

Health surveillance for occupational asthma in the UK

D. Fishwick¹, D. Sen², P. Barker², A. Codling¹, D. Fox¹ and S. Naylor¹

¹Centre for Workplace Health, Health and Safety Laboratory, Buxton, Derbyshire SK173JN, UK, ²Health and Safety Executive, Redgrave Court, Bootle, Merseyside L20 7HS, UK.

Correspondence to: D. Fishwick, Centre for Workplace Health, Health and Safety Laboratory, Harpur Hill, Buxton, Derbyshire SK173JN, UK. Tel: +44 (0)12 9821 8445; e-mail: d.fishwick@sheffield.ac.uk; david.fishwick@hsl.gsi.gov.uk

Background	Periodic health surveillance (HS) of workers can identify early cases of occupational asthma. Information about its uptake and its content in the UK is lacking.
Aims	To identify the overall levels of uptake and quality of HS for occupational asthma within three high-risk industry sectors in the UK.
Methods	A telephone survey of employers, and their occupational health (OH) professionals, carried out in three sectors with exposures potentially capable of causing occupational asthma (bakeries, wood working and motor vehicle repair).
Results	A total of 457 organizations participated (31% response rate). About 77% employed <10 people, 17% between 10 and 50 and 6% >50. Risk assessments were common (67%) and 14% carried out some form of HS for occupational asthma, rising to 19% if only organizations reporting asthma hazards and risks were considered. HS was carried out both by in-house (31%) and external providers (69%). Organizational policies were often used to define HS approaches (80%), but infrequently shared with the OH provider. OH providers described considerable variation in practice. Record keeping was universal, but worker-held records were not reported. HS tools were generally developed in-house. Lung function was commonly measured, but only limited interpretation evident. Referral of workers to local specialist respiratory services was variable.
Conclusions	This study provided new insights into the real world of HS for occupational asthma. We consider that future work could and should define simpler, more practical and evidence-based approaches to HS to ensure maximal consistency and use of high-quality approaches.
Key words	Flour; health surveillance; industry; occupational asthma; wood.

Introduction

Occupational asthma remains a relatively common occupational respiratory disease. The Health and Safety Executive (HSE) estimated that in 2013, there were 177 new cases of occupational asthma seen by respiratory physicians and that this figure was likely to be an underestimate [1]. Occupations with the highest numbers of new cases per year between 2011 and 2013 were vehicle paint technicians, bakers and flour confectioners.

Occupational asthma is a largely preventable condition [2], and early recognition is important. The diagnosis is associated with adverse personal, workplace, health care and societal costs and earlier removal from causative exposure improves prognosis [3]. Even if cases cannot

entirely be prevented, it is important to identify them early. Various risk-based approaches are used to prevent occupational asthma. Periodic health surveillance (HS) is one such method, used in conjunction with other approaches, that can identify early cases [4,5] so that remedial action can be taken at work not only to reduce progression of the index case, but also to protect similarly exposed co-workers. HS is required by UK law in certain circumstances, notably where there is a residual risk to health when all risk reduction measures identified as necessary by risk assessment have been undertaken [6]. Despite this, there is remarkably little information on the levels of uptake and the quality of HS.

We therefore present the findings of a study designed to identify the overall levels of uptake and quality of HS

for occupational asthma within three high-risk industry sectors in the UK.

Methods

We performed a telephone survey of UK-based organizations with workers thought to be at increased risk of developing occupational asthma, based on their likely exposures. Both the employers and their occupational health (OH) service providers were surveyed. Workplaces with likely flour exposure (termed FLOUR), wood dust exposure (termed WOOD) and motor vehicle repair organizations (termed MVR) were chosen.

A power calculation identified the size of the study population needed, based on the precision with which this study could estimate uptake of HS. Assuming a sample size of 500 participating organizations and an uptake of HS of 33%, the margin of error around this *a priori* point was expected to be $\pm 4\%$. In order to recruit 500 organizations, a list of standard industrial classification (SIC) codes was used to establish a study sampling frame (of ~1800 companies) working in the three chosen industry sectors. Recruitment was also carried out to ensure that the frequencies of micro (up to 10 employees), small (up to 50), medium (up to 250) and large (above 250 employees) workplaces were similar to the national proportion for each chosen sector.

We then carried out a telephone survey of employers and, where relevant, their OH service providers. Two proformas, used to record information (one for use during the employer interview and one for use during the OH professional interview), were developed by the research team. Telephone interviews were carried out by an independent company [7] after sourcing company details using the SIC codes relevant to the chosen sectors [8]. Following an initial pilot exercise of 50 interviews, the remaining employers were contacted until the target numbers were met. The interviewer asked to speak to a key representative (managerial and OH professionals where appropriate) for each organization.

We compiled descriptive statistics for the variables of interest. Chi-squared tests of proportions with 95% confidence intervals (95% CIs) were used to examine any significant differences between, and within, sectors. All analyses were performed in SPSS (version 16.0, IBM SPSS Inc., Chicago, IL) and statistical significance was taken at the 5% level.

Results

A total of 1757 organizations were invited to participate: 457 agreed, 291 could not be contacted and 1009 refused. The overall response rate was 31%.

Interviews with 153 FLOUR organizations were completed; 66% employed <10 people, 22% employed 10–50,

whilst 12% employed >50. About 65% were craft bakeries, 13% plant bakeries and 11% in store. Interviews with 149 WOOD organizations were completed; 78% employed <10 people, 18% employed 10–50, whilst only 4% employed >50. About 59% reported working with a range of wood types, including hardwoods, softwoods and composites such as medium density fibreboard. Smaller proportions worked only with softwoods (11%), composites, (7%) or hardwoods (5%). Interviews with 155 MVR organizations were completed; 86% employed <10 people, 12% employed 10–50, whilst only 2% employed >50. Only 27% (23% reported using two-pack spray paints) self-reported the presence of specific occupational asthma risks in their workplace. The equivalent figures for WOOD and FLOUR were, respectively, 52 and 62%.

The reported presence of occupational asthma risks increased significantly with the size of organization: 42% in micro, 59% in small and 81% in medium/large organizations ($P < 0.001$). Nearly half of those interviewed who reported the absence of exposure to agents that might cause occupational asthma in their workplaces (45%) attributed this view to the fact that no such exposures occurred. A similar proportion (51%) considered that whilst exposure to such agents did occur, they were well controlled and therefore posed an insignificant risk.

Fourteen per cent (95% CI 11–17.5%) of all companies reported carrying out HS, varying between sectors as follows: 9% of WOOD, 15% of MVR and 18% of FLOUR. Organization size also influenced the propensity for HS, with surveillance occurring more often in larger organizations: 7% of micro, 24% of small and 74% of medium and large organizations. However, if just those organizations actually reporting occupational asthma risks are considered, as shown in Table 1, 19% (95% CI 14.1–25.0) carried out HS, with the majority of medium and large enterprises doing so.

Table 2 illustrates answers to questions on risk perception. A significant proportion of organizations did not report the presence of occupational asthma risks. Respondents attributed this either to absence of relevant exposures or to control of those present. Risk assessments were commonly reported as having been performed, in 66% of FLOUR, 72% of WOOD and 65% of MVR organizations. Assessments were also significantly more likely ($P < 0.001$) to be completed in small (91%) and medium/large enterprises (100%) than in micro enterprises (60%), and commonly involved input from workers.

Table 3 illustrates the extent to which OH provision and surveillance for occupational asthma appear to be based on existing HSE guidance, although specific details were difficult to identify. HS was mostly provided by external contractors, either by an OH nurse or other responsible person. The three most common reasons influencing the choice of external provider were recommendation, locality and competence. Most organizations had an organizational policy for managing workers exposed to

Table 1. Uptake of HS in organizations reporting the presence of occupational asthma risks in the workplace

Sector/business size	Number of organizations reporting that HS was carried out/total number ^a	% (95% CI)	<i>P</i> value ^b
Bakery	23/95	24.2 (16.0–34.1)	NS
Woodworking	11/78	14.1 (7.3–23.8)	
Motor vehicle repair	7/42	16.7 (7.0–31.4)	
Micro (<10)	12/146	8.2 (4.3–13.9)	<0.001
Small (<50)	10/47	21.3 (10.7–35.7)	
Medium/large (<250/250+)	19/22	86.4 (65.1–97.1)	
All	41/215	19.1 (14.1–25.0)	–

NS, non-significant.

^aDenominator: all organizations which self-reported the presence of occupational asthma risks.^bDifference between all three categories; chi-squared test of proportion.**Table 2.** Responses by reported occupational asthma-related risks and risk assessments

Questionnaire item	Bakers (total 153), <i>n</i> /total (%)	Woodworkers (total 149), <i>n</i> /total (%)	Motor vehicle repairers (total 155), <i>n</i> /total (%)
Reported occupational asthma risks in workplace? ^a			
Yes	95/153 (62)	78/149 (52)	42/155 (27)
No	56/153 (37)	65/149 (44)	107/155 (69)
Missing	2/153 (1)	6/149 (4)	6/155 (4)
If no; why?			
No exposures	23/56 (41)	22/65 (34)	62/107 (58)
Exposures controlled	33/56 (59)	43/65 (66)	45/107 (42)
Yes to risk assessments carried out in workplace? ^b			
Developed with OHPs?	27/101 (27)	36/107 (34)	41/101 (41)
Developed with workers?	69/101 (68)	89/107 (83)	83/101 (82)
No to risk assessments carried out in workplace?			
Because,	52/153 (34)	42/149 (28)	54/155 (35)
Alternative	3/52 (6)	2/42 (5)	4/54 (7)
No need	47/52 (90)	34/42(81)	40/54 (74)
No time	1/52 (2)	0/42 (0)	3/54 (6)
Do not know how	2/52 (4)	4/42 (9)	5/54 (9)
Missing	0/52 (0)	2/42 (5)	2/54 (4)

OHPs, occupational health professionals.

^aAnswer to the question 'Are there any activities or processes where workers can breathe in dust or aerosols at your company that might cause occupational asthma (e.g. flour, enzymes (bread improvers), hard woods, soft woods, wood composites, two pack paints)?'^bAnswer to the question 'Does your company carry out a risk assessment of the workplace to help identify and control any agents that might cause asthma?'

asthmagens, and such policies were reported as being one of the principal reasons for deciding which workers required HS. These policies were not always shared with the OH service provider; only 36% shared this information. Furthermore, OH service providers appeared to not always visit the workplace. In 80% of cases, the workplace had been visited at some time, and of these 44% were visited by an OH service provider more than once a year.

New employees more often than not (70%) had undergone an initial health check but thereafter the frequency of HS varied. For example, whilst most organizations carried out at least yearly surveillance, the remainder provided it less frequently. Approximately one-third of the 64 organizations reported that outputs from HS included recommendations on fitness for work and restriction of exposure for at-risk workers. These

recommendations in many cases lead to subsequent actions, including review of risk assessments, reduction of exposures and removal of certain workers from exposure. The latter is detailed in Table 3.

Responses from the OH service providers were much more limited, with only 11 respondents providing details. Of these, most confirmed use of HSE guidance (a combination of MS25 [9], no longer available on the HSE website, and G402 [5]) and a written procedure to assist provision of HS. Only a minority used either a risk assessment (36%) or a workplace policy or procedure (18%) to help formulate the scheme. Whilst most (64%) did not visit the workplace prior to formulating HS, the majority (91%) reported either regularly meeting or communicating with the organization in order better to understand likely workplace exposures.

Table 3. Details of OH and HS provision supplied by the 64 organizations reporting HS for occupational asthma

Questionnaire item	<i>n</i>	95% CI limit (lower–upper)
Yes to use of HSE guidance on HS?	47/64 (73)	60.9–83.7
Specific HS guidance used?		
General guidance 1 ^a	4/64 (6)	1.7–15.2
General guidance 2 ^b	5/64 (8)	2.6–17.3
Who carries out HS?		
In-house provider	20/64 (31)	20.2–44.1
External provider	44/64 (69)	55.9–79.3
Reason for choice of external provider? ^c		
Competence	10/44 (23)	11.5–37.8
Well known	6/44 (14)	5.2–27.4
Cost	6/44 (14)	5.2–27.4
Local	17/44 (39)	24.4–54.5
Recommended	19/44 (43)	28.4–59.0
Who carries out HS?		
OH doctor	4/64 (6)	1.7–15.2
GP	6/64 (9)	3.5–19.3
OH nurse	18/64 (28)	17.6–40.8
OH technician	7/64 (11)	4.5–21.3
Other responsible person	29/64 (45)	32.8–58.3
Do you check qualifications? ^d	20/28 (71)	51.3–86.8
How is it decided which workers need HS?		
Policy	32/64 (50)	37.2–62.8
Risk assessment	34/64 (53)	40.2–65.7
OHP decides	10/64 (16)	7.8–26.9
Management decides	23/64 (36)	24.3–48.9
Actions taken following feedback from OHP?		
Review risk assessment	25/64 (39)	27.1–52.1
Reduce exposure	21/64 (33)	21.6–45.7
Remove from exposure	14/64 (22)	21.5–34.0
None of above	22/64 (34)	23.0–47.3
Actions taken to reduce exposure?		
PPE given	18/21 (86)	63.7–97.0
PPE checked	15/21 (71)	47.8–88.7
Controls checked	16/21 (76)	52.8–91.8
Worker training	18/21 (86)	63.7–97.0
Manager training	16/21 (76)	52.8–91.8

OHP, occupational health professional; PPE, personal protective equipment.

^aG402—HS for occupational asthma.

^bMS25—medical guidance for workers exposed to occupational asthmagens.

^cCategories not mutually exclusive.

^dDenominator includes OH doctor, GP and OH nurse only.

Workers requiring HS were identified either by using a risk assessment or an employer policy, or a combination of these. In only two cases were these decisions made by the employers themselves. Only approximately half of respondents confirmed that an initial health assessment was carried out prior to exposure. In terms of the frequency and content of the HS, this appeared to be mostly performed annually and consisted of a questionnaire and lung function testing by an OH nurse (82%), occupational physician (55%), general practitioner (GP; 45%) or technician (45%; multiple responses were possible).

In terms of HS tools, questionnaires were commonly developed ‘in-house’, although three providers noted that an HSE questionnaire was used. There were varied

responses to questionnaire items that helped fitness-to-work decisions; ranging from ‘full history’ to ‘sensitization’ to ‘smokers and symptomatic, breathless’. Lung function was commonly measured using a calibrated spirometer (73%), mostly according to a written procedure. Results were compared with predicted values (73%) and most assessed for accelerated annual decline in lung function (73%). Approximately half compared lung function values with questionnaire responses and workers with abnormal results were referred equally often to occupational nurses, occupational physicians and GPs. Onward referral for a specialist medical opinion was identified as possible by most respondents (73%), normally via the GP, although there were mixed feelings

about the availability and quality of local respiratory specialist expertise.

Record keeping of HS data was universal, although content varied from fitness to work only to medical diagnoses and recommendations (or restrictions) relating to exposures for individual workers. Feedback of information to the workplace, in anonymous format, appeared common. Notably, however, the majority of OH service providers (64%) had not previously worked with the employer to develop a procedure for handling abnormal results.

Discussion

This study found the uptake of HS for occupational asthma in targeted work sectors to be low with between 14 and 19% of organizations carrying HS out. The latter is a figure based only on those organizations reporting the presence of occupational asthma risks at work. Interestingly, given the higher-risk sectors targeted, these risks themselves were reported in relatively low proportions (overall only 47% of all respondents). Risk assessments were by contrast commonly carried out, although not required by law in those organizations employing five people or fewer.

Three sector types were successfully targeted, although overall the response rate was low at 31%. This low response is typical in such surveys and undoubtedly limits the generalizability of the data. Whilst it would have been ideal to compare respondents and non-respondents to assess the representativeness of the participating sample, our study design did not permit this inference.

These findings might be attributed to the absence of exposure to agents known to cause occupational asthma in many of the workplaces surveyed or may signify that such exposures are well controlled and therefore not regarded as posing a risk to health. Possible ignorance of risks could be an additional contributing factor. The design of this study did not allow further inference here, although future work could formally assess workplace risk assessments and required actions. It is reasonable to conclude, however, that levels of uptake are relatively low in high-risk industrial sectors, and this finding is comparable to that of a similar study of the uptake of HS in noise- and vibration-exposed workers [10].

The level of uptake of HS was also found to vary significantly with business size. Levels were markedly higher in larger organizations, but perhaps of more concern were the low levels of uptake in businesses employing <10 workers, given that economic activity data suggest that three-quarters of businesses fall into this size category [8]. In assessing the quality of HS provided, our findings suggested that its content was based on some form of formal or accepted guidance, although the source of that guidance appeared to vary

widely, even within a sector. Similarly, a mix of internal (the minority) and external OH services provided HS; the latter most commonly selected due to their locality and from recommendations, although competence was also cited as a reason for the choice.

HS was delivered primarily by nursing personnel or other responsible persons at work, often incorporating a 'new employee' check. It was less clear exactly how HS programmes were developed, with only approximately half of organizations noting that there were associated policies and risk assessments. This low figure may truly reflect the development process or may in part reflect lack of knowledge on the interviewee's part. HS was carried out either annually or more frequently, but only one-third of organizations reported receiving advice on fitness to work, for example. Again, the design of this study did not allow further inference here in relation to the actual content and quality of the HS described. Site visits, audits or other process assessments were not carried out, due to study design constraints. Despite these limitations, it is clear that the content and quality of HS varies across sector and organizational size.

The limited number of responses to the OH service provider survey adds a further dimension to the overall findings. Responses were generally concordant with those of the survey of employers. Whilst it was not possible to be certain that this small sample was representative of all relevant OH service providers, it was evident that HSE guidance is used to some extent to formulate HS procedures. A particular concern was that few OH service providers reported using a risk assessment from the worksite to help inform their approach to HS. It is difficult to identify exactly how a risk-based HS system could have been formulated in the absence of such information from the workplace.

HS tools, such as questionnaires, appeared to be developed predominantly in-house, although certain OH service providers cited an HSE questionnaire as a source. There is thus an opportunity to develop more consistent approaches to questionnaire usage, which could also address some of the historic concerns over their utility [11]. Lung function appeared to be measured appropriately, at least according to the reported processes, with the majority calibrating relevant equipment. However, there was a lack of comparison of spirometric measures, and consideration of annual decline in lung function values, with individual questionnaire responses. Linkage of these measures is an important aspect of the overall worker assessment in this context [4].

Whilst employers did not commonly report fitness-to-work statements as a reportable outcome from OH professionals, the latter group noted that this outcome was commonly evaluated. Finally, whilst respondents identified access and referral to local respiratory specialists as possible, the OH service providers often questioned the usefulness of advice when it was received.

Overall, this study provides new insights into the real-world practice of HS for occupational asthma. Uptake was generally identified to be low, even when only those organizations reporting the presence of respiratory health risks were considered. Smaller enterprises reported less involvement in such early detection activities, and content and quality in this group were considered to be variable. Future work could define more practical, evidence-based and simple-to-follow approaches to HS and the associated tools required, and participation by workers, trades unions and employers to ensure this is targeted and used appropriately and consistently across industries of differing types (with differing occupational asthma risks) and sizes. Additional consideration could also be given to educational initiatives among both GPs and OH professionals.

Key points

- Health surveillance for occupational asthma can allow early case identification and remediation of the causative exposure.
- In this study population, health surveillance was carried out in 19% of workplaces which had reported exposures that can cause occupational asthma. Surveillance was commoner in larger enterprises.
- There appeared to be significant variation in how the requirement for health surveillance was decided, how it was subsequently developed and carried out, and in communication between workplaces and their occupational health service providers.

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Conflicts of interest

None declared.

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