

GLOUCESTERSHIRE HEALTH AUTHORITY

Follow-up Report on the Health Impact on the Community following the Chemical Incident at Cleansing Services Group (CSG), Sandhurst October 2001

Key Findings

- The physical and/or psychological health of a significant proportion of Sandhurst residents living in the projected path of the plume was affected following the fire at CSG.
- The majority of physical symptoms experienced resolved within 4 weeks.
- Measures of psychological ill-health are no longer elevated
- A small number of people report continuing symptoms 7 months after the incident.

Incident Summary

A major fire began at the CSG chemical waste transfer site and treatment facility on Monday 30th October 2000. Over 100 tonnes of mixed chemicals were ignited and a series of explosions was observed. A plume of smoke from the fire was driven by the high south-westerly winds in a predominantly north-easterly direction over the village of Sandhurst. The incident was complicated by further leaks of chemicals and after 4 days, major flooding of the site and surrounding area

Some local residents were evacuated early on Monday but allowed to return to their properties that evening when the fire had been controlled. A number of households were evacuated on Sunday 5th November because the 'Emergency Services' were concerned that in the event of a further fire, evacuation of people from properties might prove difficult due to the extensive flooding.

Local residents began to experience health symptoms within 24 hours of the incident.

A major operation to detect environmental pollution from the fire and subsequent flooding of domestic properties was undertaken by the Environment Agency and Tewkesbury Borough Council together with the Health Authority. The results of this testing showed that chemical contamination was restricted to the site and an adjacent area where firewater had run off. Blood and urine samples were taken from emergency service workers who attended the Accident and Emergency department and others who were attending the site as they were considered to have a high risk of exposure to the chemicals involved in the fire. Samples were screened for a range of chemicals and reassuringly the results were within normal limits.

A wide variety of chemical wastes were involved in the fire and at the time of the incident the contents of the smoke plume were uncertain. This has been a cause of considerable community concern, both at the time and over the following months.

In November 2000 the Health Authority undertook a study to provide health information about people who may have been exposed to the smoke from the fire. A report on the initial findings was sent to every household surveyed, all GP practices in Gloucestershire, all organisations involved in the incident and others on request. Key findings were that:

- the physical and/or psychological health of a significant number of Sandhurst residents who replied to a questionnaire was affected following the fire.
- symptoms were compatible with a low level acute exposure to the products of combustion of a number of agents which were known to be involved in the fire.
- people who left the area at the height of the incident and were exposed outside reported more symptoms than those who sheltered indoors.
- symptoms were reported more often by those who were splashed by floodwater.
- a wide range of other symptoms were reported.
- some people reported symptoms of later onset that continued beyond the end of the original study period of 1 week .

Gloucestershire Health Authority agreed that due to the level of continuing symptoms the survey should be repeated.

Questionnaire Design

The health surveillance surveys have been designed to look at health effects following the fire and smoke plume. It was not possible to address local concerns about the long term health impacts of living near to this facility.

The first survey was carried out soon after the fire. Plume modelling data from the Met Office (The Meteorological Office) supported the observation that the principal path of the smoke plume passed over the village of Sandhurst. Two other study areas were selected for comparison; Maisemore, (similar proximity to the site but not in the principal path of the plume during the fire) and Ashleworth (3 miles to the north, not in the path of the plume but still in the area affected by flooding). The study sample areas were defined by post-codes using mapping software and information from Tewkesbury Borough Council and local knowledge.

The objectives of the follow-up questionnaire were:

- to assess the nature and level of any continuing symptoms
- to identify any possible areas of continuing concern
- to provide results which will inform the public, health professionals, public health policy and the media.

The same households in Maisemore, Sandhurst and Ashleworth were surveyed as before. Questionnaires were also sent to the organisations attending the incident and subsequent clean-up operation, for distribution to the staff.

In the first survey a number of questionnaires were sent on request to other concerned local residents living outside the sample area. These individuals were also given the opportunity to complete the follow-up questionnaire. As before the 'Out of Area' responses were analysed separately because they form a statistically unrepresentative and self-selected group.

A joint working group of healthcare researchers, public health professionals and community representatives developed the questionnaire which was a revised version of the first survey. Questions were asked about the duration of any of the physical symptoms that had developed after the fire. The list of physical symptoms was similar to the one used in the first survey (including an 'other' option) with the addition of the symptom 'fatigue'. This

symptom was added because of the number of people who reported this in the original survey.

Local people reported high levels of stress in their responses to the first survey. The General Health Questionnaire (GHQ-12) was used because it is a properly designed tool that is often used in general population surveys. It is sensitive to recent change in feelings or behaviour and focuses on breaks in normal functioning. It can also be used as a screening tool for more severe conditions. The community representatives expressed reservations about the use of the GHQ12, but it was included again because it was thought to be important to establish whether the high scores reported in the first survey had returned to normal levels.

Methodology

The questionnaires were sent by first class post in envelopes addressed to "The Occupier" for each identified household with one questionnaire for each member of household as identified by the Gloucestershire Health Authority (GHA) database of those registered with a GP. For those under 16, the instructions asked for the questionnaire to be completed by an identifiable, responsible adult. GHQ-12 and smoking questions were excluded for those under 18. A covering letter was attached giving information about the survey and giving a freephone number to call to ensure a rapid response to any queries or requests for extra questionnaires. The returns were by a first class prepaid return envelope that was provided, one per household.

All of the questionnaire returns were directed through the Research and Development Support Unit (RDSU) at GHA. The questionnaires were screened by a doctor for serious medical complications or high GHQ-12 scores so that action could be taken on an individual basis, if necessary.

Reminders were sent after 14 days to non-responding households.

Results

623 symptom questionnaires were sent by post to the residents of Sandhurst, 449 to the residents of Maisemore, 543 to the residents of Ashleworth, 328 were sent to the occupational groups and 53 were sent to residents outside the original sample area. The overall response rate was 43% (41% Sandhurst, 42% Maisemore, 45% Ashleworth). The response rate for the occupational groups was 37%. 31 responses were received from the Out of Area group, a response rate of 58%. The overall response rate to this survey was around 15% lower than the first one. This was expected and in line with previously reported repeated surveys.

As before we analysed the data for differences between Sandhurst residents and the other groups and then looked in more detail at the results for Sandhurst residents only; a summary of the findings is presented below. A number of indicator symptoms were selected and grouped for the analysis (see box 1).

Box 1 - Symptom group definitions

<i>Irritant symptoms:</i>	<i>Sore eyes, sore/itchy skin, tingling sensation of lips</i>
<i>Gastric symptoms:</i>	<i>Feeling sick, diarrhoea, vomiting</i>
<i>Respiratory symptoms:</i>	<i>Sore throat, chest pain, cough, wheezing, shortness of breath</i>

1. Baseline Characteristics of the Populations

Table 1 - Baseline characteristics

	Male %	Female %	Smokers (adults) %	Any chronic illness %
Ashleworth	47	53	12	27
Maisemore	47	53	13	30
Sandhurst	51	49	11	35
Out of area	45	55	22	27

More people reported chronic illness in the follow-up survey than in the first survey. However, this may be because in the follow-up survey a single question was asked about any chronic illness, whereas the first time the question was only about one or more specific illnesses, for example asthma, diabetes or heart disease. Thus respondents had more scope to report an illness the second time.

Table 2 - Age groups

	Under 5 %	5 to 17 %	18 to 44 %	45 to 64 %	65+ %
Ashleworth	2	16	28	29	25
Maisemore	4	8	16	47	25
Sandhurst	6	12	19	34	29
Out of area	3	19	29	36	13

There were fewer responses to the second survey on behalf of children, particularly the under 5 age group; therefore, the proportion of responders in the older aged groups (45 and over) is higher.

Respondents from Sandhurst, Ashleworth and Maisemore were similar in terms of age, sex, levels of pre-existing illness and smoking habits (table 1 and 2).

2. Health Impact

We assessed health impact by looking at the duration of symptoms reported by each person who replied in the follow-up survey.

Table 3 - Irritant symptoms by area (longest lasting symptom)

	Ashleworth %	Maisemore %	Sandhurst %
Reported any irritant symptom	8	20	35
Cleared up within 4 weeks	5	13	23
Continued for more than 4 weeks but now better	1	2	6
Still continuing	2	5	5

Statistical tests were carried out looking for trends in irritant symptoms reported from Sandhurst to Maisemore to Ashleworth. There was a highly significant trend in the numbers reporting symptoms overall, but no trend in the numbers having continuing symptoms

This suggests that levels of continuing irritant symptoms had reduced to close to the level which might normally be expected.

Table 4 - Respiratory symptoms by area (longest lasting symptom)

	Ashleworth %	Maisemore %	Sandhurst %
Reported any respiratory symptom	12	26	45
Cleared up within 4 weeks	9	16	30
Continued for more than 4 weeks but now better	1	5	8
Still continuing	2	5	7

Statistical tests were carried out looking for trends in respiratory symptoms reported from Sandhurst to Maisemore to Ashleworth. There was a highly significant trend in the numbers reporting symptoms overall, and a trend of medium strength in the numbers having continuing symptoms.

This suggests that although the level of continuing respiratory symptoms had reduced substantially it was still slightly higher in Sandhurst and Maisemore than would normally be expected.

Table 5 - Gastric symptoms by area (longest lasting symptom)

	Ashleworth %	Maisemore %	Sandhurst %
Reported any gastric symptom	4	11	19
Cleared up within 4 weeks	4	6	15
Continued for more than 4 weeks but now better	0	2	2
Still continuing	0	2	3

Statistical tests were carried out looking for trends in gastric symptoms reported from Sandhurst to Maisemore to Ashleworth. There was a highly significant trend in the numbers reporting symptoms overall, and a trend of medium strength in the numbers having continuing symptoms.

This suggests that although the level of gastric symptoms had reduced substantially, levels of symptoms in Sandhurst and Maisemore were still slightly higher than would normally be expected.

The symptom of fatigue was added to the second survey following discussions with the community representatives.

Table 6 - Reported fatigue by area

	Ashleworth %	Maisemore %	Sandhurst %
Reported fatigue	4	12	19
Cleared up within 4 weeks	3	5	5
Continued for more than 4 weeks but now better	0	1	5
Still continuing	1	6	9

Statistical tests were carried out looking for trends in reported fatigue from Sandhurst to Maisemore to Ashleworth. There was a highly significant trend in the numbers reporting symptoms overall, and a highly significant trend in the numbers having continuing fatigue.

This suggests that although the reported levels of fatigue had decreased substantially, levels had remained higher in Sandhurst and Maisemore than would normally be expected.

The levels of continuing symptoms reported by the occupational groups at 7 months were fairly consistent with these findings; irritant symptoms 3%, respiratory symptoms 3%, gastric symptoms 2% and fatigue 3%.

Responses from people reporting continuing symptoms in the follow-up survey were compared according to whether or not they had noticed a smell on the day of the fire (as reported in the first survey). However it is important to note that this analysis is based on relatively small numbers.

Table 7 - Continuing symptoms by whether noticed smell on day of fire (Sandhurst residents only)

	Yes % n=98	No % n=86	* Significance of Result
Any irritant symptom continues	8	2	None
Any respiratory symptom continues	9	5	None
Any gastric symptom continues	3	2	None
Fatigue continues	10	6	None

* 'Significance of Result' refers to a statistical test of whether there is a difference in continuing symptom levels between those who noticed a smell and those who did not. No significant differences were found.

Sandhurst residents were exposed to the effects of both the fire and flooding. Table 8 compares symptom levels in the Sandhurst respondents who reported splashing by floodwater and those who did not.

Table 8 - Continuing Symptoms by whether splashed by floodwater (Sandhurst residents only)

	Yes % n=31	No % n=153	* Significance of Result
Any irritant symptom continues	3	6	None
Any respiratory symptom continues	7	7	None
Any gastric symptom continues	7	2	None
Fatigue continues	13	7	None

* 'Significance of Result' refers to a statistical test of whether there is a difference in continuing symptom levels between those who were splashed by flood water and those who were not. No significant differences were found.

This result suggests that there have been no additional lasting effects caused by either splashing with flood water or "noticing a smell". It is important to note that due to the small number of responses involved it is not possible to tell whether this is truly a non-significant result.

Table 9 - Proportion with higher GHQ-12 score (4+)

	Yes %	Significance of Result
Ashleworth	10	None
Maisemore	15	
Sandhurst	14	
Out of area	14	Not applicable
Occupational groups	14	Not applicable

* 'Significance of Result' refers to a statistical test of whether there is a trend in higher GHQ-12 scores from Sandhurst to Maisemore to Ashleworth. No significant trend was found.

This result suggests that the higher level of psychological stress noted in Sandhurst in the first survey is now below the standardised rate for Gloucestershire of 17.2% (Source: Health Survey for England).

Summary of Findings

When the findings of the two surveys were considered together they showed:

- a significant proportion of the Sandhurst community who responded to the questionnaire experienced health symptoms following the major chemical incident at CSG Ltd
- people who left the area as a result of the fire (e.g. smoke, police advice) reported a higher level of symptoms than those who sheltered indoors
- symptoms reported were compatible with low level acute exposure to the large number of volatile agents which were identified as being involved in the fire
- In the first survey, people in Sandhurst who were splashed with floodwater, or who noticed a smell on the day of the fire, were more likely than other Sandhurst residents to report symptoms. However, these significant differences did not extend to the continuing symptoms reported in the follow-up survey.

- the majority of reported physical symptoms had resolved within 4 weeks.
- continuing symptoms were reported by small numbers of people 7 months after the incident. Sandhurst residents were more likely to report fatigue and to a lesser extent, respiratory or gastric symptoms than Maisemore or Ashleworth residents. Continuing irritant symptoms were reported at similar levels by people living in Sandhurst, Maisemore and Ashleworth.
- measures of the psychological impact of the incident on the community are now below the county reference value
- the study suggests that the acute health effects reported following the incident have resolved for the majority of the people who responded to the questionnaires.

Discussion

The results of the follow-up study add to what is known about the health effects of this incident. However it is important once more to acknowledge at the outset that there are still a number of unknowns, and that this limits the conclusions which can be drawn from the study. For example we do not know with absolute certainty the composition, dilution, path or grounding of the smoke plume. Nor do we know anything about the health of people who did not respond to the questionnaires. However it has been possible to describe and compare some patterns of ill health between the residents of Sandhurst, Maisemore and Ashleworth who responded to these surveys. The surveys show an association between the chemical incident and health effects, but are not capable of demonstrating cause and effect.

Conclusion

This survey provides quantified information about health effects experienced by local people in association with the fire, subsequent clean-up issues and flooding at CSG Ltd in Sandhurst. The reported health effects are compatible with low level exposure to a variety of agents many of which have been identified as involved in the fire.

Although the overall effect of the incident on the health of the local community is diminishing, a number of individuals living in Sandhurst, Maisemore and Ashleworth report continuing physical and/or psychological effects. These respondents will be contacted individually and advised accordingly.

This survey was not designed to consider health effects that may arise in the future. The level of the symptoms reported in the survey do not suggest that there is a high risk that adverse health effects will occur. However this can only be demonstrated by monitoring the health of the population over a period of years. The Health Authority is in the process of setting up a scheme to monitor long-term health using local and national data sources.

This report will be sent to all households in the surveyed area, to agencies involved in the incident, to relevant Health Care Professionals and to others on request from Gloucestershire Health Authority tel: Dr Tyler 01452 300222

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