.Location
- D05.Activity
- D06.Indoors
- D07.Ventilation
- D08.Weather
- D09.Contact
- D10.Protective Equipmen
- D11.Protective Clothing
- D12.Wash
- D13.Products
- D14.Formulation
- D15.Pests
- E01.Sex
- E03.Region
- E04.Origin
- E05.Interviews
- E06.New Symptoms
- E07.Symptoms Worsenir
- E08.Symptoms Changed
- E09.Symptoms Occasior
- E10.Symptoms Onset
- E11.Foods
- E12.Stress
- E13.Alcohol
- E14.Cigarettes
- E15.Other Smokers

GPRF / ICH Pesticides Study [Vn 1.6]

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D08 What were the weather conditions at the time of the incident? *(tick all that apply)*

hot/humid hot/dry light rain
 heavy rain still (no breeze) light breeze
 windy snowing don't know
 other: please specify...

D09 How did you come into contact with the chemical(s)? *(tick all that apply)*

swallowing breathing in contact with skin
 contact with eyes don't know other: please specify...

D10 What items of personal protective equipment, if any, were you wearing? *(tick all that apply)*

none fabric or leather gloves fabric apron or overall
 face mask rubber apron rubber boots
 rubber gloves don't know other: please specify...

D11 Were your arms and/or legs covered (either by protective equipment or normal clothing)?

arms only legs only arms and legs neither don't know

B15.Protective Equipmen
 B16.Protective Clothing
 B17.Chemical Quantity
 B18.Storage
 B19.Disposal
 B20.Proximity
 B21.Other People
 C01.Hobbies
 C02.Hazards
 C03.Activities
 C04.Other Activity
 D01.Incident
 D04.Location
 D05.Activity
 D06.Indoors
 D07.Venilation
 D08.Weather
 D09.Contact
 D10.Protective Equipmen
 D11.Protective Clothing
 D12.Wash
 D13.Products
 D14.Formulation
 D15.Pests
 E01.Sex
 E03.Region
 E04.Origin
 E05.Interviews
 E06.New Symptoms
 E07.Symptoms Worsenir
 E08.Symptoms Changed
 E09.Symptoms Occasior
 E10.Symptoms Onset
 E11.Foods
 E12.Stress
 E13.Alcohol
 E14.Cigarettes
 E15.Other Smokers

LIVE database 2990001PX

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D12 After coming into contact with the chemical(s) approximately how long was it before you washed your hands or took a shower/bath?

	<10 mins	10-29 mins	30-59 mins	1-4 hours	4+ hours	don't know
wash hands	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
shower/bath	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

D13 Please name the products involved if known.

DON'T KNOW

D14 What was the product formulation? (tick all that apply)

liquid (aerosol) liquid (spray) liquid

gel granules/pellets dust/powder

wax blocks smoke/gas don't know

other: please specify...

D15 What type of pest(s) was the chemical used to control? (tick all that apply)

weeds, roots, vegetation mould or mildew woodworm

flying or crawling insects mice or rats don't know

other: please specify...

- B15.Protective Equipmer
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies
- C02.Hazards
- C03.Activities
- C04.Other Activity
- D01.Incident
- D04.Location
- D05.Activity
- D06.Indoors
- D07.Ventilation
- D08.Weather
- D09.Contact
- D10.Protective Equipmer
- D11.Protective Clothing
- D12.Wash
- D13.Products
- D14.Formulation
- D15.Pests
- E01.Sex
- E03.Region
- E04.Origin
- E05.Interviews
- E06.New Symptoms
- E07.Symptoms Worsenir
- E08.Symptoms Changed
- E09.Symptoms Occasior
- E10.Symptoms Onset
- E11.Foods
- E12.Stress
- E13.Alcohol
- E14.Cigarettes
- E15.Other Smokers

LIVE database Z990001PX

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E00 SECTION E - About you
In Section E I would like to ask you for some information about yourself.

E01 What is your sex?
 male female

E02 This question is no longer used.

E03 Where do you live?
 SE England SW England E England
 Midlands N England Wales
 S Scotland Central Scotland N Scotland

E04 What is your ethnic origin?
Select a type from the left-hand box, sub-types for that category will appear in the right-hand box. Select a sub-type. If the sub-type is other, please specify by typing in the box provided.

white british
 mixed irish
 asian or asian british other white origin, specify...
 black or black british
 chinese or other

E05 How many times have you been interviewed for this study (including this one)? 01

LIVE database Z990001PX

- B15.Protective Equipmen
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies
- C02.Hazards
- C03.Activities
- C04.Other Activity
- D01.Incident
- D04.Location
- D05.Activity
- D06.Indoors
- D07.Ventilation
- D08.Weather
- D09.Contact
- D10.Protective Equipmen
- D11.Protective Clothing
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- D13.Products
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- E11.Foods
- E12.Stress
- E13.Alcohol
- E14.Cigarettes
- E15.Other Smokers

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E06 Did you visit the GP because of new symptoms occurring?
 no yes

E07 Did you visit your GP because of existing symptoms getting worse?
 no yes

E08 How have your symptoms changed since you visited your GP?
 gone improved same worse

E09 Do/did you notice any change in your symptoms (i.e. do they get better or worse) during any of these occasions?

	better	worse	no change
at work	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
at home	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
at the weekends	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

E10 When did the onset or worsening of your symptoms first occur?
07/06/2004

LIVE database Z990001PX

- B15.Protective Equipmen
- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies
- C02.Hazards
- C03.Activities
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- D13.Products
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- E11.Foods
- E12.Stress
- E13.Alcohol
- E14.Cigarettes
- E15.Other Smokers

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Select New Withdraw Back Next Save Print Quit

E11 During the week before your symptoms developed did you come into contact with any foods, beverages or other substances that you are sensitive to (e.g. those that give you a runny nose, heartburn, bloating etc.) or cause allergic reactions (e.g. those that cause rash, wheezing etc.)

no don't know yes: please specify... DAIRYPRODUCT PERFUME

E12 Have you suffered any major stresses during the last 4 weeks? (e.g. bereavement, separation, moving house, change of job, illness in someone close)

no yes

E13 During an average week how many units of alcohol do you drink? (1 unit = half a pint of beer or 1 glass of wine or 1 measure of spirits)

none 1 - 7 8 - 14 15 - 21 22 - 28 29+

E14 On an average day approximately how many cigarettes do you smoke?

none 1 - 10 11 - 20 21 - 40 41 - 60 61+

E15 Does anyone else in your household smoke?

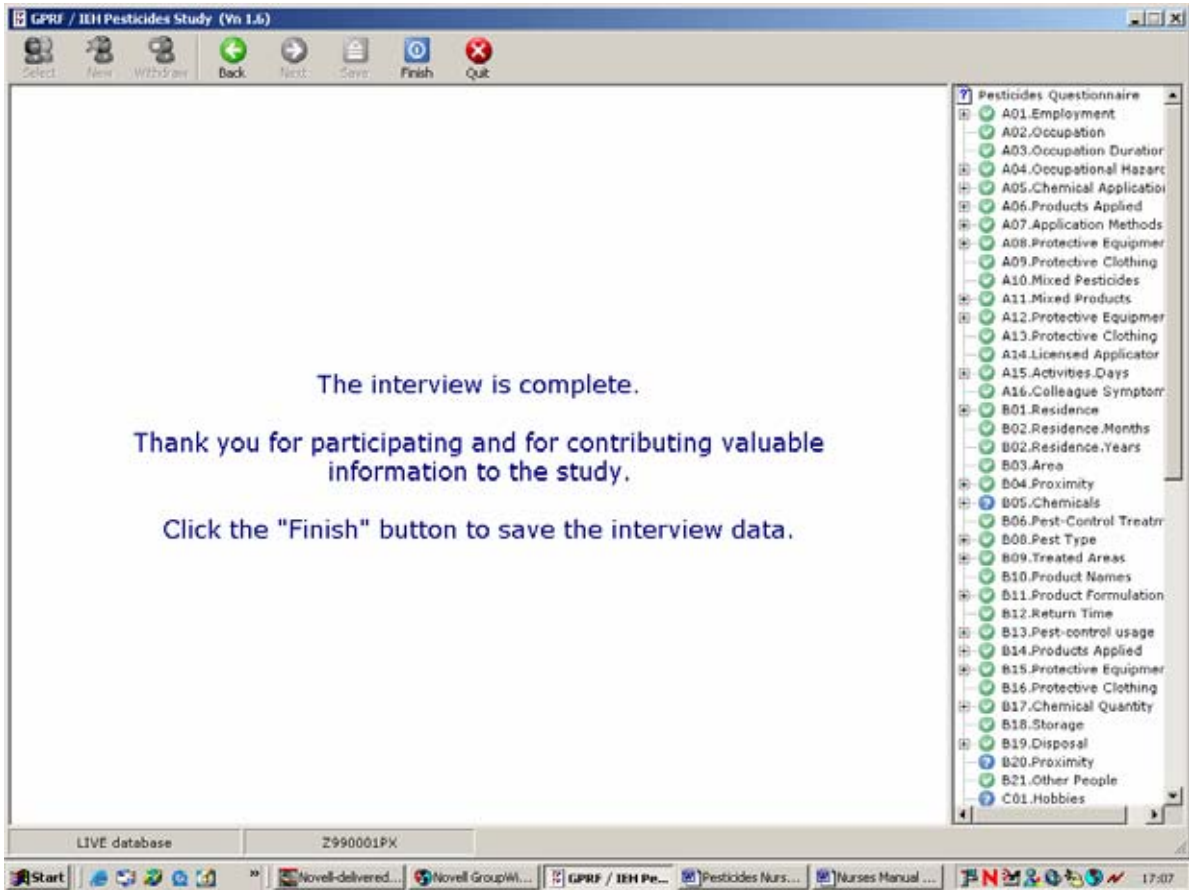
no yes

Pesticides Questionnaire

- A01.Employment
- A02.Occupation
- A03.Occupation Duration
- A04.Occupational Hazard
- A05.Chemical Application
- A06.Products Applied
- A07.Application Methods
- A08.Protective Equipmer
- A09.Protective Clothing
- A10.Mixed Pesticides
- A11.Mixed Products
- A12.Protective Equipmer
- A13.Protective Clothing
- A14.Licensed Applicator
- A15.Activities.Days
- A16.Colleague Symptom
- B01.Residence
- B02.Residence.Months
- B02.Residence.Years
- B03.Area
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- B05.Chemicals
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- B16.Protective Clothing
- B17.Chemical Quantity
- B18.Storage
- B19.Disposal
- B20.Proximity
- B21.Other People
- C01.Hobbies

LIVE database Z990001PX

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APPENDIX 3 PATIENT INFORMATION

INVITATION LETTER

Dear

The practice has agreed to help with a study looking at the possibility that some patients' symptoms could be related to the use of pesticides. This is a national study and is funded by the Health and Safety Executive. We would like to invite you to take part in this study.

Recently a Government committee recommended the development of a scheme that allows doctors to report cases of ill health that might be caused by pesticides. This study is trying to find out if such a scheme is possible. The study is led by Dr Madge Vickers, Head of the Medical Research Council's General Practice Research Framework (GPRF). The study has been approved by a Research Ethics Committee.

If you agree to join this study, you will be asked to attend the surgery for an appointment with the nurse who will complete a questionnaire on a laptop computer by asking you questions about yourself, your health and any contact you may have had with pesticides. We would like you to attend even if you are now feeling better.

We have enclosed an information sheet that describes the study in more detail. We hope that it will answer some of the questions you may have about taking part. However, if you would like to ask any other questions about the research, please feel free to get in touch with XXXXXXXX at the surgery or Ken Whyte at the Medical Research Council (GPRF) in London on 020 7670 4858, who will be happy to answer your questions. If you wish they will take your details and ring you back.

It would be very helpful if you could return the completed reply slip in the stamped addressed envelope provided even if you do not want to take part in the research. If you do not want to take part, this would save us troubling you with a reminder or sending you more letters about the study in the future.

While your help in this project would be greatly appreciated, it is completely voluntary. If you do not want to take part, it will not affect the care you receive from the surgery in any way.

Many thanks for your help.

Yours sincerely

Signed by lead GP at the practice

Enc.

PATIENT INFORMATION SHEET

Invitation

You are being invited to help with a research study looking at the possibility that some patients' symptoms could be related to the use of pesticides. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. If you would like further information about the study you can contact us at the address given at the end of this information sheet or discuss it with the research nurse at the practice.

What is the purpose of the study?

Pesticides are used widely in all areas of life. Before the Government allows a pesticide to be sold it must have been through rigorous scientific tests. Also the Government seeks to collect as much information as possible about any ill effects of pesticides once they are on the market. Recently a Government committee recommended the development of a scheme that allows General Practitioners (GPs) to report the cases of incidence of ill health that might be caused by pesticides. This study will tell us whether such a scheme is possible.

Why have I been chosen?

Patients in practices around the country are being asked to join this study and answer a questionnaire to see if their symptoms could possibly have occurred after being in contact with pesticides. It is completely up to you to decide whether or not to take part.

Do I have to take part?

No. The practice nurse at the surgery is contacting a sample of patients who have consulted their GP to ask if they will help. If you do decide to take part you are still free to withdraw at any time and you do not have to give a reason. If you do decide not to take part or to withdraw from the study this will not affect the care you receive from the practice.

What will happen to me if I take part?

You will be asked to come into the practice to see the research nurse. The nurse will tell you more about the study. You can ask questions if you want. If you still want to take part after this the nurse will complete a questionnaire on a laptop computer by asking you a number of questions about you, your symptoms, your health, and any contact you may have had with pesticides. This visit will take approximately one hour.

What are the possible risks of taking part?

No new medicines or treatments are being tested. We will only be collecting information from you so there should be no risks from taking part in this research.

Will my taking part in this study be kept confidential?

All information is treated in accordance with the Data Protection Act. Your name, address or any identifying details will not be included in the questionnaires sent to the researchers. When the nurse enters your information onto the computer a study number will be used instead of your name and address. This means that the information is kept anonymous. The researchers may look at your medical records in the future and assess your health by looking at national records. For this the researchers will need your name and NHS number and will seek your consent for this. The practice will then supply this information on a separate secure list.

What will happen to the results of the research study?

The results of the study will be used to decide whether a national system to identify pesticide related illness should be set up within general practice. It is anticipated that the results of the

study will be published a year after the conclusion of the research. No person will be able to be identified within any publication.

Who is funding the research?

The Health and Safety Executive is funding this study.

What if I still want further information?

If you have any problems, concerns or other questions about this study, you should contact Mr Ken Whyte at the MRC General Practice Research Framework, Stephenson House, 158-160, North Gower Street, London, NW1 2ND. Telephone 020 7670 4858. Email: NAMED GPRF STAFF OR RESEARCH NURSE at the surgery.

Thank you for reading this document and if you choose to take part in the study please keep this information sheet.

CONSENT FORM

Title of Project: General practitioner based scheme for monitoring pesticide related illness

Patients name.....Study Number.....

NHS number..... Please initial each box

I confirm that I have read and understood the information sheet.

I confirm that I have had the opportunity to ask questions and discuss the study with the research nurse.

I have received satisfactory answers to all my questions.

I fully understand the study.

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without the medical care I receive from the practice being affected in any way.

I understand that any information I give will be passed to the researchers involved in the project and will be kept completely confidential at all times.

I understand that I will not be identified by name in any report made about the research.

I consent to the practice nurse examining my medical records in the future, to find out about my health care and supplying this information to the research team.

I agree that the researchers may look at my medical records in the future and assess my health by looking at national records for which they will use my name and NHS number.

Signed

Participant

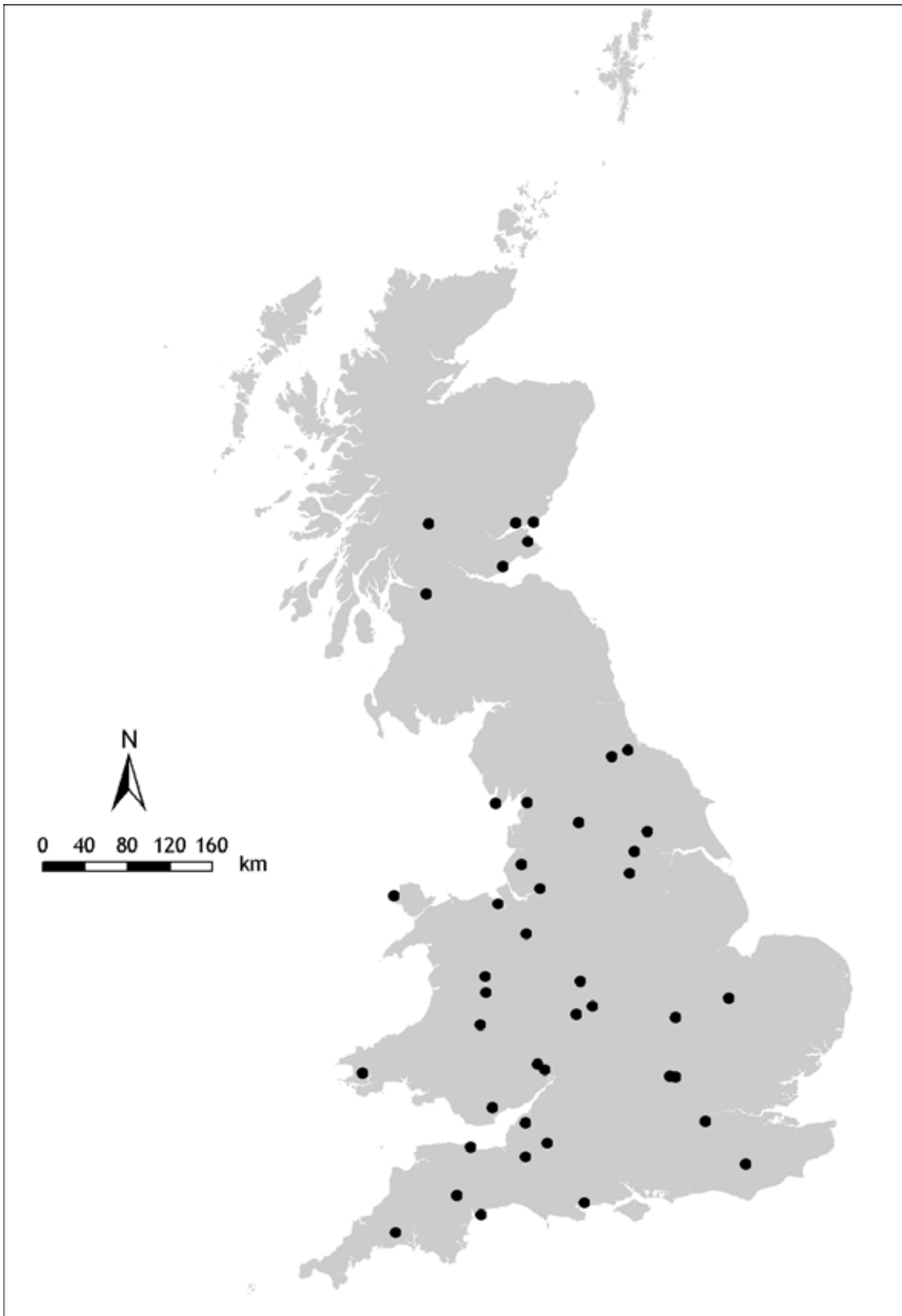
Date.....

Research Nurse.....

Date.....

One copy to co-ordinating centre, middle copy in patient notes and bottom copy to the patients

APPENDIX 4 LOCATIONS OF THE PARTICIPATING PRACTICES



APPENDIX 5 GP FOLLOW-UP QUESTIONNAIRE



Department of Epidemiology and Public Health
Praed Street, St Mary's Campus
Norfolk Place, Paddington, London W2 1PG, UK
Tel: +44 (0)20 7594 1802 Fax: +44 (0)20 7594 3196
l.rushton@imperial.ac.uk

Dr Lesley Rushton OBE

Principal Research Fellow

Dear,

Pesticide Related Illness Study

Thank you very much for all your hard work in completing the checklists for the pesticide study. We are asking all participating GP's to complete this short feedback questionnaire.

1. Did you generally find completion of the checklist

straightforward/quick [] difficult/time consuming []

2. We are interested in finding out what criteria you used to decide whether a patient had symptoms that were likely or possibly related to exposure to pesticides.

a. What were the criteria that you GENERALLY used to decide whether the patient had symptoms that were POSSIBLY related to pesticides.

Please tick only one category below

- (i) the symptoms or group of symptoms []
(ii) activity when the symptoms occurred as discussed during the consultation, eg. gardening []
(iii) combinations of (i) and (ii) []
(iv) pesticide use was mentioned during the consultation []
(v) other please specify []

b. What were the criteria that you GENERALLY used to decide whether the patient had symptoms that were LIKELY related to pesticides.

Please tick only one category below

- (i) the symptoms or group of symptoms []
(ii) activity when the symptoms occurred as discussed during the consultation, eg. gardening []
(iii) combinations of (i) and (ii) []

- (iv) pesticide use was mentioned during the consultation
- (v) other please specify

3. Do you have any further comments about the study

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Thank you for your co-operation. Please return this questionnaire back to Helen Pedersen on 0207 594 3196.

Thank you once again for participating in the study. We will send you the results in due course.

Yours sincerely
Lesley Rushton

Estimating the prevalence and incidence of pesticide-related illness presented to General Practitioners in Great Britain

The aim of this study was to investigate the nature and extent of pesticide-related illness presenting to and diagnosed by General Practitioners (GPs). A screening checklist was completed by GPs for patients over the age of 18. Patients were classified as eligible for a detailed interview if: exposure was specifically mentioned by patients; there were serious acute symptoms; the patient had newly occurring flu type, respiratory, gastrointestinal, skin, eye or acute neurological symptoms and the GP thought that symptoms were not definitely not related to pesticide exposure.

Checklists were completed for 59320 patients from 43 practices and 1335 interviews were carried out. The annual prevalence and incidence of illness reported to GPs because of concern about pesticide exposure were 0.07% and 0.04% respectively (42 and 24 patients). The annual prevalence and incidence of consultations where symptoms were diagnosed by GPs as likely to be related to pesticide exposure were 0.01% and 0.003% respectively, with estimates of prevalence and incidence of symptoms possibly related to pesticide-related symptoms being 2.7% and 1.64%. Although small these estimates give relatively large number of consultations annually. Limited information on actual chemicals and active ingredients of pesticides restricted the study's ability to establish a definite causal relationship between pesticide exposure and symptoms.

There was widespread use of pesticides in the home environment but unsatisfactory use of product labels and precautionary measures, and storage and disposal of pesticides were also poor. Among the patients who were interviewed, the risk of patients being categorised by their GP as having symptoms possibly compared to unlikely to be related to pesticide exposure was associated with home use of pesticides and also with change of use of several other chemicals in the home in the week before the consultation.

The amount of data and the effort required to obtain it suggests that it would not be feasible to use the same methods more generally in GB for monitoring pesticide related illness reported and diagnosed in Primary Care.

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