

Chemical Hazards and Poisons Report

From the Centre for Radiation, Chemical and Environmental Hazards
October 2010 Issue 18



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Editorial

Editor: Professor Virginia Murray
Associate Editor: Catherine Keshishian
Centre for Radiation, Chemical and Environmental Hazards,
Health Protection Agency

For some years there has been considerable concern about how to best respond to public health aspects of large fires involving materials such as hydrocarbons, car tyres, liquid petroleum gas cylinders, alcohol and unspecified waste products. Of note was the explosion and fire at the Buncefield oil depot in Hertfordshire in December 2005. Following this fire the Major Incident Investigation Board of the Health and Safety Executive recommended that:

- air quality data in a major incident should be co-ordinated
- public health advice should be available from the outset.

It is therefore with great pleasure that this Chemical Hazards and Poisons Report highlights the new arrangements, in place since 1 April 2010, for the new multi-agency Air Quality Cell (AQC), which has been developed and is co-ordinated by the Environment Agency with key partners including the Health Protection Agency (HPA), Food Standards Agency, Met Office and Health and Safety Laboratory. Available on a 24/7 basis, the AQC convenes virtually and covers England and Wales. The AQC deploys mobile Incident Response Teams to the incident site, who have real-time air monitoring capabilities. Using these data and improved air dispersion modelling, the AQC advises on the public health impact at the outset of incidents (page 4). In this issue, we discuss the public health aspect of fires involving waste materials, and describe three large fires where an AQC has been activated: in Shropshire in 2009, where the concept of an AQC was exercised (page 6), in Doncaster in June 2010 (page 9) and in West Yorkshire in July 2010 (page 12). By having access to the resources of an AQC, monitoring data provided real-time information, improving our ability to communicate clear public health messages.

In July 2010 the HPA and its associate partners – British Paediatric Surveillance Unit, National Poisons Information Service, Supra-Regional Assay Service, Health Protection Scotland, Health Service Executive of the Republic of Ireland, Public Health Agency for Northern Ireland and Public Health Wales – announced our project on the Surveillance of raised blood Lead levels in Children (SLIC), www.hpa.org.uk/chemicals/slic.

Public health interventions have succeeded in removing most sources of lead from the environment. However, a small proportion of children continue to be exposed to harmful levels of lead, usually in the home. Exposure to lead in children is associated with a range of adverse health effects, from sub-clinical neurodevelopmental impairment to encephalitis. We consider that the study will provide important information on the management of cases, both clinically and in terms

of the public health response. We consider it important to share our progress and this report has two articles on lead: one on the health protection response action card (page 40) and the other on findings from a public focus group (page 43).

The UN Millennium Development Goals (MDG) are of vital import in an increasingly interconnected and interdependent world, where sustainable development and efficient use of water resources are a recognised global concern. Will we meet the MDG for halving the proportion of the population (from 1990 levels) without sustainable access to safe drinking water and basic sanitation by 2015? A paper offering some hope is presented on page 35.

The Chemical Hazards and Poisons Reports are now solely available online; those who previously received hard copies will now be receiving them by email. We hope readers will find it easy to share the email with colleagues who may be interested. If you have any comments on how we can improve this service, or to subscribe or unsubscribe, please email chapreport@hpa.org.uk.

The next issue of the report is planned for January 2011; the deadline for submissions is 1 November 2010 and Guidelines for Authors and a permission to publish form can be found on the website at www.hpa.org.uk/chemicals/reports. Please do not hesitate to contact us about any papers you may wish to submit on chapreport@hpa.org.uk, or call us on 0207 759 2871.

We are very grateful to Dr John Cooper, Mary Morrey, Andrew Tristem and Matthew Pardo for their support in preparing this issue. Thanks also go to Dr Graham Urquhart, Dr Sohel Saikat, Dr Gary Lau and Peter Lamb for their editing assistance.

Centre for Radiation, Chemical and Environmental Hazards,
Health Protection Agency, Chilton, Didcot, Oxfordshire OX11 0RQ.
email: virginia.murray@hpa.org.uk © 2010

Front cover image: Tyre fire at Wem, courtesy of Toby Smith

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Incident Response

Air quality in major incidents

Heather Barker
Environment Agency

Background

Following the explosion and fire at the Buncefield oil depot in Hertfordshire in December 2005 (Figure 1), the Major Incident Investigation Board of the Health and Safety Executive recommended that:

- air quality data in a major incident should be co-ordinated
- public health advice should be available from the outset.



Figure 1: Buncefield oil storage depot, Hertfordshire (photo courtesy Chiltern Air Support Unit)

On average, there is an incident involving air quality with a potentially significant impact on public health once a month. Although not on the scale of Buncefield, these incidents may still generate concern within the local community.

Since 1 April 2010, a new national multi-agency Air Quality Cell (AQC) has been available. The AQC deploys mobile Incident Response Teams to the incident site, who have real-time air monitoring capabilities. Using these data and improved air dispersion modelling, the AQC advises on the public health impact at the outset of incidents, providing regular SITREPs to those managing the incident at Silver/Gold Group. The SITREP contains advice on evacuation, sheltering, exposure and identifying and

protecting those most at risk. Where appropriate, it may also include advice on when to wash and peel food crops.

Operating on a 24/7 basis, the AQC convenes virtually and covers England and Wales. It is co-ordinated by the Environment Agency (EA), with key partners including the Health Protection Agency (HPA), Food Standards Agency, Met Office and Health and Safety Laboratory; however, other experts from across the country may be called upon where necessary.

Triggering the AQC

The AQC is triggered by agreement between air quality experts in the Environment Agency and Health Protection Agency. The following criteria should be met in order to activate the AQC:

- major incident where Strategic or Tactical Multi-agency Co-ordination Group (Silver/Gold Group) has been set up
- fire, explosion or chemical release
- known hazards and the AQC has the capability to monitor for them
- significant public health risk
- duration of incident is expected to be longer than six hours.

Responding to incidents

The AQC has been activated eight times for major incidents between April 2010 and July 2010 (Table 1), and the service is seen as an important resource in protecting and alerting local communities to exposure from hazardous materials.

The majority of incidents have been fires at waste management facilities involving tyre reprocessing. Figure 2 shows Kingpin Tyres at Wem in Shropshire, which has caught fire three times in the last year. As part of its regulatory work, the Environment Agency is currently working with the Fire and Rescue Service to provide improved guidance on stockpiling of tyres and shredded material to reduce the risk of arson and spontaneous combustion. In many circumstances, tyre products, e.g. shred and crumb, are not considered to be 'waste' and are therefore outside regulatory controls.



Figure 2: Kingpin Tyres, Wem

Table 1: Major incidents requiring activation of the Air Quality Cell since April 2010

Date	Operator	Site	Sector	Material
21/04/10	Interfloor Ltd	Langley Moor, County Durham	Waste Management	Tyres
22/04/10	Abbey Metals Finishing	Weddington Road, Nuneaton	COMAH	Metal plating/finishing
24/05/10	Grosvenor Chemicals Ltd	Linthwaite, Huddersfield	COMAH	Chemical manufacture
16/06/10	Solvent Safety	Harworth, Doncaster	Manufacturing	Solvents
24/06/10	Viridor Waste Management	Lean Quarry Landfill, Liskeard	Waste Management	Waste
28/06/10	Illegal - Grove Lea Industrial Park	Mexborough, Doncaster	Illegal waste	Tyres
05/07/10	Kingpin Tyres	Wem, Shropshire	Waste Management	Tyres
12/07/10	Claddagh Skip Hire	Neath, Wales	Waste Management	Waste

At the Mexborough tyre fire, in late June 2010, residents from Frederick Street were evacuated for 48 hours and the Air Quality Cell provided evidence and advice on when it was safe for people to return home. An Incident Response Team was located in Frederick Street during the incident, capturing real-time air quality data and relaying this to the AQC to inform decisions.

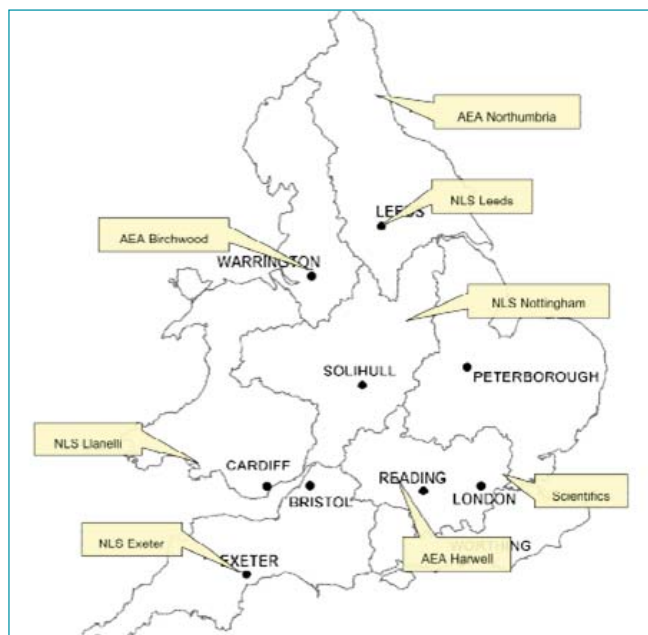
Typically two Incident Response Teams with hand-held air quality monitors are deployed to within approx 1 km of the incident (Figure 3). These teams can be located at any nearby, down-wind sensitive receptors, e.g. schools, nursing homes and hospitals. A minimum of one hour of data is collected then transferred to the AQC via 3G. Often, however, data from longer periods of time are required before an accurate public health risk assessment of the situation can be made. The Incident Response Teams are able to monitor for a range of parameters including particulates, chlorine, hydrogen sulphide and a range of other hazardous inorganics and organics.

**Figure 3: Incident response vehicle and hand-held equipment**

There are currently eight Incident Response Teams based around England and Wales (Figure 4). They are strategically placed to reach an incident within three or four hours anywhere in the country. In addition there are two mobile monitoring laboratories capable of air sampling and with on-board meteorological stations, which are located at Harwell, Oxfordshire, and Sale, Manchester.

Data are fed to experts from the Centre for Radiation, Chemical and Environmental Hazards (CRCE), where they may be compared against the US Acute Exposure Guideline Levels (AEGs) and other health standards, as part of the analysis and interpretation carried out by the AQC.

The AQC also provides air dispersion modelling to forecast the movement of the plume. Source terms are calculated by experts from the Health and Safety Laboratory, based on release rates estimated from previous incidents. Air dispersion modelling and monitoring data collected from the ground are used to further refine the modelling.

**Figure 4: Location of Incident Response Teams**

The AQC is operational during the response phase of a major incident, usually between one and two days. Once the incident has stabilised, then the Cell hands over to the Recovery Co-ordination Group, which is usually led by the local authority.

Managing controlled burn

In many waste fires, where there is no immediate risk to life but firewater run-off could cause a serious pollution risk to surface or groundwater, the Fire and Rescue Service may choose to use a 'controlled burn' method to tackle the fire. Incidents managed using controlled burn usually continue, in the recovery phase, for many weeks. During this time the Fire Service turns the smouldering material, generating a plume of combustion products, which can lead to ongoing public health concerns.

The Environment Agency, Health Protection Agency and Fire and Rescue Service are currently working to revise pollution prevention guidance (PPG 28¹) which sets out what factors need to be considered when deciding on controlled burn. The revised version will aim to balance the needs of the air and water environment and look at what additional measures may be needed during the recovery phase, in order to manage public health concerns.

Reference

- 1 Environment Agency. Pollution Prevention Guidelines 28: Controlled Burn (2007). Available at <http://publications.environment-agency.gov.uk/pdf/PMHO1005BJIT-e-e.pdf>

Health Protection Agency experience on the public health aspects of fires involving waste materials

Andrew Kibble
Centre for Radiation, Chemical and Environmental Hazards,
Health Protection Agency

Introduction

Fires are a common mechanism through which the environment can become chemically contaminated. Fires will generate a plume which may contain gaseous pollutants, smoke (which effectively disperses as a gas), and quite often relatively large particles. Chemical conversions will occur both during the fire and when the chemicals enter the wider environment after the fire. During the fire, chemicals may react once they mix with water (such as fire fighting water) or through reactions in the combustion zone.

The Centre for Radiation, Chemical and Environmental Hazards (CRCE) of the Health Protection Agency (HPA) is frequently required to advise on the public health effects from fires. The HPA leads on the public health risk assessment of these fires and works closely with the emergency services and the Environment Agency in England and Wales.

Occurrence

From 2006 to 2009, the HPA responded to an average of 31 large fires per year involving various forms of waste materials. The waste involved in these fires is highly varied, ranging from tyres and plastics to wood and paper (see Figure 1). Locations included waste recycling facilities, waste transfer stations, landfill sites and paper mills. As can be seen in Figure 1, tyre fires accounted for over 40% of the fires reported to CRCE in the past three years. An increase in fires at waste transfer stations has also been noted. The most common causes of fires were arson and vandalism, illegal burning and accidental (helped by glass, the sun and dry material) (EA, personal communication).

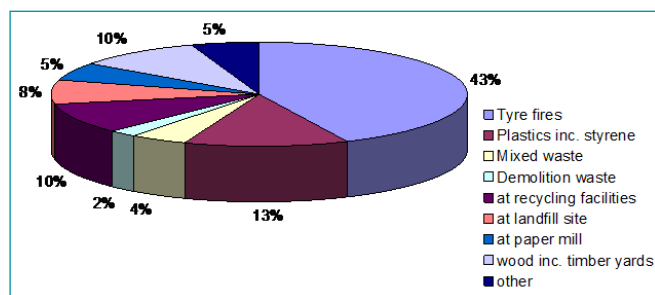


Figure 1: Fires by type/facility responded to by HPA (CRCE) in England and Wales, between 01/01/07 and 07/10/09 (n=93)

Risk to health

Given the complex and varied nature of waste materials that may be involved in fires, potentially a wide range of pollutants can be released in the smoke plume (and also entrained in water run-off). It is extremely difficult to state with any certainty exactly what the smoke plume may contain, especially as there is often considerable uncertainty of the exact composition of the waste at the time of the fire.

Clearly different waste materials release different pollutants upon combustion and there is a small but growing evidence base on emissions from fires (see Table 1). As well as variations in emissions due to the nature of the waste material, the smoke composition will vary depending on the nature of the fire, the temperature of combustion and the availability of oxygen for the combustion process and ventilation in the fire environment (see Table 2).

As a result of the difficulties defining the compounds in a plume, it is difficult to assess the public health risk associated with waste fires. In order to address such uncertainties the HPA has produced a detailed toxicological review of the products of combustion¹.

Tyre fires

Waste tyres can be difficult to ignite but once alight can be very difficult to control and extinguish and have the capacity to burn for long periods. The resultant pollution can spread over a wide area affecting not just air but water, soil and herbage. Such fires may generate large amounts of particulate matter and in some cases significant yields of sulphur dioxide due to the high sulphur content as a result of the rubber vulcanisation process. The quantities of sulphur dioxide depend on the type of tyre involved². Other pollutants can include heavy metals, carbon monoxide, polycyclic aromatic hydrocarbons (PAHs) and other organics including benzene compounds, phenols and styrene^{3,4}. Additionally some rubber compounds contain organophosphate-based flame retardants, which upon combustion may also yield phosphorus pentoxide¹. Large and ongoing tyre fires can produce large quantities of PAHs, particularly high-ring number PAHs which may have higher mutagenicity than benzo[a]pyrene⁵. Data from laboratory experiments in the United States suggest that emissions from tyre fires will contain considerably more mutagenic compounds than from wood or coal fires⁴.

Polychlorinated dioxins and furans are produced during the incomplete combustion of organic materials and elevated levels of dioxins are often detected in the environment affected by the uncontrolled burning of waste. In Sweden and Finland dioxin and furan emissions from a typical year of landfill fires are greater than the total emissions from incinerators^{6,7,8}. The toxicity of dioxins and furans, which can potentially lead to reproductive and developmental effects, and cancer, is related to their high persistence in the environment and consequent exposure through dietary pathways. Waste fires, including those involving tyres, seldom produce concentrations of dioxins or furans sufficient to present an inhalation risk but deposition onto farmland can result in contamination of local food chains and these will require consideration in any risk assessment.

Public health impact and assessment

Individuals at greater risk of life-threatening health effects from combustion products are those with pre-existing respiratory diseases such as asthma and chronic obstructive pulmonary disease, pregnant women, newborn infants, children and the elderly.

Table 1: Hazardous combustion products generated with respect to the material involved (from Wakefield, 2009¹)

Material involved	Fire Zone*	CO	HCN	HCl/ HBr/ HF	NO _x	SO ₂	P ₂ O ₅	Organic irritants, e.g. acrolein/ formaldehyde	Inorganic irritants, e.g. phosgene/ ammonia	PAHs	Complex/exotic, e.g. PCDDs/ PCDFs/ isocyanates/ PFIB	Particles
Polymeric materials	1	+++	+++	+++	++	+	+	++	+	++	++	+++
	2	±	±	+	+	±	-	++	+	±	++	++
Wood	1	++	-	-	+	-	-	++	-	+	+	+++
	2	-	-	-	±	-	-	+	-	±	+	±
Rubber/ tyres	1	+++	+	+	+	+++	+	++	+	++	++	+++
	2	±	±	+	±	+++	±	++	±	±	++	++
Oil/ petrol	1	++	-	-	-	±	-	++	-	++	++	+++
	2	-	-	-	-	±	-	++	-	±	+	++

* Zone 1 relates to the immediate vicinity / compartment of the fire. Zone 2 relates to the location immediately outside the source of the fire.

Key

+++ Likely to be present in very high quantities	++ Likely to be present in high quantities	+ Likely to be present	± May be present at low level	- Unlikely to be present
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The majority of particles produced by fires will be sized less than 10 µm in diameter, although larger particles and even flakes will also be produced. Larger particles settle out rapidly from the air and will not be dispersed at large distances from the fire. Smaller particles, more specifically the mass fraction termed PM₁₀ (i.e. particles with an aerodynamic diameter less than 10 µm), will travel much greater distances.

Some prolonged fires clearly can have measurable health effects in local communities. For example, summer fires around Vilnius, Lithuania, in 2002 resulted in major increases in the levels of pollutants such as nitrogen dioxide, sulphur dioxide, carbon monoxide and PM₁₀, which greatly exceeded EU limit values, accompanied by significant increases in respiratory complaints⁹. During Australian bushfires, PM₁₀ from burning vegetation matter was associated with increased emergency department attendances for respiratory complaints during a period of sustained smoke¹⁰.

In the UK exposure to such prolonged periods of poor air quality from fires is rare but this does occasionally occur. For example, recent fires at waste management sites have resulted in daily exceedances of the UK Air Quality Objective for PM₁₀ and other pollutants (see the case study). When such events occur, the HPA leads the public health risk assessment and works with local health colleagues to communicate the risk to local people. Briefings are provided to local general practitioners (GPs) and hospitals as well as the affected community. The HPA will also heighten health surveillance of the local community during and after the event.

Table 2: Types of fire and key products (from Wakefield, 2009¹)

Type of fire	Products
Flaming	
Well ventilated (normal oxygen)	Complete combustion: carbon dioxide, water, nitrogen dioxide Low production of smoke and toxic compounds
Ventilation controlled (low oxygen)	High yields of carbon monoxide, carbon dioxide, hydrogen cyanide, other inorganic and organic gases, smoke
Pyrolysis (smouldering)	
Oxidative (normal oxygen)	Lower temperatures result in greater quantities of toxic products than flaming combustion
Anaerobic (low oxygen)	Chemical conversion is incomplete, yielding more toxic compounds than oxidative pyrolysis

Fire-fighting techniques

The HPA has been working with the Environment Agency and Fire and Rescue Services to better assess the health impacts of various waste fire-fighting techniques. In reality, there are two key decisions to make, whether to fight the fire with water or foam and potentially contaminate water resources, or to manage a controlled burn, without attempting extinguishing, with the accompanying risks of short-term air pollution and longer-term pollution of land and water in the event that the smoke plume comes to ground.

Controlled-burn is a commonly used tactic in fire-fighting operations where the use of fire-fighting media, such as water or foam, is restricted in order to minimise adverse environmental impacts caused by polluted run-off. In theory, controlled burns may, under favourable circumstances, also reduce air pollution as a consequence of more efficient combustion and dispersion of pollutants. It is known that tyre fires tend to produce more smoke and more toxic chemicals when they smoulder than when they burn freely³.

The decision to use a controlled burn is a difficult one, which needs to take account of the best public health and environment options, but also should consider factors such as public perception and the need to stop the fire escalating. The use of water or foam may often exacerbate the situation by reducing the temperature of the fire leading to incomplete degradation and more toxic pollutants and reduced buoyancy of the plume, which can increase the impact at ground level.

Case study

Deployment of monitoring equipment to a major fire at a tyre recycling facility in Shropshire, England, 2009

The UK Environment Agency, in consultation with the Health Protection Agency, deployed real-time air quality monitoring equipment to the scene of a large and prolonged fire at a tyre recycling factory in Wem, North Shropshire, England, in 2009 (see page 4 for more information on monitoring and Air Quality Cells). The fire involved scrap tyres and produced a dense black plume of smoke which dispersed over the local town (population of 5000) for over ten days (Figure 2). Initial forecasts suggested the fire could burn for six to eight weeks. Air monitoring was undertaken at a number of locations downwind of the fire based



Figure 2: Smoke from the tyre fire in Wem, Shropshire

on forecasted modelling predictions of the plume, observations at the scene with regard to the dispersion of smoke, and locations of susceptible groups of people within the town (e.g. school children).

The fire generated sufficient quantities of smoke to adversely affect ambient air quality in the surrounding area with local concentrations of PM_{10} , well above the World Health Organization (WHO) Air Quality Guidelines 2005 and UK Air Quality Strategy objective of $50 \mu\text{g m}^{-3}$ (measured as a 24-hour mean) (Figure 3). Hourly average PM_{10} concentrations were elevated and, at the height of the fire, peaked at $880 \mu\text{g m}^{-3}$, whilst the 24-hour mean PM_{10} concentrations ranged from 14 to $194 \mu\text{g m}^{-3}$ with typical averages in the first couple of days between 100 and $125 \mu\text{g m}^{-3}$. A variety of gaseous pollutants were also detected, including sulphur dioxide, benzene, acrolein, hydrogen cyanide and phosphine. However, concentrations were relatively low and below relevant health based standards.

Monitoring data also provided valuable information on the possible importance of peak concentrations of pollutants within each 24-hour period. During the afternoon of the first day of the fire, PM_{10} concentrations spiked at over $6000 \mu\text{g m}^{-3}$, which prompted widespread shelter advice to the local populations and the establishment of a Scientific Technical Advice Cell to provide health advice into Silver Command.

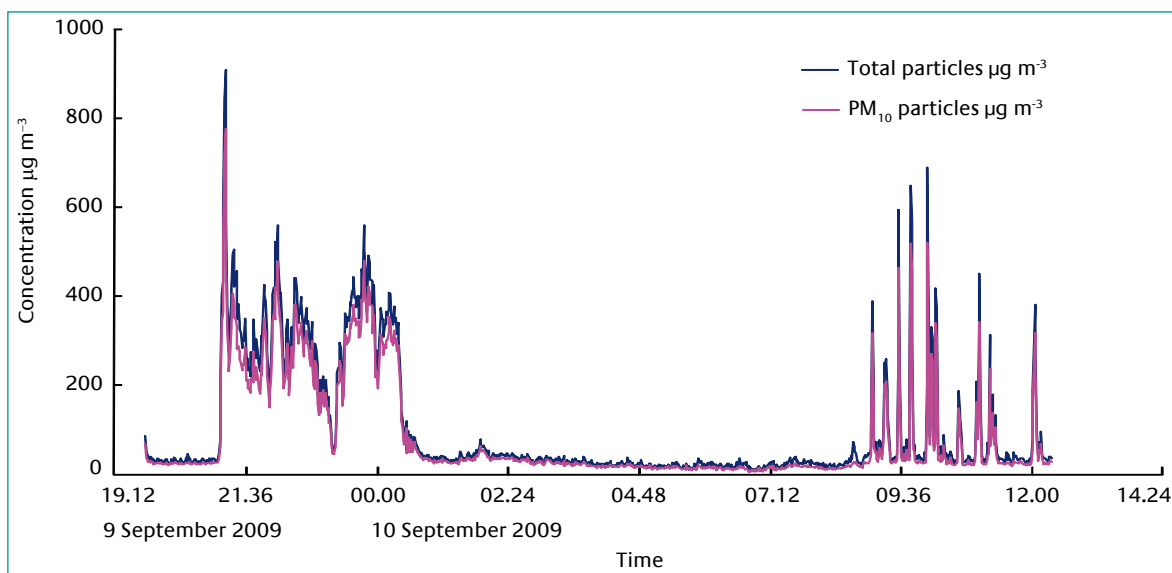


Figure 3: Particulate matter reported over the first two days in Wem, Shropshire

Despite unfavourable weather conditions and the prolonged nature of the fire, monitoring data showed that elevated PM_{10} concentrations were not sustained and within several days, concentrations were only slightly above typical ambient concentrations for that area. The smouldering pile of shredded tyres was eventually extinguished nine days later. Health surveillance showed that despite considerable public concern, no serious health effects were reported during the fire for the duration of the fire. Sensitive groups such as asthmatics were given specific health advice on the need to increase their medication.

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 Dr Robert Carr, West Midlands North Health Protection Unit.

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Tyre fire, Mexborough, Doncaster

Lydia Izon-Cooper
Centre for Radiation, Chemical and Environmental Hazards,
Health Protection Agency
 email: lydia.izon-cooper@hpa.org.uk

Background

In June 2010, a fire broke out at a tyre storage facility in the White Lee Grove Industrial Park in Mexborough, Doncaster. The site has been the subject of a lot of interest from the Environment Agency who had been working with the operators to improve site facilities. It is understood that when the fire broke out, 70,000 to 120,000 tyres remained at the site.

The site is located in a mixed industrial, commercial and residential area, with the nearest residential properties lying approximately 55 m to the north of the site (see Figure 1, overleaf).

A multi-agency response

A multi-agency group was formed in December 2009, to consider the risk of a major tyre fire at the site, to produce a multi-agency major fire contingency plan, and to consider risk mitigating actions that could be taken in the event of a major fire.

This group consisted of a number of stakeholders including Doncaster Council (Emergency Planning, Neighbourhood and Environmental Health Departments), South Yorkshire Fire and Rescue Service (SYFRS), South Yorkshire Police and the Environment Agency (EA). The Centre for Radiation, Chemical and Environmental Hazards (CRCE) provided comments on the plan from an environmental public health perspective; the plan was published in January 2010. As part of the emergency planning process a multi-agency table top exercise was scheduled for 22 July 2010 to test the plan.

In the period up to the incident the multi-agency group had implemented a number of mitigation measures, including CCTV monitoring and regular site visits – these were implemented due to the nature of the site and the potential consequences of a fire.

The emergency services and Doncaster Council were made aware of a fire at the site at 02.10 hours on 28 June 2010. The CRCE out-of-hours service was alerted by the receipt of a CHEMET¹ from the Met Office at 03.30 hours. After establishing the details of the incident, CRCE held discussions with the EA National Air Quality Technical Advisor (NAQTA) and agreed to initiate the National Air Quality Cell (AQC) arrangements (see page 4 for more information on Air Quality Cells). Two monitoring teams arrived at the site to begin air quality monitoring at 09.00 on 28 June 2010.

A multi-agency Silver (tactical) Command was established at Doncaster Council's Emergency Planning Office at Unity House, Doncaster. A number of agencies were represented at Silver Command including South Yorkshire Health Protection Unit (SYHPU), CRCE (Nottingham), SYFRS, South Yorkshire Police, Doncaster Council and the Environment Agency.



Photos of the tyre fire in Mexborough, Doncaster: Chris Gaughan, Regulatory Officer, Environment Agency, 28 June 2010

At the onset of the fire SYFRS advised nearby residents to take shelter from the smoke plume. In the early hours of the morning around 60 residents self-evacuated from their homes to a nearby public house; 16 of the evacuated residents were later moved to a Doncaster Council run rest-centre and the remainder were advised to shelter.

The acute phase of the incident lasted for three days from 28 June to 30 June 2010 and involved the dedicated input of the multi-agency stakeholders to allow all responses to be effectively coordinated and to protect public health. CRCE provided a 24-hour response during the acute phase of the incident, involving CRCE (Nottingham) staff and CRCE national on-call staff.

Air Quality Cell and public health actions

In consultation with CRCE (Nottingham), the EA monitored for a number of pollutants (using Osiris and Gasmeter monitoring equipment) in the smoke plume, including particulate matter (PM), and a number of products of combustion.

Air quality monitoring was undertaken at five locations over the three days of the acute incident phase, including a junior school, a public library, a care home and at the residential street closest to the

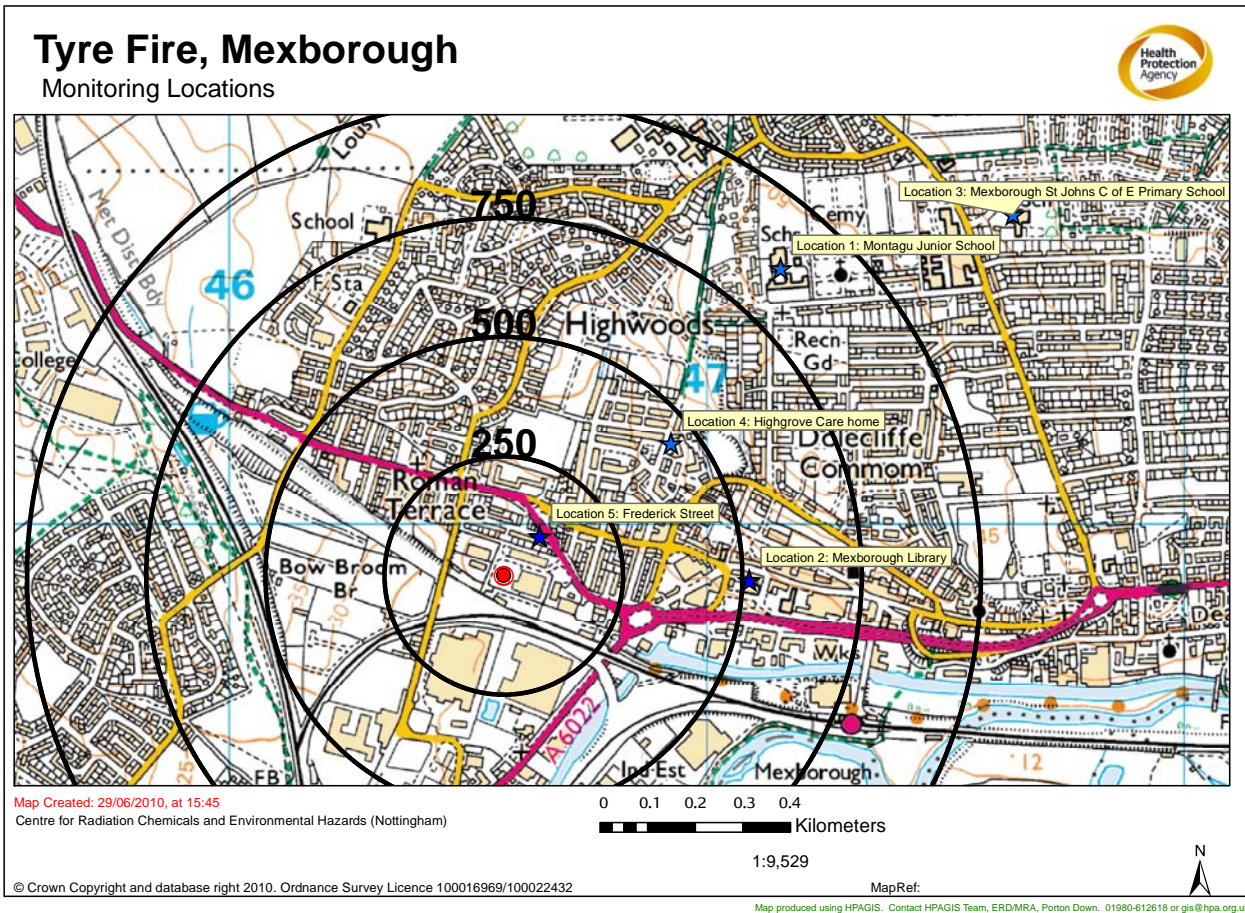


Figure 1: Map showing air quality monitoring locations around the fire at Mexborough

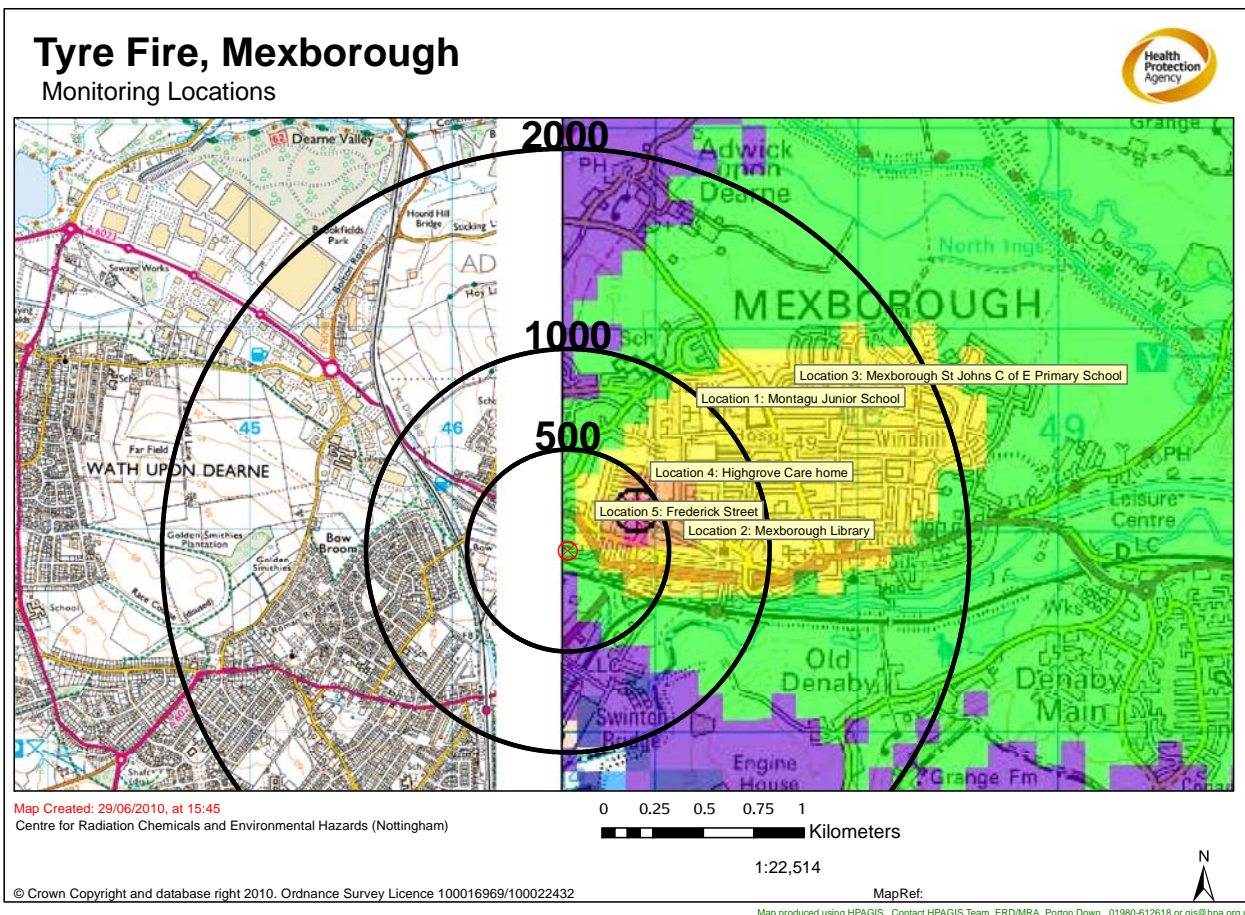


Figure 2: Map showing air quality monitoring locations with pollutant concentration plot overlain

Table 1: Monitoring results and public health actions

Date and time of brief to CRCE Silver representative	Summary of monitoring observations	Public health action
28.06.10 01.15 – 11.15	Elevated PM levels and other pollutants recorded at school and library monitoring locations	Continued to maintain shelter advice. Further evacuation not necessary
28.06.10 12.00 – 15.45	Elevated PM levels recorded at the care home. Gasmeter data showed a few exceedances of health standards, but with low confidence on the data. Therefore decision made to focus on PM data	Continued to maintain shelter advice at the care home. In consultation with a CRCE senior toxicologist, additional advice was given to the care home to ensure that shelter advice is balanced with the need to keep residents cool
28.06.10 16.00 – 18.30	Elevated PM levels continued to be recorded at the care home	In the very short term, due to the possibility of heat exhaustion amongst care home residents, the AQC advised that close watch should be kept on residents and to open windows when absolutely necessary to keep residents cool. If signs of irritation were observed the AQC advised to close windows immediately. The predictions of duration of incident required close monitoring to determine if further evacuations would be required. Evacuated residents advised to remain at rest centre over night whilst fire-fighting actions continued
29.06.10 08.00 – 10.00 10.00 – 12.00	Elevated PM levels continued to be recorded	Sheltering advice and precautionary advice to care home continued; predictions of duration of incident required close monitoring to determine if further evacuations would be required
29.06.10 12.00 – 14.00	Reduction in PM levels recorded at monitoring locations. Some residents self re-occupied despite evacuation advice	Shelter and evacuation messages maintained until further evidence of improvement in air quality was gathered. Monitoring began at residential street adjacent to the site, to provide evidence to allow re-occupation
29.06.10 14.00 – 16.00 16.00 – 18.00	Slightly elevated PM levels recorded at residential street (wind taking plume away from the area at time of monitoring). Wind direction predicted to change and bring plume back over evacuated houses overnight	Continued to maintain shelter advice. Evacuees allowed to temporarily re-occupy properties from 19.00 to 21.00 hours to collect belongings. Evacuees advised to return to rest centre over night, due to predicted change in wind direction
30.06.10 09.00	Much reduced PM levels	Evacuees allowed to return to their properties at 09.30 hours
30.06.10 11.00	PM levels continued to be much reduced	All shelter messages lifted

site (see Figure 1). Monitoring locations were identified based upon observed and predicted meteorological conditions, plume dispersion and fire-fighting actions; Figure 2 shows the monitoring locations with an air concentration plot overlain, provided by the Environment Monitoring and Response Centre (EMARC) of the Met Office.

A summary timeline of how the AQC monitoring assisted in informing public health protection actions is provided in Table 1. The temperature and humidity were high during the three days of the incident.

Recovery

A multi-agency debrief was held on 6 July 2010 to document and discuss learning points from the incident response. In general terms the debrief team felt that the multi-agency response to the incident was successful and the emergency planning valuable.

On 26 July, SYHPU and CRCE (Nottingham) received reports from local media that workers had been observed clearing waste materials from the site without personal protective equipment (PPE) and therefore with potential exposure to contaminated fire water and waste materials at the site. The EA and the Health and Safety Executive (HSE) carried out investigations of these reports.

It is understood that the EA is continuing to work with the site operator to clean up and secure the site.

Observations

- This incident highlighted the importance of involving health protection professionals in effective emergency planning and multi-agency stakeholder communications to ensure that a complex environmental incident can be dealt with efficiently and effectively, in the interest of protecting public health.
- CRCE was instrumental in setting the battle rhythm early on in the incident to ensure that AQC outputs linked in effectively with Silver (tactical) Command meetings. This allowed the outputs from the AQC to be effective in informing public health protection decisions.
- The role and capabilities of the AQC were not fully understood by Silver Command, who queried why the monitoring teams were not capable of undertaking monitoring closer to the incident, in the area of evacuated residents, in the initial stages. Further multi-agency awareness events to promote understanding of AQC capabilities amongst emergency responders are needed.
- As a result of the incident the EA agreed to identify similar tyre dump sites at risk of a major fire, in order that emergency planning and regulatory actions can be pursued. It is understood that the EA is in the process of compiling this list. Page 6 of this report describes the role of the HPA in another recent tyre fire in Wem, Shropshire.

Reference

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Fire at WasteCare, Garforth, West Yorkshire

Jim Stewart-Evans

Centre for Radiation, Chemical and Environmental Hazards,
Health Protection Agency

email: james.stewart-evans@hpa.org.uk

This article summarises the involvement of the Health Protection Agency (HPA) during the acute and recovery phases of a fire at a waste site that led to wider environmental issues once the initial fire was over.

Acute incident timeline

At 01.44 hours on Thursday 1 July 2010, the HPA Centre for Radiation, Chemical and Environmental Hazards (CRCE) was alerted to a fire at a recycling and waste management site (WasteCare) in Garforth, West Yorkshire, by the issue of a chemical meteorology report¹ (CHEMET) by the Met Office, which predicted a smoke plume moving in a northerly direction. An illustrative HPA-generated Geographic Information System (GIS) map is shown in Figure 1.

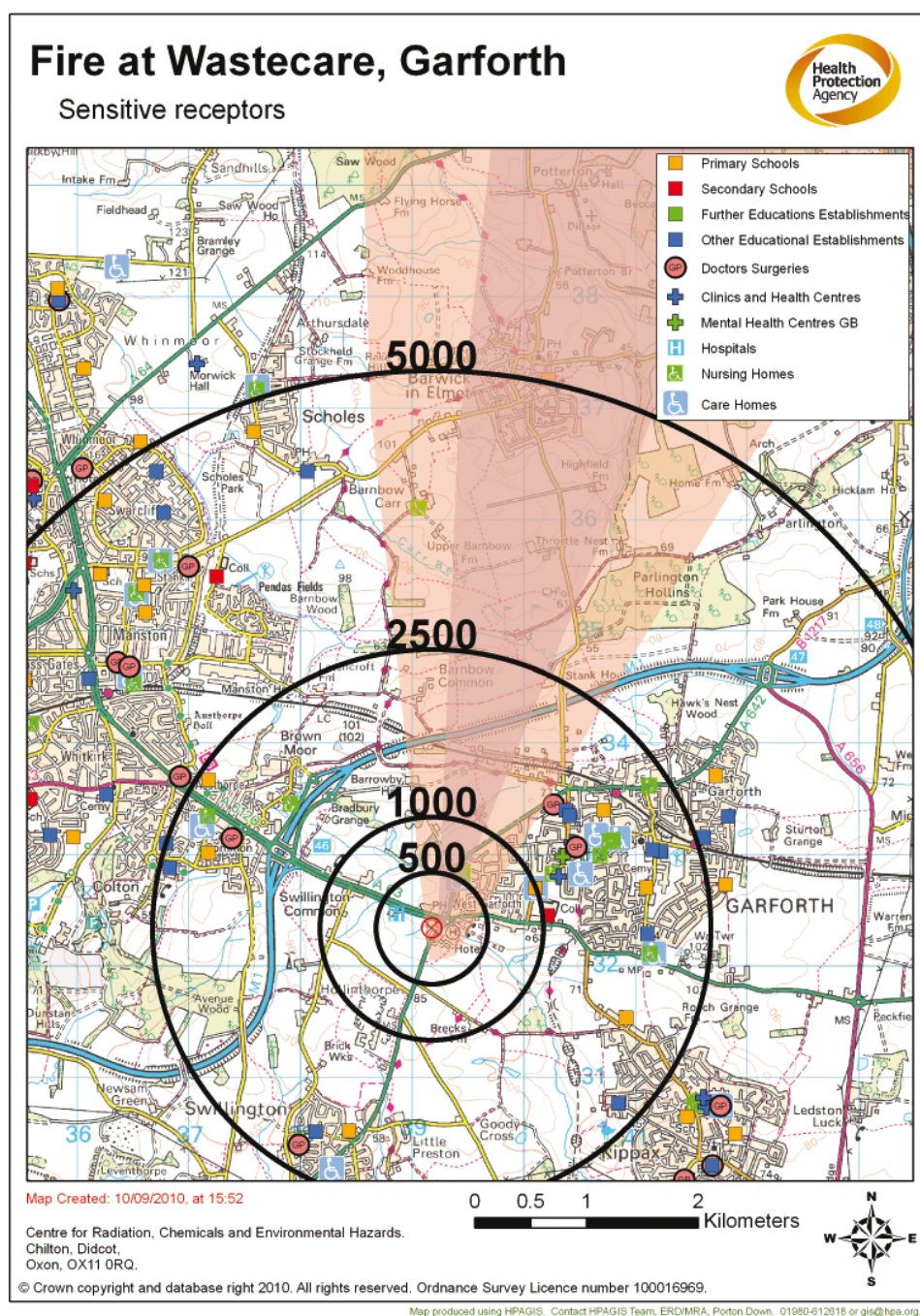


Figure 1: HPA-generated GIS map

The fire had been reported to the Fire and Rescue Service (FRS) at 00.06 hours. A building on-site was alight and the site inventory was described as consisting of cylinders (including those containing liquid petroleum gas), alcohol, and unspecified waste products. It was reported that two solvent containers (each of 60,000 litre capacity) were adjacent to the burning building; whilst the FRS had initially remained 200 m distant from the fire due to the risk of explosion, fire-fighting was now commencing (Figure 2). Due to the explosive risk, approximately 20 people had been evacuated from an adjoining row of terraced houses and a hotel nearby. The surrounding roads were closed. No casualties were reported; however, due to the nature of the fire, the Ambulance Service Hazardous Area Response Team (HART) had been notified (Figure 3).

The CRCE notified public health on-call colleagues and, by 02.38, the FRS presence on-scene had been escalated to 20 appliances. The attending FRS Hazardous Material (HAZMAT) Officer was able to provide further details regarding the wastes on-site: 100 tonnes of batteries; 40 tonnes of white spirits; 20 tonnes of water-based paints; 20 tonnes of printing ink; two tonnes of flammable dry paint; aluminium printing plates; and oxyacetylene cylinders. Due to a breach in the site's bunding, fire-water run-off was entering the local watercourse and representatives of the water company and Environment Agency (EA) were



Figure 2: Fire and Rescue Service at the scene of the incident (Source: West Yorkshire HPU)



Figure 3: Ambulance Service command vehicle at the scene of the incident (Source: West Yorkshire HPU)

attending the scene whilst Local Authority (LA) Emergency Planning Officers organised rest centres for evacuees. The HART Hazardous Medicine (HAZMED)*² officer provided first-hand information from the scene to public health on-call colleagues.

By 04.47 the Health Protection Unit (HPU) representative (Consultant in Communicable Disease Control on-call) had arrived on-scene. There were now 25 appliances in attendance and three fire-fighters had attended A&E for checks after reporting shortness of breath and nausea. Although no off-site multi-agency Silver Command meeting had been called, an on-site Silver group had met, with reports that the fire could continue until 10.00 that morning amidst a defensive fire-fighting strategy. The HPA public health advice was for the public to shelter indoors, close windows, and turn off any air-conditioning systems – this was fed into a press statement issued by the police. The CRCE initiated discussions with the EA regarding deployment of air quality monitoring teams and activation of a multi-agency Air Quality Cell (AQC): this was contingent on the fire continuing to burn over an extended period of time.

An updated CHEMET, issued at 05.16, indicated that the plume was likely to continue to move in a northerly direction, over a sparsely populated area. By 06.00 fire hydrants were running out of water, yet it was

* In the Yorkshire and East Midlands regions HAZMED chemical-trained paramedics provide additional on-scene expertise and liaison with public health colleagues.

expected that the fire would be out within one hour. If the incident were to continue, then a more densely populated area of the suburbs of Leeds to the north-northwest was identified as a likely location for setting up the air quality monitoring teams. AQC arrangements remained on standby as the fire had been contained within two tanks, with reportedly no chance of spreading, and a foam attack from the FRS was imminent; furthermore, the FRS indicated that the majority of the chemicals reported in the site inventory were not part of the blaze. By 07.00 smoke from the fire had reduced, and the HPU representative left the scene.

At 08.10 the incident was handed over from the CRCE on-call to the CRCE (Nottingham) supra-regional unit. At this point there were two tanks ablaze (each of 45,000 litre capacity), suspected to contain white spirits. Fifteen fire appliances remained on-scene, fighting the fire with foam and damping down over the remainder of the site. Conflicting information from the scene meant that it was unclear whether the fire had been restricted to solely burning solvents or whether other inventory items had been involved. By 09.35 the FRS had run out of water and was awaiting foam supplies. The incident received extensive local press coverage that morning, with health advice issued to the public by the HPU, and media reports indicated that road closures in the immediate area of the site were likely to remain in place throughout the day.

A multi-agency Silver meeting was held on-site at 10.00, attended by the HPU representative. The feedback from this meeting indicated that, whilst the fire was being brought under control and the FRS had received further foam supplies, it was expected to burn for the remainder of the day and to be damped down the following morning. Meanwhile, the police sought HPA advice regarding health effects in relation to a number of queries from concerned residents and a health information sheet for residents was prepared by the HPA and issued jointly with NHS Leeds. The HPU representative prepared to attend the following 14.00 Silver meeting alongside those of the EA, LA, and the Health and Safety Executive. Following pressure-testing, the water company indicated that it had no concerns regarding the integrity of drinking water supplies.

Throughout late morning and early afternoon, the CRCE liaised with the HPU regarding the provision of public advice and reinforcement of the previously issued shelter message via a multi-agency press statement. Feedback from the 14.00 Silver meeting indicated that the fire was finally out and that the FRS was damping down, with three appliances remaining on-site. Incident management was passed over to the LA as it moved into the recovery phase (with subsequent daily meetings attended by the HPU representative), and the site owner was requested to begin clean-up and to secure the site perimeter. Reports of surface water contamination were under investigation by the EA. The evacuated hotel re-opened and evacuated residents were temporarily allowed to return home to collect belongings, with the expectation that they would be allowed to re-occupy their homes later in the day.

Recovery phase

The following evening, Friday 2 July, the CRCE on-call received a request for support from the HPU prior to a public meeting, which would be held the following morning. The focus of concern was fire-water, mixed with material from the site, which had formed a sludge that had leaked into the grounds and sub-floor space of a nearby mail sorting office and residential properties (Figures 4 and 5). Evacuated residents had not returned to their homes and the LA Environmental Health Officer reported strong fumes when undertaking sampling of the sludge.



Figure 4: Clean up work at the adjoining Royal Mail depot
(Source: West Yorkshire HPU)



Figure 5: Run off from the fire near the row of terraced houses
(Source: West Yorkshire HPU)

Results forwarded to the CRCE indicated that a broad suite of chemicals were present, including metals and volatile organic compounds (VOCs). The primary concerns of the CRCE were associated with the VOCs and their potential to cause irritant effects, permeate plastic water service pipes, and give rise to fumes that could accumulate within confined spaces, potentially posing a risk of explosion. The substances present had low odour thresholds and further potential to lead to nuisance complaints, but quantified indoor air quality monitoring had not been undertaken, leading to a conservative risk assessment for the properties affected. The CRCE recommended that residents be excluded from their properties until remedial action had been undertaken to remove the sludge and that indoor air quality and drinking water quality be monitored before re-occupation.

The residential properties remained empty over the weekend, during which the FRS carried out limited indoor monitoring which did not find elevated levels but did identify a strong solvent odour in two properties. Five properties on higher ground were cleared for re-occupation, and additional testing and remedial actions were required for five more low-lying properties. Further sludge analysis results were provided to the CRCE in the morning of Monday 5 July; with a multi-agency meeting planned for that afternoon to consider whether the remaining properties could be re-occupied.

On Tuesday 6 July the HPA and LA worked together to produce a letter for evacuated residents, explaining the situation, giving health advice, and detailing the remediation proposals. Over the next week, clean-up of the remaining properties was undertaken by contractors employed by the LA (removal of sludge, hosing down and removal of residues, and venting of sub-floor spaces, followed by environmental monitoring). The CRCE received further queries from the LA regarding deposition from the plume, which was subsequently not considered to have been significant.

A fortnight later, on Wednesday 21 July, the CRCE was contacted by the LA regarding health risks associated with elevated results found by stream water and sediment sampling. At this stage all evacuated residents had returned to their properties and wider remediation was under discussion with the site owner.

Learning points

Ascertaining the exact substances involved in a fire at a waste site can be challenging. Site inventories are useful, but do not necessarily indicate which substances are burning and/or released. The main emission of concern arising from any fire will be of products of combustion, which will include particulate matter and irritant and asphyxiant substances. During this incident, emissions of metals and VOCs were also of potential concern.

AQC activation is contingent on an incident being likely to continue over an extended time period. The situation on scene, and the information provided, can quickly change during an incident and conflicting reports may be received. During the acute phase of an incident an AQC activation decision must be kept under continuous review by CRCE and EA staff.

Acute incidents may give rise to the potential for continued public exposure to chemical hazards once the initial incident is over. Incidents at waste sites can be particularly problematic due to the nature of materials that may be released and due to the intricacies of clean-up and remediation actions. It is important that HPA staff continue their liaison and engagement with stakeholders during the recovery phase.

The complex nature of acute incidents at waste sites and their subsequent clean-up means that maintaining effective risk communication may be challenging in the face of limited and/or changing information. Multi-agency meetings are important for the sharing of information, past and future actions, agreeing a common approach, and communicating clear messages to the public.

References

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Emergency Planning and Preparedness

Exercise Salvus:

Hospital evacuation emergency response

Vanessa Middlemiss¹, Sue Corcoran², Paul Riley¹, John Simpson¹

1 Emergency Response Department, Health Protection Agency

2 Royal Cornwall Hospitals NHS Trust

email: vanessa.middlemiss@hpa.org.uk

Introduction

Fires are a relatively common occurrence in hospitals, although the vast majority are very minor and readily controlled. However, over the past three years, there has been a series of larger hospital fires at NHS London sites requiring partial or full evacuation. A report¹ commissioned to look at the events surrounding these fires concluded that “this has demonstrated the complex nature of hospital evacuation and the need for comprehensive planning”. In April 2009 the Department of Health published best practice guidance², which provided a framework for people who manage health services to design, plan and manage a co-ordinated response for an evacuation, training through underpinning knowledge and guidance to link with wider area evacuation planning and response and recovery procedures. These two documents provided the backdrop for Exercise Salvus.

The exercise was designed and delivered by the HPA Exercises Team in close collaboration with Salvus, a South West multi-agency planning group, to provide an opportunity to explore the South West’s response to a hospital evacuation incident in a multi-agency environment. It also sought to highlight how the comprehensive planning and co-ordinated response that the NHS London report and the Department of Health guidance had recommended would aid the evacuation and sheltering process.

The Royal Cornwall Hospital in Truro was chosen to be the focus of the exercise. It is a medium sized (over 700 beds) teaching hospital and has the only fully resourced A&E department in Cornwall. One of the main reasons this hospital was selected was due to its remoteness from the majority of other NHS resources in the South West and the challenges this presented. This meant that the hospital would have to cope with the evacuation and shelter event with, in the short-term, only local

multi-agency assistance. A further driver was that no similar evacuation exercise had been carried out at the hospital before. Exercise Salvus took place on 30 March 2010 at the Eden Project (Figure 1) in Cornwall. There were over 100 players including health care representatives from many of the NHS trusts of the South West, with a particular focus on Cornwall and Devon. All major partner agencies attended in support of their health colleagues including the emergency and voluntary services, local authority and military liaison.

The aim of the exercise was to develop and enhance the evacuation and shelter response of the Royal Cornwall Hospital and the wider health community and supporting partner agencies to improve planning and response at an operational and tactical level. Particularly key was to explore how the supporting partner agencies interacted and co-ordinated their response in support of the hospital, principally due to the hospital’s remoteness from other NHS assets. The exercise scenario enabled this aspiration.

The exercise

Scenario

The scenario was designed to exercise full evacuation of the Royal Cornwall Hospital, using a desktop exercise format. The trigger was a gas delivery lorry, which crashed into a nitrous oxide gas store. The store is adjacent to the Princess Alexandra maternity wing section of the hospital. A fire quickly spread to adjacent cars and some gas cylinders were ruptured both in the lorry and in store. Some of the cylinders contained acetylene and, because of the strict guidelines on the cooling of such cylinders, the Fire Service enforced a 24-hour, 200 m cordon to cool the cylinders and make them safe. This precipitated evacuation of the hospital.

The exercise started as the incident occurred and ran in real time examining how the players managed the first four hours of the hospital evacuation response. It was vital that players (Figure 2) came from all relevant NHS trusts and major partner agencies, as following full evacuation of the hospital, over 1200 people including patients, staff, visitors and contractors required support. This level of response is



Figure 1: The Eden Project



Figure 2: Players at the Exercise Salvus working on scenario injects

variously described as a 'medium scale evacuation', or in the context of a health care facility, a 'major' evacuation by the Department of Health guidance². These 1200 people had varying degrees of dependency and they had to be looked after and accommodated over the course of the four hours of exercise play. This number of people meant that the response could not be managed by the health economy alone and required co-ordinated efforts of all relevant agencies.

As part of overall response, communication to the media and the general public was also exercised (Figure 3). There were communications representatives from major response organisations, who considered communications and media strategy requirements for an evacuation from the Royal Cornwall Hospital. This was a particularly successful element of the exercise due to the amount of preparatory work that was done before the exercise.



Figure 3: Exercise Control (EXCON) showing the 'pseudo' media discussing the strategy for testing communications response

All the main elements of the exercise, including response, co-ordination and communication, were explored and analysed; any activity was monitored and recorded to create a record that was used to evaluate success of the exercise.

Evaluation

Capture of outcomes from the exercise is one of the most valuable outputs and there were various elements of data capture used during this exercise. These included:

- **Umpires** Members of the exercise planning team were allocated the role of syndicate umpire. Larger syndicates had additional umpires to allow sufficient oversight and exercise management. All umpires were comprehensively briefed prior to the exercise and reported back on their analysis of syndicate performance
- **Hot debrief session** Conducted at the end of the exercise and a representative of each of the main syndicates presented key issues, learning points, strengths and good practice
- **Player post-exercise evaluation** All participants submitted an evaluation of the exercise and their performance including learning points for themselves and their organisation. There was also feedback from observers
- **Formal debrief** The final element of the evaluation process was a formal structured debrief informed by local debriefs.

From these data, a final report was compiled and lessons identified.

Outcomes

The final report identified 13 proposed actions for the various participant organisations. The key points of note are listed.

- Following the exercise a multi-agency task and finish group will be established to create a robust validated Royal Cornwall Hospital evacuation and shelter plan. The exercise identified a significant number of inclusions, which must be considered when the plan is developed
- Whilst in the exercise the Ambulance Service partially fulfilled a patient management role. There is value in identifying a lead co-ordinating organisation that would be responsible for patient management covering NHS bed assets, patient tracking and transport options
- There needs to be a greater awareness between health and partner organisations in terms of command and control structures and roles and responsibilities during a major incident
- Additional opportunities for training and practice for senior management in the hospital on major incident response would be useful.

Conclusions

Despite the limited time and artificialities of a one-day desktop exercise format, this exercise successfully challenged the players on both an organisational and personal level and provided the opportunity for multi-agency interaction in a safe environment, a circumstance that is seldom available during normal working practices. Players highlighted the benefit gained from the opportunity to gain an overview of other player organisations' plans and response procedures and received an insight into how a holistic response would be managed from a multi-agency perspective.

The remoteness of the Royal Cornwall Hospital presented some significant challenges in terms of distance and access to other NHS resources and the way local response organisations and support agencies responded and co-ordinated their overall effort. This ensured the hospital was sustained and that people were cared for and accommodated with minimal risk. Some useful learning outcomes came from the day, around command and control and the need for a lead organisation to co-ordinate patient management. The exercise highlighted that although organisations practice for these types of event, preparation and co-ordination can be enhanced through training with other agencies involved. The establishment of a task and finish group to take the outputs from the day and develop a robust multi-agency plan for evacuation and sheltering will improve the preparedness of this trust for that eventuality and may provide a model for the development of plans in this area by others.

This exercise provided an opportunity to explore the South West's response to a hospital evacuation incident in a multi-agency environment and sought to give the planning and co-ordinated response that the London fires study had recommended.

References

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Lessons learnt from a COMAH site exercise: A public health trainee's view

Addisalem Taye¹, Peter Lamb¹, Maggie Bruce², James Sedgwick³

1 Centre for Radiation, Chemical and Environmental Hazards, Health Protection Agency

2 NHS Medway

3 Kent Health Protection Unit, Health Protection Agency

email: addis.taye@hpa.org.uk

Introduction

Control of Major Accident Hazard (COMAH) sites are sites that manufacture, process or store dangerous chemicals and substances in quantities that could pose a risk to workers, members of the public and the environment, in the event of an accident¹.

The Control of Major Accident Hazards Regulations implement the European Seveso II directive into UK legislation. The directive was developed in order to prevent, prepare and mitigate the effects of major accidents at chemical industry facilities. The regulations came into force in 1999 and in 2005 were amended to broaden their scope. This included the addition of new named substances to the list of chemicals covered by the regulations and a reduction in the amounts of chemicals required to be present on a site before it is declared a COMAH site.

The regulations apply mainly to chemical industries, but also to fuel storage activities, explosives and some nuclear sites and other industries where dangerous substances identified in the regulations are kept or used in quantities over specified thresholds. The regulations stipulate that operators of COMAH sites have to take measures to prevent major accidents and, in the event of such accidents, limit the effects on people and the environment.

The requirements of the regulations are implemented in two tiers depending on the amount of hazardous materials that are stored on the sites. Sites that hold materials in amounts above the 'lower' threshold are referred to as 'lower-tier' COMAH sites. As the amounts of chemicals stored on a site increase, the potential public health and environmental consequences of accidents on a site also increases. Sites holding very large quantities of hazardous substances may meet the threshold to be classified as 'top-tier' sites. The hazard presented by these sites is larger, increasing the risk of an incident with off-site consequences. To manage this risk the upper-tier COMAH sites are subject to more elaborate planning requirements than 'lower-tier' sites¹.

The regulations are enforced by a 'Competent Authority' that has the responsibility to check that site operators take steps to prevent and limit the effects of major accidents. In England and Wales, the competent authorities are the Health and Safety Executive (HSE) and the Environment Agency (EA). In Scotland, competent authorities are the HSE and the Scottish Environment Protection Agency (SEPA).

Under the regulations, each COMAH site is required by the HSE to develop an on-site plan and upper tier sites must support the local authority (LA) in developing an off-site plan. The off-site plans must be reviewed and tested by way of an exercise every three years.

A multi-agency table-top exercise that involved two COMAH sites was held in the HPA South East region in March 2010. The exercise was organised by the local authority in collaboration with staff from the COMAH sites, the local HPA Health Emergency Planning Advisor (HEPA), the EA, Emergency Response Organisations (ERO) and the local NHS. The lead author attended while on secondment to CRCE London.

The exercise

The main aim was to test the off-site emergency plans of two adjacent COMAH sites. In the event of a major incident at one site the other is likely to be affected. Joint planning and exercising of COMAH sites is required under the regulations where such a 'domino effect' may occur.

The scenario included an on-site explosion with a potentially hazardous plume at the first COMAH site, with a possibility of spreading to surrounding areas and, additionally, an unrelated road traffic collision along the single access road that leads to the COMAH sites blocking access to the emergency services.

Box 1: Scenario

There is an escape of chemicals from leaking pipes at COMAH site A with a possibility of the escaped vapour being carried over to a residential area, with casualties on the ground at the time of reporting

This was followed by an explosion at nearby COMAH site B with a smoke plume that was expanding. Here, some staff members were missing

There was then a report of a road traffic collision that almost completely blocked both sides of the carriageway leading to the COMAH sites and residential areas beyond with an unknown number of casualties

The specified objectives of the exercise were:

- to test the response to an incident involving a hazardous plume
- to test the implementation of a Science and Technical Advice Cell (STAC) during an incident
- to identify the differences in response to a domino incident
- to evaluate the implications of a prolonged incident and closure of main road leading to COMAH site(s) and nearby areas
- to understand the implications of a site evacuation
- to develop the off-site plans in relation to lessons identified.

Format

This was a table-top exercise led by a multi-agency Silver (tactical) Command group supported by:

- a Science and Technical Advice Cell (STAC)
- a Welfare Team
- a group representing local industry.



Figure 1: Attendees in syndicate groups (Source: Medway Council)

The exercise was presented by a facilitator from the local authority and discussions were held among the groups at the end of several injects into the incident (Figure 1).

Multi-agency Silver (tactical) Command

The role of the multi-agency Silver Command is to provide tactical direction in the response to the incident. In this exercise Silver was required to prioritise and transform the public health strategy based on advice from STAC, into tactical plans that addressed issues associated with the incident. Silver command was composed of representatives from the COMAH sites, the NHS, the police and various representatives from LA departments such as emergency planning and media/communications. Gold Command (or strategic co-ordinating group) was not exercised on this occasion.

Science and Technical Advice Cell (STAC)

The STAC is a strategic advisory group which provides technical and scientific advice to inform decision making by responding organisations regarding evacuation and specialist requirements on health, but has no command and control remit². In this exercise, it was chaired and led by a senior public health professional.

In incidents that involve releases to air or a hazardous smoke plume, the health advice that a STAC produces is based on air quality data from an 'Air Quality Cell' (AQC). An AQC assesses and delivers timely air quality information by deploying air quality monitoring devices in the vicinity of the incident³. Air quality cells were set up following the Buncefield fire in 2005 which highlighted the need to improve air monitoring capability and the need to co-ordinate the provision of air quality data to Gold Command (see page 4 for more information on monitoring and Air Quality Cells).

In this exercise there were air quality experts embedded within the STAC. The STAC included representatives from the HPA Centre for Radiation, Chemical and Environmental Hazards (CRCE), the Met Office and EA who were all able to give direct advice on air quality.

Box 2: Composition of exercise groups

Multi-agency Silver (tactical)

Representatives from the COMAH site/s, Fire and Rescue Service, Police, NHS, Ambulance service, Local Council (Highways, Service Manager, Emergency Planning, Media/Communications)

Science and Technical Advice Cell (STAC)

Environment Agency, NHS, HPA, Site Hazard Specialists, Met Office, Local Council (Environmental Health)

Welfare Team

Representatives from the COMAH site/s, NHS, Voluntary Sector (St John Ambulance and British Red Cross), Local Council (Social Care, Rural Strategy Manager, Children's Services and Housing)

Local Industry

A number of local industries likely to be affected by an incident were represented. Many attendees were also local residents

Panel of Observers

Health and Safety Executive

Welfare Team

The primary role of the Welfare Team was to ensure that the safety and welfare needs of the community in the surrounding areas were met. It also had a supportive role to the operators of the COMAH and other industrial sites to ensure that the safety and welfare needs of their staff were addressed. It was made up of representatives from the COMAH sites, the NHS, various voluntary sector representatives and the LA, which led the team. As the exercise involved the isolation of a community for an extended period, the Welfare Team had a very important role. The realistic exercising of this role would be of great benefit in the event of an incident.

Local Industry

The Local Industry Group that was composed of representatives from the main local industry providers discussed and agreed plans to mitigate any adverse effects the incident may have on local industry and its staff. Their involvement in the exercise was very useful to make them aware of the impact on their operations of an incident on the sites and of the capabilities of the emergency services and other agencies to respond.

Panel of Observers

The Health and Safety Executive (HSE) was represented by four members of its staff who were at the exercise as the main observers.

Lessons identified

The exercise concluded successfully with active participation from all groups and with the following learning points and observations.

- The impact of a domino effect when there are two COMAH sites next to each other is significant and joint planning and exercising is crucial
- Ensuring the off-site plan incorporates up-to-date information on the roles and responsibilities, in particular of the NHS and HPA, is essential
- The effect of a road closure, leading to the isolation of inhabited areas, on management of a COMAH site incident, can be profound
- Early alerting of incidents and cohesive partnership working are vital
- Understanding and utilising key communication routes is also important. This is imperative for issuing clear, consistent and timely public warning messages
- The need for prioritising tasks and utilising the skill-mix within a group effectively was highlighted
- The importance of looking ahead and undertaking horizon scanning, even in the short term, was highlighted
- The importance of implementing a business continuity/resilience plan was also raised
- Involving local businesses in the exercise was useful to prepare the community to respond to an incident and to make them aware of the capabilities of the responding agencies.

Specifically from a public health trainee's perspective, the following observations were made.

- Attending, and participating in, major incident exercises is an important opportunity for a trainee to learn and gain practical experience in the principles of management of major incidents in a multi-agency environment
- Attending such exercises is also an opportunity for trainees to understand the roles and responsibilities of public health professionals and other stakeholders in the management of major incidents, and understand how these come together in a multi-agency context
- There is high expectation placed on the STAC with very limited time for robust response or advice
- Time management in a major incident is of paramount importance
- In a major incident, it is possible that not all stakeholders or partners would be (or need to be) in 'Command and Control' mode and therefore may not respond to issues arising from the incident with the same urgency and intensity as those that are more used to the Command and Control behaviour shown in incident response.

Conclusion

This was a table-top exercise that tested the preparedness and response of a number of agencies to a chemical leak at one COMAH site and a hazardous plume from an explosion at a second COMAH site. The exercise demonstrated areas that were functioning well such as the existing strong liaison and partnership working and the wealth of experience and skills of stakeholder agencies. It also highlighted areas that can be improved such as the involvement of local businesses in the exercising of COMAH site off-site plans.

From a trainee's point of view, this was an invaluable chance to gain very useful experience in the management of major incidents and understand the expectations of a public health professional during such an incident.

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Environmental Science and Toxicology

Disaster epidemiology in Europe

Marta Sala Soler, Philippe Pirard, Yvon Motreff
Institut de Veille Sanitaire, France

Introduction

Disasters constitute a major public health problem as they can affect large groups of people, and their consequences in terms of physical, psychological and social health may be long lasting. In the event of a major disaster (natural or man-made), two equally important phases can be identified:

- the **emergency phase**, where the usual measures are evacuation, provision of shelter and intake restriction of water or certain foods
- the **post-accident phase**, where management problems related to the consequences of the disaster often continue (environmental pollution, material loss, etc.) and additional problems appear (social repercussions, psychological distress and other long-term health risks).

Risk assessment and epidemiology can be useful tools to assess the health burden of the disaster during the two phases and therefore help orientate management actions (e.g. clean-up measures or mental health screening). Their results can point out the main health problems, warn of unexpected ones, identify at-risk populations and improve awareness of risk factors.

The Netherlands, the United Kingdom and France have been hit by natural and man-made disasters in the recent past. In order to improve future response to such incidents, these countries have been reflecting on lessons learned and developing and adapting their management organisation as well as their epidemiological preparedness schemes.

Based on the comparison of responses to three disasters in these three different countries, the objective of this paper is to identify and discuss common epidemiological challenges that public health institutions around Europe face in their response to major disasters.

Methods

Choice of case studies

The disasters chosen for comparison were the 2001 AZF factory explosion in Toulouse (France), the 2000 Enschede fireworks disaster (the Netherlands) and the 2005 London Bombings (United Kingdom). These examples were chosen due to the major impact they had on the population and for the quantity of epidemiological articles published regarding them.

Bibliographic review

Studies were identified mainly by using PubMed-Medline databases, Google and Google Scholar. Articles were limited to studies in humans and to reports published in English or French. Systematic searches of the scientific literature were conducted using the following key words: epidemiologic studies, chemical disaster, physical and mental health effects, Enschede fireworks disaster, AZF explosion, London bombings.

Exchange with other institutes

As a result of the literature review, key themes emerged and these were followed up through discussion with the respective public health institutes: the French Institute for Public Health Surveillance (InVS), the National Institute for Public Health and Environment (RIVM) in the Netherlands, and the UK Health Protection Agency (HPA). These issues were: health risk assessment, biomonitoring, community involvement, surveillance systems, cohort and cross-sectional surveys, including population registration and health reference levels, good comparison and feedback to the stakeholders.

Results

Despite the management of all three disaster scenarios being different in each country, Figure 1 shows that similar methods were used to reach a complete assessment of the health burden of the disaster, discussed below.

Health risk assessment

The first action undertaken by the public health institutes of all three countries was a health risk assessment (HRA) based on environmental and toxicological measures launched immediately after the explosions, to evaluate the risk due to any potential acute danger and orientate management actions.

Only limited time is available during and directly after a chemical incident to obtain certain necessary samples. As appears in Figure 1, France and the UK relied on the emergency responders (police, fire-fighters, etc.) to deal with the collection of samples^{2,11}. However, French public health experts had significant difficulties obtaining these data from fire-fighters and factory owners due to a lack of experience in collaboration between epidemiologists and emergency responders. The UK had prepared for such a situation as the London Bombings and immediately set up an environment group to share data between all stakeholders involved in the environmental and health risk assessments¹¹.

Good communication with emergency staff is also important in a system where the collection of samples from the affected area is performed by the staff of the public health institutes, as in the Dutch system¹². In such situations, there must be a clear understanding of their respective roles in order to facilitate a situation where both task forces (emergency responders and the public health institute staff) work together without getting in the way of one another. Upstream organisational preparation with optimal measurement principles and timely discussion between users of environmental measurements are therefore very important.

In the Netherlands, the HRA included data from a biomonitoring system, where blood and urine samples of rescue workers and the exposed population were tested for firework-related substances¹³. The feedback of this experience promoted the production of guidelines for biomonitoring pre-identified toxins relevant in a post-disaster situation, as well as campaigns of biomeasurements in the general population in order to have reference distributions for comparisons in an emergency.

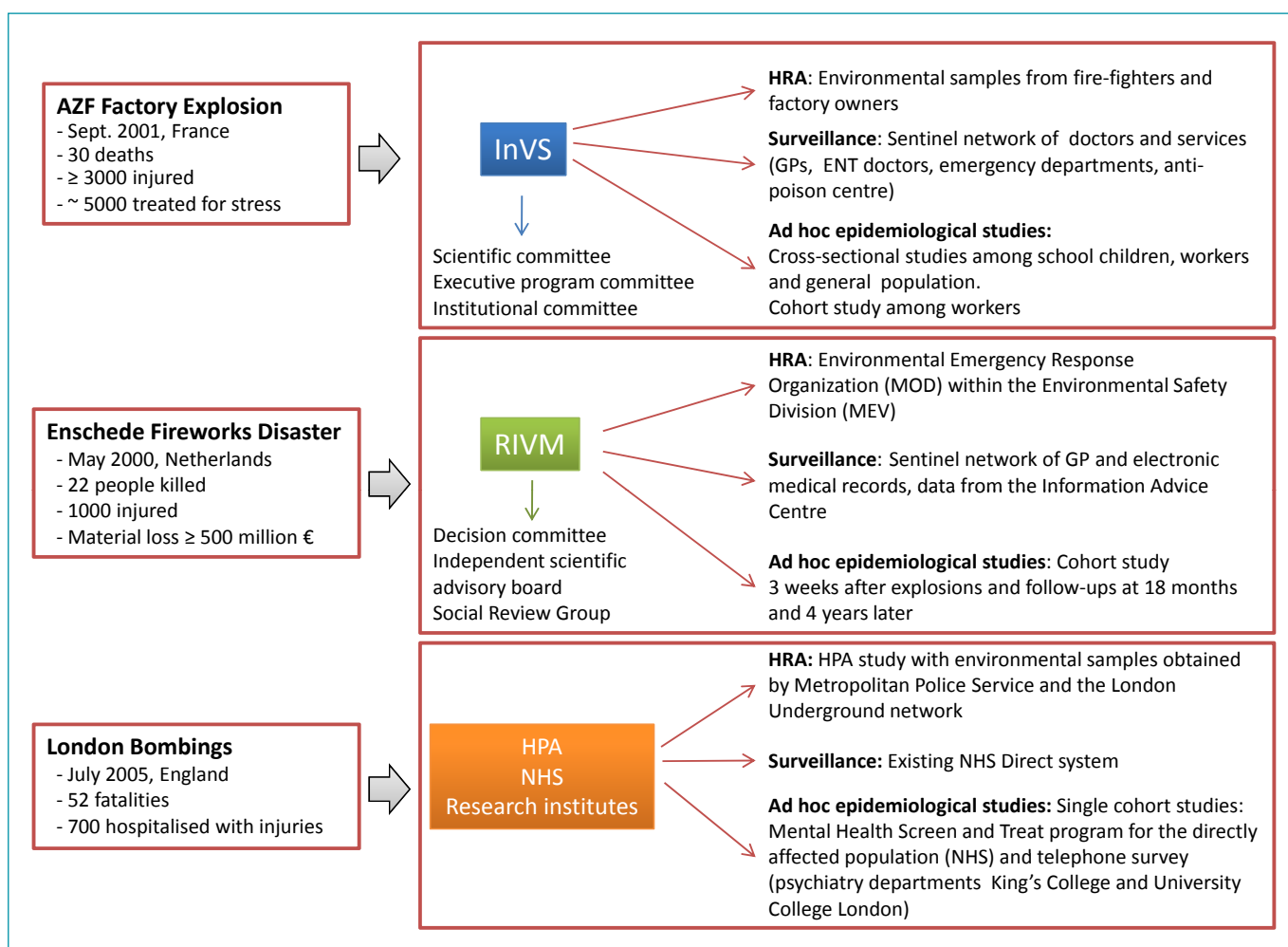


Figure 1: Responses to national disasters¹⁻¹¹

Epidemiological response

Scientific staff worked on the identification of data sources and methods to answer the public health issues associated with all three disasters. In all examples different methods with different purposes were used to reach a complete assessment of the health burden of the disaster. By and large it could be said that two sets of tools were used:

- a surveillance system based on ecological data and monitoring and alert systems
- ad-hoc epidemiological studies (e.g. cohorts or repeated cross-sectional studies) based on direct individual interviews.

Health surveillance

In the three countries, the adaptation of existing data systems and the activation of new data sources served to alert healthcare professionals to emerging health issues as well as allowing them to assess the impact of the event. Despite most data systems being created after the disaster on a temporary basis, they were called surveillance systems by the authors.

In France, these systems permitted an assessment of the initial impact of the disaster, by monitoring the change in use of emergency services (Orumip) and visits to general practitioners, psychiatrists, gynaecologists and a Poisons Information Centre. This enabled the detection of hearing problems and an impact on mental health in relation to the AZF explosion⁴. The UK used its existing syndromic surveillance system (NHS Direct) to monitor the mental health impact of the London Bombings as well as for the identification of exposed populations¹⁴.

In the Netherlands, in contrast to the other examples, the surveillance system was established not at the time of the incident, but some time later, after the start of the epidemiological studies. It was based on complete individual electronic medical records of general practitioners of Enschede¹⁵ and allowed collection of retrospective pre-explosion data for each of the individuals studied, and therefore a direct pre- and post-event comparison of health problems¹⁶. The special characteristics of the Dutch surveillance system also permitted a cross-validation of the cohort results and the identification of socioeconomic risk factors¹⁷.

Taking into account the usefulness of such surveillance systems, all three countries are currently analysing the adaptation of their systems in the aftermath of disasters.

Ad hoc cohort and cross-sectional studies

Specific epidemiological studies were conducted in all three incidents, based on issues highlighted by steering committees or identified by the surveillance systems. The objectives of the studies were to assess the health impact of the event, and for some studies to gain better knowledge of the relationship between risk factors and the health impact of the accident, in order to help direct actions for mid- and long-term care of the affected populations.

In all three countries epidemiologists were confronted with important difficulties and limits, such as the identification of the exposed population and controls, the selection of good health reference values and how to ensure results were fed back in an easily understood way to stakeholders and members of the public.

Table 1: Selection of study population^{1,2,4,5,7,8,16,18-20}

	AZF Factory Explosion Toulouse	Enschede Fireworks Disaster	London Bombings
Identification of exposed population	Population from the vicinity of the factory: Registered school children Employees Municipal registry	Population from the vicinity of the factory: Letters to homes (municipal registry) Employees Media messages	All exposed population: Hospitals London Bombing Charitable Fund NHS Direct HPA (media message)
Identification of comparison information	Pre-event information: Emergency activity (ORUMIP) CPAM: psychotropic prescriptions Comparison groups: Students from schools not affected by the explosion Toulouse workers beyond the 3 km perimeter of the explosion	Pre-event health status: GP data (EMR) Comparison group: City of Tilburg (comparable histories)	Pre-event health status: NHS Direct No comparison group used

In the absence of formal health registers of victims at the moment of the disasters, epidemiologists had to find different ways to identify and contact affected persons in order to launch health studies. This led to some difficulties in checking the representativeness of the selected and responding population.

For example, in Enschede, the blast partly or completely destroyed a large proportion of houses and therefore it was not clear whether the residents listed in municipal databases were reached and informed of the project¹⁹. Five years after the AZF blast, a shared feedback of the epidemiological results between all the local stakeholders revealed the existence of a proportion of the exposed victims who had never registered for insurance compensation nor been involved in epidemiological studies². Nonetheless the testimonies of some of these non-respondents stressed that a proportion of them had been seriously exposed to the AZF incident (personal communication from population advisor).

Experiences show that the failure to plan for the establishment of a comprehensive database of disaster victims in the emergency planning stage has proven to be a major limitation in post-accident management, as well as a limitation for successful epidemiological follow-up. If a pre-established protocol for a health register had existed, the selection of a representative population would have been easier.

Currently, the three countries are working on the preparation of pre-planned registers in case of future disasters. In the UK, a Health Register Project has been developed within the HPA with experts from different divisions of the HPA, outside academics and other experts. Initial efforts have focussed on the identification of attributes of an incident that can be used as the criteria for establishing a health register and consequently developing a proposal for a protocol for an HPA Rapid Response Register.

Likewise in the Netherlands, RIVM is proposing census factsheets collecting the main principles and recommendations to be delivered

to regional authorities, who in the case of a major incident would be in charge of the situation.

In France, a protocol for a register of the exposed population to a radiological accident has recently been proposed by the Codirpa Committee, the steering committee for the structuring of the post-accident phase management of a nuclear disaster²¹. This protocol relies on several particular situations favourable for a good register with names and contact details. Some examples are the first shelter gathering after the initial evacuation, within the assistance centre, during the first health evaluations, etc.

Apart from identifying the exposed population, one of the bases of epidemiology is the identification of reference or control groups to assess the impact of an event or an exposure, although differences in exposure within the same population could also allow valid comparisons. Existing or rapidly measurable baselines are highly important for allowing the comparison of the results obtained in a study of a post-disaster scenario. As can be seen in Table 1, controls can be the same affected population if pre-event health data are available, a comparable group of non-exposed population, or a subgroup of the same population with a lower level of exposure compared to another subgroup. Except for the first study in Enschede, all the studies in the Netherlands and France had selected control groups. The English response did not include control groups in its studies due to its different approach (screen and treat).

Community involvement

In order to obtain a complete overview of the public health implications of the disasters, similar structures were created by responders to all three incidents to facilitate the communication between decision makers, scientists and local stakeholders.

In all three countries, public health steering committees were created where decision makers and experts discussed with local stakeholders (including victims), the identification of the public health issues of the disaster.

Table 2: Community involvement in the aftermath of the disasters^{2,7,9,22-24}

	AZF Factory Explosion Toulouse	Enschede Fireworks Disaster	London Bombings
Involvement of community representative in health research	Local stakeholders involved in the institutional committee: Facilitating the organisation of the studies. Exchanges between epidemiologists, the public and the media	Local stakeholders involved through the social review group: Give opinion at the start of new activities. Participated on the outline of reports	Gold representative from local authority + Local stakeholders participated in the Psychological Steering Group set up by the mental health trust as part of the NHS trauma response programme: Consider proposals for mental health response

Apart from the steering committees, the Netherlands and the UK established facilities to directly assist the affected population and their friends and families. The London centre was first named 'Family Assistance Centre' and later renamed '7th July Assistance Centre' due to a multi-agency investigation that found that the word 'family' had been unhelpful and misleading, preventing some individuals from attending²³. In Enschede the installation was given the name of 'Information Advice Centre'²². Both structures contained a special unit for psychological and psychiatric support to treat disaster-related disorders.

In France, after the explosion of the AZF factory, no information and advice centre was established because at the time, no such thing had been considered. Recently, however, a similar concept (CAI: Centre d'accueil et d'information) was proposed by the Codirpa Committee²⁴.

Conclusion

Different approaches are necessary to address the public health consequences of a disaster. Cancer, birth defects, mental health effects and secondary effects due to the disruption of the economy are clear examples of delayed societal implications of a catastrophe outside the scope of the emergency services.

With adequate information, many of these late effects can be anticipated or controlled through secondary prevention or social measures, for example. In this context, epidemiology can be a very useful tool to provide relevant, transparent and timely data for the management of this late health and social burden.

The comparison of the response of the three countries has stressed the fact that in order to guarantee a complete analysis of the health situation, a combination of methods (HRA, surveillance and surveys) must be used and that results must constantly be analysed and divulged to decision makers and the public. It has also pointed out that in order to obtain a complete analysis of the situation, responsive to the affected population needs, victims as well as other local stakeholders should participate in the management process and have a good interaction with epidemiologists in charge of the studies to be launched. This interaction of local stakeholders, decision makers and epidemiologists is the only way to guarantee relevant, high quality health research and has to be included in the upstream preparation of post-accident management organisations.

Last but not least, this project has highlighted the usefulness of analysing and learning from previous experience. Bearing in mind that fortunately disasters of this scale are scarce at a country level, lessons can be learned not only from previous national disasters but also from international events. Furthermore developing collaborations between public health institutes across European countries can help to gain expertise by facilitating the production of homogeneous and comparable results and thus enhancing the knowledge base for how to address public health in these challenging situations.

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Feeling Good About Where You Live: Impact of improving the residential environment on mental well-being

Aideen Silke

NHS Greenwich/Greenwich Council

email: aideen.silke@greenwich.gov.uk

Little is known about the impact of improving residential areas on mental health of the residents. 'Feeling Good About Where You Live' is a case-control study which seeks to provide causal evidence describing the relationships between physical and social aspects of residential environments and psychological well-being. Not feeling good about where you live is associated with significantly poorer mental health, which is associated with reduced life expectancy and a contributing factor to health inequalities.

Good robust research on the health gains resulting from investment in housing and residential areas is lacking¹. Most investments in social housing are likely to be modest in monetary terms, especially within the current climate; hence this is of great interest for policy makers working in health and housing. Increasingly, partnerships and joint working with local community structures will be required to maximise the benefits of local community assets, both physical and social. Authorities do not know how much or even how little can be spent (and on which specific features of the home and neighbourhood environment) to improve psychological health for the residents². Neither is it understood, in an increasingly constrained financial climate, how the impact of more localised decision making will influence neighbourhood change and contribute to thriving civil societies. An understanding of how residents relate to the place in which they live and to their local community in a deprived community is valuable in elucidating how this might be delivered in the context of changing relationships between the individual, the community and the state.

Feeling Good About Where You Live

Feeling Good About Where You Live (FGAWYL) is an innovative piece of research jointly led by Greenwich Council and NHS Greenwich, which is seeking to understand the nature of the relationships between factors in the physical and social residential environment and mental well-being at the community level. It is based on a postal survey of 2696 adults in Greenwich in 2003 (38% response rate; 46.4% at household level). The survey found that being dissatisfied or very dissatisfied with twelve factors across six domains, set out in Table 1, meant that residents were 200–300% more likely to be in the lowest quartile for mental health (measured through the mental health scale SF36³) after adjusting for confounding. The research highlighted the need to intervene on both design and social features of residential areas to promote psychological health⁴. Consideration of the qualitative comments and more recent literature added transport and accessibility as a thirteenth factor.

FGAWYL is a prospective case-control study based on two estates in Greenwich. It will examine the impact on mental health of low-cost improvements to physical and social aspects of a residential area and determine the nature of any causal relationships. It is envisaged that the

'control' estate will receive interventions on completion of the follow-up period. The project will not interfere with normal business on the estates.

To ensure comparability the two estates were matched on:

- level of council ownership (greater than 60%)
- mix of types of accommodation, e.g. blocks of flats or houses
- rank on the index of multiple deprivation (bottom 6.5%)
- completion of all Decent Homes⁵ works
- sociodemographic factors
- size.

Full NHS ethical approval was granted for the project in July 2009.

Table 1: Environmental factors negatively impacting on mental well-being⁴

Domain	Significant factor
Control over the internal environment	Damp
Design and maintenance	Liking the look of where you live
Noise	Noise (from neighbours)
Density and escape	Feeling overcrowded in the home Access to green spaces (transport and movement)
Fear of crime and harassment	Fear of going out during the day Fear of going out at night Needles and syringes left lying around
Social participation	Events to get people together Places to stop and chat Community facilities Social and entertainment facilities

Interventions

The thirteen intervention factors were regrouped into six themes, three addressing estate-wide factors and three addressing individual factors. The interventions address physical and social elements of the residential areas and at least one intervention to address each factor will be delivered over the 18 month intervention phase. An integrated approach to delivery has been adopted to maximise the effectiveness of existing routine services and funding sources. The project interventions will be low cost and primarily delivered and funded through integrated uses of existing budgets and services. Where possible, delivery will be designed and undertaken in conjunction with residents on the estate to develop a sense of local ownership and help ensure project sustainability. The effectiveness of the intervention for improving psychological health is being evaluated quantitatively and qualitatively. It builds on successful Neighbourhood Pride⁶ work which places residents at the heart of work on their estate.

Achievements/interventions to date

- Detailed qualitative and quantitative baseline survey of the two comparison estates completed (53% response rate at household level)
- Physical quality audit of the two estates completed
- Neighbourhood Pride Project established on the estate
- Effective delivery partnerships established between NHS Greenwich, Metropolitan Police, Greenwich Council, local voluntary sector and local schools
- New tenants and residents group established to guide the project and support future sustainability
- Significant increase in level of community engagement, provision and participation in community activities, including development of a community garden and planting over 1000 bulbs with estate residents; cookery club, dancing and aerobics in the local community centre, school and nursery; improved access to a local community centre through a weekly well-being drop-in hub
- Over 40 activities undertaken on the estate since project commencement
- Increased neighbourhood warden presence and installation of a CCTV camera
- Graffiti clean-up and joint work to address noise, housing repair and damp issues
- Successful funding bid to the Paul Hamlyn Foundation for the arts and gardening strand of the project, which is running a full summer programme of activities based around mobile structures on the estate
- Three large community days held, including 'Party in the Park' on 17 July 2010 attended by over 350 residents.

The findings of the study will inform future decision making about environmental and social interventions to improve well-being delivered in partnership with the local community for councils and healthcare commissioners in the UK, particularly in deprived areas. It will help to elucidate the impact of local decision making in a residential area and start to understand the nature of the changing relationship between individual, community and state. It will recognise the impact of the changing economic and social environment and how that will influence residents' views regarding their place and their ability to influence this. The impact of changes made in this local area will be fully examined and will provide recommendations to inform future decisions.

Conclusion

Knowledge about which environmental improvements result in better mental health will be of benefit for policy makers in health and housing. Importantly, FGAWYL seeks to establish where limited budgets can best be spent by housing providers to improve residents' well-being and provide a replicable model of estate engagement. The findings of the study will inform future decision making in relation to mental health and environments for councils, housing providers, and healthcare commissioners in the UK.

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The Housing Health and Safety Rating System: Application to homes in the private rented sector

Peter Good¹, Darrell Gale²

1 Private Sector Housing, Medway Council

2 Kent, Surrey and Sussex Public Health Training Scheme

Introduction

The Housing Health and Safety Rating System (HHSRS) is used by local authorities to inspect poor housing and recommend its improvement. This article discusses how the guiding principles of the HHSRS are applied in driving up standards in the private rented sector, and describes the observations of its application by a Specialty Registrar in Public Health and recommendations for future collaborations between the public health and housing sectors.

The role of the Private Sector Housing Technician within a local authority is to deal with service requests (complaints) from tenants in the private rented sector about the poor condition of their accommodation. These requests are predominantly from vulnerable individuals and families who either are unable or feel unwilling (in cases of large rent arrears) to contact their landlord, or who have been in contact but have not been able get their problem dealt with satisfactorily.

Medway Council is a unitary authority, providing all local government services for a quarter of a million people. It is situated in Kent in the South East of England, just 45 minutes from the centre of London; Medway grew up around the river from which it takes its name¹. The majority of service requests to the Council come from the central areas of Chatham and Gillingham where the housing stock mainly comprises high-density, Victorian-build terraced housing. Much of this housing stock falls below what is termed a 'decent standard'² and was purchased by investors during the buy-to-let boom. Many of the tenants living in these central wards are on low incomes or unemployed and are dependent on government housing benefits. More recently, this population has expanded rapidly due to inward migration from Eastern Europe.

The 2006 Medway House Condition Survey established that³:

- 15% of homes in Medway (over 15,000) contain a 'category one' hazard. That is a hazard which poses a serious risk of death or permanent harm and on which the Local Authority has a duty to take the most appropriate remedial action
- In the private rented stock, 53% of all homes were determined as being non-decent against a Medway average of 20%
- 43% of properties in the private rented sector contained a category one hazard against a Medway average of 15%
- The majority of homes failing the HHSRS do so due to 'excess cold'. This was followed at a much lower incidence by 'falls' – either on the stairs or on the level.

Property values in Medway have traditionally been and remain below the average for the South East⁴ and rental demand has been strong due to a sizeable proportion of the local population not being in a position to buy their own homes. Thus the rental values achieved offer a good rate of return to investors. Whilst some landlords have approached property investment with a carefully thought-out business plan and budgeted for

an initial programme of refurbishment and future maintenance, others have adopted a more cavalier approach. Some have bought up cheap properties, and benefited from rising property prices to borrow more money against their equity to buy even more property to expand their portfolios. They often appear to have little understanding of the need for maintenance of the older properties they own or to understand the health and well-being needs of often vulnerable tenants, and the liabilities to which they are potentially exposed.

Tenants may become trapped in the property, as they are reliant on housing benefit and are prone to falling into rent arrears with changes of circumstance or an inability to pay top-up rent. Arrears may mount up whilst a landlord continues to receive the basic housing benefit paid directly to them⁵. Tenants may then feel unable to make requests for improvements and this may restrict their ability to move.

What is the HHSRS?

The Housing Health and Safety Rating System (HHSRS) is a risk-based evaluation tool used to assess potential risks to the health and safety of occupants and visitors in residential properties (in England and Wales)⁶. It is an evidence-based risk assessment procedure on which local authorities must now base their decisions on the action to be taken to deal with poor housing conditions. The HHSRS assesses 29 different hazards⁷, where each hazard has a weighting which determines if the property is rated as having category 1 (serious) or category 2 (other) hazards; the scores from different hazards are not aggregated⁸.

A risk assessment looks at the likelihood of an incident arising from the condition of the property and the likely harmful outcome. The possible harms that may result from an occurrence are categorised according to their perceived severity into four classes of harm: extreme, severe, serious and moderate. These are harms of sufficient severity that they will either prove fatal or require medical attention and, therefore, would be recorded in hospital admissions or GP records⁹.

Officers of the Council recognise that harm is an adverse physical or mental effect on the health of a person. This is an individual's state of physical, mental and social well-being, and is by no means limited to the presence of disease or physical injury. This includes very real psychological distress and community instability¹⁰, which often arise from a person having to live on a daily basis in a property with a deficiency over whose repair the person has no control.

Not all risks can be eliminated but the conclusions of any assessment, expressed as a schedule of works, aim to reduce to a minimum the probability of an occurrence and of the potential harm that could result.

How is the HHSRS applied in Medway?

When a complaint is received it is logged and then allocated to an officer who then contacts the tenant to discuss the circumstance of the complaint and arranges an inspection. An officer may consider whether it is prudent to contact the landlord before visiting the property or may decide to leave this contact until after inspection when more detailed information will be to hand.

At Medway Council the Private Sector Housing Team adopts the good practice of carrying out as full an inspection as possible. This more often than not results in other and probably more significant hazards being identified than those initially complained of by the tenant. During the inspection it is important that the tenant is made aware of the scope and purpose of the inspection so that their expectations from the council are not inflated. Detailed notes of the visit and photographic evidence are recorded. More sensitive pieces of information about the tenant’s personal circumstance, previous dealings with the landlord and any rent arrears are also noted.

The initial contact with the landlord is made on an informal basis designed to encourage co-operation between the local authority and the landlord. This may be in the form of a phone call or a carefully written letter that advises that the local authority has visited the property at the request of the tenant (or some other external body), setting out expectations, and providing a detailed schedule of the work required, giving both the reason for the request and technical advice on the recommended remedy.

The Housing Act 2004¹¹ gives a local authority a number of possible formal enforcement powers to which it can resort when a landlord refuses to co-operate and where category 1 and high category 2 hazards exist.

Case studies

As part of a placement with the HPA Centre for Radiation, Chemical and Environmental Hazards (CRCE) in London, Darrell Gale, a Specialty Registrar on the London Kent Surrey and Sussex Public Health Training Scheme, spent a day with Peter Good from Medway Council to observe how HHSRS inspections and implementation occurred on the ground.

Case study 1

The first property to be inspected was a typical Victorian terraced house where there was no effective form of heating, just a dated gas fire downstairs and old electric storage heaters (not connected to a low cost tariff), which along with no loft insulation could result in excess cold,



Figure 1: Property 1 showing an open low sill window vent on the first floor, with a high risk of fall

damp and mould. The stairwell ceiling was covered with polystyrene tiles that constituted a fire hazard within the main escape route. The top-hung window openings to first-floor windows could easily be opened widely, and the height of the sill was low and therefore the risk to vulnerable young children from falling out onto a hard surface was high (Figure 1). This property clearly demonstrated the three most common hazards experienced in the area: excess cold; damp and mould; and falling between levels.

Case study 2

Probably the fourth most common hazard – electrical hazards – was demonstrated in the second property (Figure 2). Again this was a dated and much neglected Victorian property. This property had been previously visited but on this occasion, the landlord had agreed to accompany the inspection to view and discuss the condition of the electrical installation as there were numerous elements of the electrical installation that gave cause for great concern. Apart from the electrics being dated, most of the switches and sockets were broken exposing live wires. Fortunately these items were repaired within a few days.



Figure 2: Property 2 showing a dangerous electrical socket with a high risk of electrocution

Case study 3

An Eastern European family with rent arrears following a work-related injury occupied the final property inspected. The landlord had failed to establish any meaningful correspondence with regard to attending to numerous deficiencies at the property on the basis he would not carry



Figure 3: Property 3 showing damp and mould growth in the single storey extension

out the work until the rent was paid. The purpose of the inspection was to gather data at the property and to carry out the risk assessment under the HHSRS. Damp and mould were the main hazard in this dwelling (Figure 3). The walls of the single storey rear projection were of a sub-standard single brick thickness. Walls of this slenderness are particularly prone to problems of damp penetration and condensation. This part of the dwelling was experiencing severe damp associated with condensation, the walls and ceiling were covered in black mould and this had spread into the kitchen. The back wall in the dining room exhibited rising damp and there was dry rot in the floor. This was later classified as a Band D hazard – a high category 2 hazard.

Increasing take-up in Medway

Whilst the level of complaints received varies from one month to the next, there has been a noticeable increase in the level of complaints received by Medway Council year on year. This increase in up-take of the Council's service can be attributed to a number of reasons. Improvements in complaint handling and a conscientious effort to bring outside landlords, who were previously wary of the Council's actions and motives, has meant that the Council is now able to more readily resolve issues quickly and informally without having to use enforcement action.

This improvement has been recognised in a recent Audit Commission report in which Medway Council's strategic housing services have been judged as providing a 'good' two star service for residents. The Audit Commission's awarded score shows an unprecedented rate of improvement that makes the Council the first authority in the country to go from zero to two stars on re-inspection. The Commission welcomed the fact that poor, private sector housing is being tackled and improved by the Council through a 'proactive approach to enforcement and regulation'.

The consequence of working more effectively has in turn resulted in more referrals from partnership organisations such as social services, health visitors, schools, doctors, police, the fire service and local support groups. Perhaps the most rewarding is the increase in referrals arising by word of mouth between tenants.

Medway Council has recently adopted a private sector housing strategy to tackle the poor housing conditions found in Medway, the aims of which are listed below²:

- Improving the health of private sector residents by ensuring they have access to decent, safe and warm homes in a sustainable community
- Improving the overall standards and management of private sector accommodation and empowering private sector tenants
- Making the best use of the Council's existing private housing partnerships and resources in delivering objectives.

With the influx of migrants from Eastern Europe, the Council was concerned that it was not reaching this vulnerable and sizable group in the local population. It now employs a Private Sector Community Support Officer to work in the community and hold surgeries at local schools and libraries. She has uncovered some very poor living and housing condition as well as issues of overcrowding.

Conclusion

The HHSRS gives local authorities a powerful tool to ensure private rented sector housing is improved to decent homes standards, and consequently that risks to the health and well-being of occupants are reduced. The opportunity to observe HHSRS inspections in process and to understand the context within which the tenants of such properties

live has proved an enormously valuable learning experience for a Specialty Registrar in public health. This is something that should be recommended to all such Registrars. The links between poor housing and poor health are well known and are a key element of the UK public health training curriculum¹³. However, the experience of viewing housing hazards and discussing their impact with both residents and the housing professionals undertaking inspections and recommending remedial works, adds a more profound element to this knowledge, and to understanding the health needs of some of the most vulnerable people in society.

Specialty Registrars in public health are well placed to ensure that data from HHSRS inspections can be used to inform local policy and commissioning in the area of health improvement and housing. Evidence¹⁴ and tool kits are available that allow local public health teams to assess the costs to the health service of the effects of poor housing in their area, and to calculate the cost of remedial works¹⁵. With the recent Health White Paper¹⁶ proposing a return of many public health functions to local authorities, there are now many emerging opportunities for public health to make lasting improvements in housing conditions.

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Natural Hazards and Climate Change

Climate change and the duty of a doctor: Teaching sustainable healthcare

Stefi Barna¹, Frances Mortimer²

1 Teaching Public Health Network, University of East Anglia, Norwich

2 Sustainable Healthcare Education, The Campaign for Greener Healthcare, Oxford

email: frances.mortimer@kintoa.org

Climate change is expected to bring about significant changes to the social, economic and demographic determinants of health¹, and therefore to the way in which public health and medicine are viewed and practised. There is growing health sector support for mitigation of climate change (e.g. advocating for the health co-benefits of a low carbon society), adaptation to climate changes (e.g. planning for altered disease distribution), and more sustainable use of resources.

The NHS Carbon Reduction Strategy² calls upon “NHS organisations and Strategic Health Authorities [to] work in partnership with Higher Education Institutions to ensure that sustainability and carbon reduction concepts are included in undergraduate curricula”. Sir Liam Donaldson echoed this in the CMO Report 2009³, recommending that “the health impacts of climate change should feature prominently in undergraduate and postgraduate health professional education curricula”. This imperative is congruent with the General Medical Council’s Duty of a Doctor to “protect and promote the health of patients and the public”, and also Tomorrow’s Doctors (2009)⁴ Outcomes for Graduates to “recognise the role of environmental and occupational hazards in ill-health and discuss ways to mitigate their effects”.

To prepare tomorrow’s doctors for work in a changing world, a multi-agency, multi-professional collaboration* has developed an innovative curriculum and teaching materials about the health aspects of climate change. Because of the uncertainties in the impacts of environmental change and the responses that will be needed, the curriculum purposely focuses on concepts, motivations and skills, rather than factual knowledge. In the coming academic year, these materials and approaches will be tested in a range of medical school settings and evaluated collectively.

Get involved

Join the Sustainable Healthcare Education (SHE) network of clinicians, academics and students near you

Create a network on sustainability teaching in your own discipline and expand the SHE approach to other health professions. Contact us for materials and assistance

Help frame climate change as a health crisis in addition to an environmental one. Attend CPD training from the Sustainable Development Unit (www.sdu.nhs.uk)

Sustainable healthcare learning objectives for medical students

Describe the benefits and challenges of the concept of sustainability as a framework for high quality healthcare provision

- Explain the concepts of ecosystem services and sustainable development in relation to human health
- Describe the importance of systems theory and feedback loops in auto-regulation of climate and biological systems
- Explore the ways in which the links between environment and health might affect the duty of the doctor to “protect and promote the health of patients and the public”
- Discuss the relationship of sustainability to quality of care in one medical speciality.

Recognise the role of climate change (as an environmental hazard) in ill-health and discuss ways to mitigate its effects

- Describe the impact of climate change on inequality in the determinants of health
- Define the relationship between climate change adaptation and mitigation
- Explain the health co-benefits of each (e.g. transport, food production, energy generation and use, population control, and distribution of resources)
- Explain how ‘Contraction and Convergence’ relate to ethical issues of distributive justice in health
- Critically appraise scientific evidence on the mechanisms by which climate change affects health, directly and indirectly.

Demonstrate advocacy skills for action on sustainable healthcare

- Discuss social and psychological aspects of environmental behaviour change (e.g. why and how people/organisations change or do not change)
- Informal advocacy: discuss with colleagues whether or why individuals in the NHS should support sustainable healthcare
- Formal advocacy: give a ten minute presentation or write a letter to senior colleagues about NHS responsibilities and opportunities for sustainable healthcare
- Advocacy in practice: identify an unsustainable practice in your medical school or in a clinical setting and attempt to change it
- Describe strategies for creating a support network to increase the effectiveness of professional actions.

* NHS Sustainable Development Unit, the Campaign for Greener Healthcare, the East of England Teaching Public Health Network and the network of Public Health Educators in Medical Schools (www.sdu.nhs.uk).

Demonstrate leadership skills and clinical skills for sustainable healthcare

- Leadership skills (from the Academy of Medical Royal Colleges Medical Leadership Competency Framework): demonstrate personal qualities, and skills in working with others, setting direction, improving services (inclusion of sustainability as an aspect of care quality), and managing services (stewardship)
- Clinical skills: demonstrate effective use of lifestyle interventions in disease prevention, describe ways in which patients may be supported to care for themselves, and demonstrate effective conduct of a remote consultation with a patient.

Conclusions

As healthcare professionals adapt to a new climatic world, we must also adopt mitigation measures that deliver clear benefits to health. Creating a more sustainable healthcare system requires collaboration across many areas of the undergraduate curriculum, including healthcare quality improvement, the role of doctors as managers, communication skills, evidence appraisal, health promotion, global health inequalities and ethics. More than dedicated time as a stand-alone subject, it requires a broad team to integrate a vision of sustainability across all fields.

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How can local communities cope with flooding?

Understanding local social structures and how these shape collective flood responses

Tracey Coates

Flood Hazard Research Centre, Middlesex University, London

email: tracey.coates@btinternet.com

Introduction

In both the UK and worldwide there is a move from flood defence to flood risk management. This change has placed an increasing emphasis on local communities and their involvement in the flood risk management process^{1,2,3}. Whilst the concept of communities is being increasingly incorporated into emergency/disaster management, it is necessary to understand its complexities and not use the term in a simplistic way. To date there has been a tendency within this policy literature to treat local community as self evident and unproblematic, rather than complex and requiring investigation^{4,5,6}. The current calls for greater community involvement are as yet unclear about the form that this should take. The implication is, however, that there must be some form of local collective action; otherwise responses would remain individual rather than communal. The assumption is that there will be some kind of relationship between residents, in other words it is reliant on the face-to-face community and the existence of local networks.

Yet it is not clear that this is a reasonable assumption, many authors have declared the loss of local community and its associated networks of support^{7,8}. The research found that whilst residents often desired local community and local networks there was no clear mechanism for these to be created. In the traditional community of the past, residents were relatively isolated and most of life's experiences were expected to take place within the community, leading to the creation of dense local networks. Yet people's lives were no longer confined to the locality, and the traditional structures of community such as school, religion or employment largely failed to create the types of networks understood to be an essential part of community. How then can local people meet to create the types of networks envisaged, or do they simply fail to materialise?

This paper explores residents' understanding of what is meant by local community and how they set about creating their vision. The focus is largely on the more structural and discernable elements of local community. (Less apparent aspects such as local identity and attachment to place are important in understanding the concept of community but there is not space to consider these in detail here.) It is then shown how an understanding of the local social structures can be used to assess the extent and types of collective action that are likely in the event of flooding. This information could then be used to support or enhance a community's effort to help itself.

Method

The research was conducted as part of a PhD⁹ and was carried out in three locations in the north of England which had been affected by flooding. The following place names are pseudonyms to protect interviewees' identities. Two of the locations, Aylesby and Haylton, were

small rural villages and the third, the Upbeck estate in Leeds, was an urban area. The urban area has been flooded three times; the rural areas only once. In total 54 people were interviewed, some more than once. Interviewees included both residents (flooded and non-flooded) and 'flood professionals' (staff members from the Environment Agency, and various local council departments with flood responsibilities). Interviews were recorded, transcribed and later analysed. The aim was to examine understandings of the term 'local community' and the social processes operating within local communities. These were examined in the context of residents' responses to flooding, and how the 'communities' were changed by the flood experience. (The research does not aim to be statistically representative but to uncover underlying meanings and processes.)

Creating local structures

The research found that the creation of local networks now requires considerable reflexivity and active efforts by local residents, who had to set about consciously creating their own local structures, which could enable these types of networks to develop. It is proposed that the local community can be understood as a 'conscious community'. Not only must residents consciously desire it, they must make continual efforts to construct and maintain the local networks they still consider an essential part of local community. This means that local community may be absent or where it is present it may take very varied forms. In order to understand any particular conscious community and its likely flood response, it is therefore necessary to assess each community individually. This involves consideration of its context, the local social structures and the local networks.

Community context

To understand the local social structures it is first necessary to understand the context in which these are created. It is important to realise that residents' designation of their local community boundaries may not coincide with 'official' boundaries, such as the village, town, city or parish. Local community tends to be defined by residents at a small scale, so that at least potentially, most residents can be known personally. When assessing the local community there are a number of factors to consider.

- Boundaries (physical and social) – where do these lie, how clearly defined are they, how isolated or integrated is the community?
- Communal identity – is there one, how strong is it, what is its basis? (e.g. shared ideal of community, ethnicity, religion, shared experience, rural idyll)
- Movement of population – what mobility is there through the community and what impact does this have? (The impacts are dependent on the local structures and the ease with which new people can be integrated and new networks created. So mobility is not necessarily detrimental to a sense of local community and local networks in any straightforward way.)

Local social structures

The majority of interviewees desired local networks and some were prepared to put considerable effort into creating them. The research identified four categories of social structure:

- casual structures – these offer an opportunity for residents to meet informally in an unplanned way, e.g. a local shop or pub. This type of structure is not common but was the predominant method for meeting other residents in Aylesby
- organised structures – these are created specifically by residents to provide an opportunity for locals to come together, e.g. history group, art group or village Christmas party. These played the most significant role in Haylton
- institutional structures – where networks are formed through institutions such as schools, religious organisations or parish councils. These had a limited role but were most significant in Haylton
- absence of social structures – where there are no places which enable community members to recognise other community members and develop networks with them. This was the situation in Upbeck prior to the flood.

Local network patterns

Analysing the structures that residents have created, and which of the four types are present in a location and in what proportions, can help us to understand the local networks. These vary in their quantity and their connectedness. The type and extent of networks impact on the way in which information travels around the community. The patterns found have been categorised into three types:

- sparse – very few local networks
- clustered – some networks, in clusters with few interconnections
- dense and interconnected – many networks, with many connections.

Types of flood response

Residents in all the fieldwork areas were able to help one another in a wide variety of ways, both during and after flooding. The degree to which many of these types of services could be considered collective, however, is doubtful. They tend to be spontaneous offers of help from individual to individual, or household to household, rather than wider collective action. In the days and months following the flooding there was potential for more collective action.

Three types of communal response to flooding were identified:

- unstructured responses – these do not require local networks but local support was more extensive where these networks were present
- structured responses – exhibit some level of organisation, dependent on networks
- formalised – where specific systems have been set up to cope with flooding.

The types of response are closely linked to the types of local structures created by residents and the networks that then developed. Whilst the type of collective response possible is reliant on existing communal systems, the repeat flooding in the urban area demonstrates that given time and commitment these structures can be developed to allow more systematic responses.

How the factors interact to shape collective responses

Figure 1 and the descriptive text for each location illustrate how by examining the local context, the local social structures and the patterns of local networks it is possible to understand the communal flood response. In Upbeck it also shows how this has changed over time. The central arrow illustrates the steps to assessing likely community flood responses. This involves considering the context in which the community operates, the form of the local social structures, and the local network patterns. This is not a simple deterministic relationship where a particular set of factors will always lead to a particular outcome. Rather by considering these and how they interact, likely responses can be established. The boxes within the diagram illustrate how in each of the fieldwork locations the context, local structures and networks led to particular outcomes. The two boxes for Upbeck illustrate the change that has occurred over time with repeat flooding.

Aylesby

The very small population size, relative isolation and shared rural identity meant that the largely casual social structures had been effective in producing dense local networks and a situation where everybody did literally know everybody else. Therefore when the flood occurred the news travelled rapidly through the community. Residents then quickly came together to help one another cope with the flooding, and this included assisting a number of trapped tourists. Collective help tended to centre on those institutions which were also central in network creation, the hotel and the shop/tea room. Unstructured one-to-one help was quickly and widely offered, and collective action, such as clearing the road, also took place. In this small isolated village where residents were well known to one another, the largely casual local structures were sufficient to provide at least some immediate organised responses to the flood. However, the development of formal responses seems unlikely.

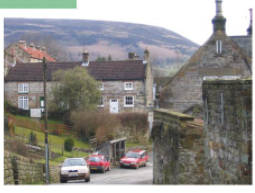

Haylton

Haylton was similar to Aylesby in that residents were well known to one another. However, this had come about through very different local structures. In the absence of any casual meeting points all social relations are formed through organised meetings and this is supported by the parish meeting which operates at the village scale. Like Aylesby, the dense local networks meant that unstructured help was quickly and widely offered. The strong belief in active participation and the existing pattern of residents helping one another in times of crisis meant that assistance was quickly offered. The organised structures within the village lend themselves well to systematic responses and villagers came together to cope with flooding. These local structures have also enabled them to gather information after the flood and reflect on the experience. They have considered adopting a more formal response and the structures already in place would make this relatively straightforward.

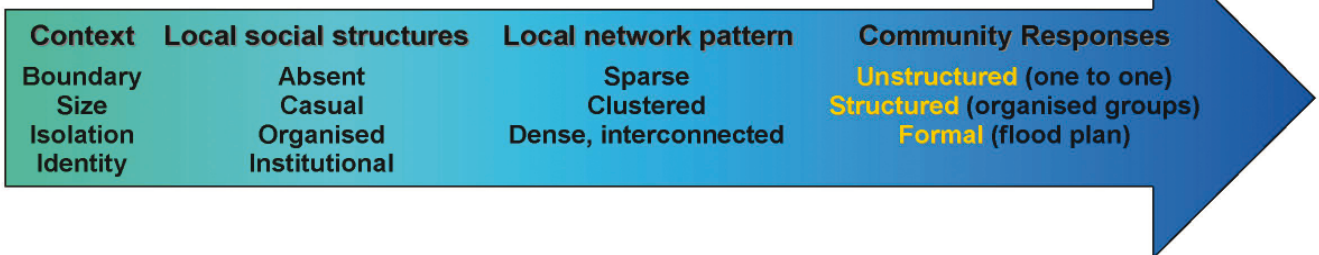
Upbeck

Upbeck is very different to Aylesby and Haylton as prior to flooding it lacked any local structures. The presence of extended family nearby meant that some support was available for many. However, within the housing estate there were few networks and these tended to be clustered around the residence. So news of the flood did not travel beyond the street scale initially. All the responses to the first flood were unstructured, and this was spatially limited, again to the street scale, because of the lack of networks. The flooding though played a key role in developing localised networks and a shared identity. This proved instrumental in the development of the first social structures at the estate scale.


Factors influencing collective flood responses within the local community

<p>Context Very small, rural, isolated village. Tourism important. Strong village identity.</p> 	<p>Aylesby</p> <p>Local Structures Casual meeting points account for most local interaction using shop, tea room & pub. Some organised village wide events, based on village hall, recreation field and church</p>	<p>Context Small village, clear boundary but not isolated. Strong village identity around the notion of active participation.</p> 	<p>Haylton</p> <p>Local Structures Organised meeting points account for the majority of local interaction, many active groups and events based in the village. Reinforced by institutional structure at village scale (Parish Meeting). No casual meeting points.</p>
<p>Local Networks Dense, interlinked networks, formed largely through casual meetings. Occasional village wide events reinforce village identity.</p>	<p>Flood Response Village wide unstructured response to help those flooded. Structured, organised, collective action to clear roads of mud and debris.</p>	<p>Local Networks Dense interlinked networks formed almost entirely through local groups and village events.</p>	<p>Flood Response Village wide unstructured response. Collective, structured action to clear debris. One person liaised with authorities. Formal response being considered.</p>

Steps to assessing likely community response



Upbeck 2004

<p>Context Housing estate on edge of city of Leeds. Identification with estate as potential community. Many residents lived in area all their lives.</p> 	<p>Local Structures Absence of any social structures at estate level. The street the only place to meet other residents.</p>
<p>Local Networks Very few local networks. Mostly isolated clusters based around residence.</p>	<p>Flood Response Unstructured, one to one help only. Largely confined to the street scale. Following first flood a structured response by group formed to clean out watercourse.</p>

Upbeck 2008


<p>Context Repeat flooding, formation of shared 'flood identity'. Some movement of flooded residents away from the estate.</p> 	<p>Local Structures New organised groups formed following floods— flood action group and community association.</p>
<p>Local Networks Local networks more extensive. Some across the estate but majority concentrated at street level.</p>	<p>Flood Response Wider networks allow more extensive unstructured help. Formal response being developed with EA and City Council.</p>

Figure 1: Factors influencing communal flood responses

These flood-based social structures have been developed to enable organised and formal responses. Following the first flood a group formed and this allowed residents to come together to clean out the water course. The wider networks have also allowed the unstructured responses to become more widespread and move beyond the street scale. Subsequent flooding led to the formation of a Flood Action Group which enabled more organised responses to take place. Together with support from the Environment Agency and the City Council this group has developed a formal response to the flooding. There are now a number of systems in place: to disseminate warnings, for neighbours to assist one another and for checks to take place on vulnerable community members. There are also processes to include residents in decision making on flood alleviation works. These are structures developed and supported specifically for the purpose of flood response and they have arisen out of flood experience.

Conclusions

The research found that residents would often help one another and were usually happy to do so. However, this help is often spontaneous, unplanned, lacking in organisation and spatially limited. If more organised collective action is required or desired then some kind of structure needs to exist to support this. Given the probable increase in flooding³ and the direction of flood policy, it seems likely that local communities will be expected to do more for themselves in the future. However, local communities may take very varied forms. It cannot simply be assumed that a community is present, willing and able to take on whatever flood risk managers may require of it. The information above can be used to gain a better understanding of an individual community, so that its efforts can be supported and where necessary developed.

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Water sustainability and the Millennium Development Goals

Osman Dar
Centre for Radiation, Chemical and Environmental Hazards,
Health Protection Agency

Introduction

The United Nations Millennium Declaration of 2000 incorporated eight Millennium Development Goals (MDGs) designed to address basic human needs and rights for every individual around the world. All 192 United Nations member states agreed to the contents of the declaration, which called for the achievement of these goals by the year 2015¹.

The eight Millennium Development Goals are:

- 1 Eradicate extreme poverty and hunger
- 2 Achieve universal primary education
- 3 Promote gender equality and empower women
- 4 Reduce child mortality rate
- 5 Improve maternal health
- 6 Combat HIV/AIDS, malaria, and other diseases
- 7 Ensure environmental sustainability
- 8 Develop a global partnership for development.

What is the water target?

One of the primary targets of MDG 7, dealing with issues of environmental sustainability, is to halve by 2015 the proportion of the population without sustainable access to safe drinking water and basic sanitation (from 1990 levels)^{2,3}.

The World Health Organization/United Nations Children’s Fund (WHO/UNICEF) Joint Monitoring Programme, which produces the Global Assessment of Water Supply and Sanitation report, defines key terms relating to the MDG 7 target on water as follows:

- **access to water** is defined as being “the availability of at least 20 litres per person per day from a source within one kilometre of the user’s dwelling”⁴
- an **improved drinking water source** (see Table 1) is defined as “a drinking water source or delivery point that, by nature of its construction and design, is likely to protect the water source from outside contamination, in particular from faecal matter”³.

The debate around definitions

Several areas for debate exist around the definitions used for the water target set by the UN Millennium Development Goals. What constitutes ‘sustainable access’ is one such question. The minimal figure of 20 litres per person per day advocated by the WHO is based on an aggregate of minimal needs for a person to fulfil basic domestic functions of consumption (including drinking and eating) and hygiene (including personal and domestic cleanliness)³. Some variation exists in

Table 1: WHO/UNICEF Joint Monitoring Programme for water supply and sanitation classification of water sources

Improved drinking water source	Unimproved drinking water source
Piped water into dwelling, plot or yard	Unprotected dug well
Public tap/stand pipe	Unprotected spring
Tube well/borehole	Cart with small tank/drum
Protected dug well	Tanker truck
Protected spring	Surface water (river, dam, lake, pond, stream, canal, irrigation channel)
Rainwater collection	Bottled water*

* Bottled water is considered to be improved only when the household uses water from an improved source for cooking and personal hygiene; where this information is not available, bottled water is classified on a case-by-case basis.

international standards around this figure with the SPHERE project, for instance, advocating a figure of 15 litres per person per day as a minimal standard for disaster relief⁵.

Studies have found that when drinking water is not available in the home the time taken to collect water is an important determinant of whether a household can obtain enough water for domestic needs⁶⁻⁹. When time spent collecting drinking water is between 5 and 30 minutes, the amount collected is fairly constant and suitable to meet basic needs at around 20 litres per person per day (illustrated in Figure 1)⁹. However, if the total time taken per round trip exceeds 30 minutes, people tend to collect less water, compromising on basic needs^{6,7}. The MDG indicator does not include a measure for time taken to collect water. It instead equates the 1 kilometre distance from the user’s dwelling in its definition of ‘access to water’, as an approximation of 30 minutes of time spent in collecting water. This, however, may not hold true in hilly and mountainous terrain where average walking speeds are much lower, and in regions where a paucity of suitable water sources results in extensive queuing times. These factors often increase the time of a round trip far beyond 30 minutes.

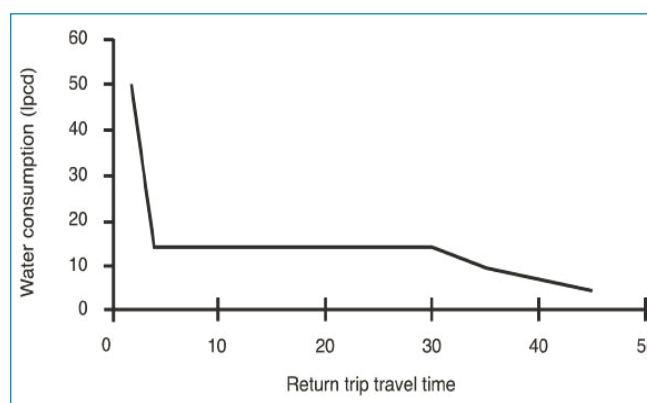


Figure 1: Total journey time (in minutes) vs. water usage (litres per person per day). (Source: WEDC, Loughborough, UK⁹)

Another key consideration of the water target is the provision of 'safe' drinking water. While standards guidelines on the quality of water have been published by the WHO, designating a water source as providing 'safe drinking water' for the purposes of achieving the MDG target remains problematic¹⁰. Routine chemical and microbiological testing is often not available for many improved water sources in many regions of the world and thus ensuring a water source is sufficiently safe is often simply not done. A notable example highlighting this is the experience of Bangladesh with arsenicosis. Through the 1970s, UNICEF worked with the Department of Public Health Engineering in Bangladesh to install tube-wells to provide safe sources of drinking water throughout the country. By 1997, UNICEF had indicated in its country report for Bangladesh that it had surpassed its goal of providing 80% of the population by 2000 with access to 'safe' drinking water. Unfortunately, many of these wells have turned out to have higher than safe levels of arsenic, with an estimated 35 million to 77 million of Bangladesh's 125 million inhabitants being at risk of drinking contaminated water¹¹.

Classifying water-related illness

Classification of water-related illness has traditionally focussed on diseases caused by an infectious microorganism. The widely used Bradley classification divides pathogens/diseases in relation to their broad mode of transmission⁶.

Using this system, four categories of water-related illness are described:

- waterborne – caused through consumption of contaminated water
- water-washed – caused through the use of inadequate volumes for hygiene practice
- water-based – transmission via an intermediate aquatic host (e.g. schistosomiasis)
- water-related vector – spread through insect vectors associated with water (e.g. malaria).

With the ingestion of toxic chemicals from contaminated water sources becoming an increasingly recognised source of human morbidity and mortality in recent decades, this too can be classified as water-related illness. As such, disease entities such as arsenicosis and fluorosis caused by the ingestion of toxic levels of chemicals in water, need to be appropriately recognised in classification systems. A possible modification of Bradley's classification may be to include such chemical-related water illnesses as a subcategory of 'waterborne illnesses'.

Where are we now?

While the world is set to miss the sanitation target, achievement of the overall water target remains on course². To reach the target, by current population forecasts, an additional 784 million people worldwide will need to have access to improved drinking water sources. If current trends continue, the world will meet and may even exceed the MDG drinking water target by 2015. Current estimates suggest that by that time, 86% of the population in developing regions will have gained access to improved sources of drinking water³.

While the overall findings are encouraging, progress in Oceania and Sub-Saharan Africa has lagged behind the rest of the world (see Figure 2)². Accelerated progress will be needed in these areas to ensure the MDG target is met.

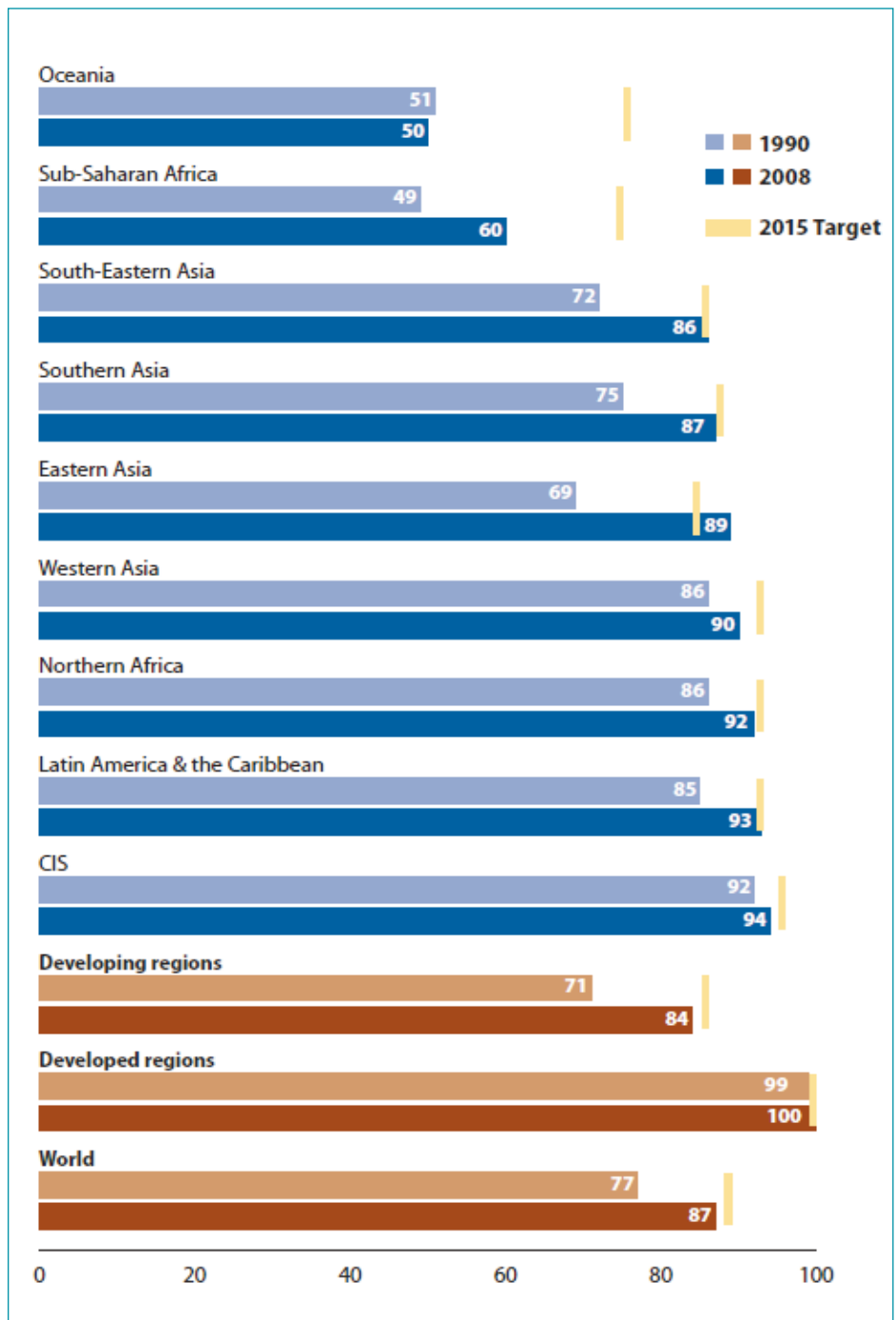


Figure 2: Proportion of population using an improved water source, 1990 and 2008 (percentage) (Source: UN Millennium Development Goals Report 2010²)

Domestic water usage picture in the UK

According to the UK Department for Environment, Food and Rural Affairs (Defra) average water consumption for domestic purposes in the UK was 148 litres per person each day in 2007/08 (see Figure 3).

Other key usage trends suggest a picture of increasing water efficiency in the UK, with reduced wastage. England and Wales have seen a decline in litres of water abstracted per day from non-tidal surface and groundwater sources to below 1990 levels¹². This has happened despite both population and economic growth. However, this is partially explained by the UK moving away from a high water-usage manufacturing economy to a more financial-services-led economy in recent decades.

Leakage losses have similarly decreased, with 2007/08 losses 31% lower than those in 1992/93 (see Figure 4)¹³.

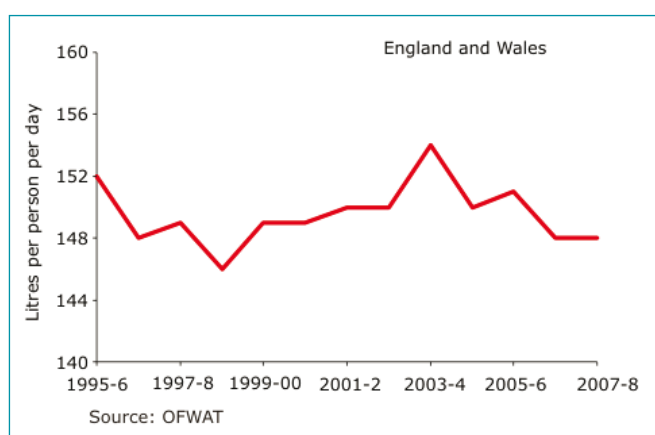


Figure 3: UK domestic water usage, in litres per person per day, 1995/96 to 2007/08 (© Defra¹²)

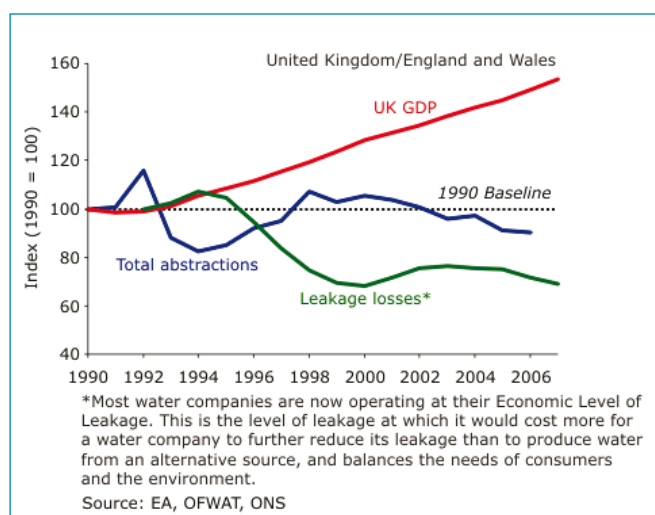


Figure 4: Total abstractions from non-tidal surface water and groundwater, leakage losses and Gross Domestic Product, 1990 to 2007 (© Defra¹³)

Conclusion

Overall, the world is on course to reach the MDG target on water access by the target year of 2015. While this will be an important achievement, much remains to be done globally to fully reap the benefits of improved access to water. What truly constitutes ‘improved access’ and ‘safe’ water remains an area of debate and improvements in measurement and recording, particularly in developing world settings, is required. As such, chemical-related water illnesses in particular need appropriate classification and recognition when determining whether a water source can be considered ‘safe’.

In an increasingly interconnected and interdependent world, sustainable development and efficient use of water resources are a recognised global concern. As such, while developing countries seek to reach the MDG target on access to water, developed countries must seek to limit their wastage and ensure provision of water for their populations in a sustainable and efficient manner. While countries like the UK have made some progress in limiting their leakage losses in recent years, much still remains to be done to reduce the overuse and wastage seen in many developed countries. Only then will inequalities in water access and usage between the developed and developing world truly be addressed.

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HPA Project Updates

An introduction to the Chemical Incident Response Handbook

Kerry Foxall, Rob Chilcott, Robert Maynard
Centre for Radiation, Chemicals and Environmental Hazards,
Health Protection Agency

email: kerry.foxall@hpa.org.uk

The Chemical Incident Response Handbook has been developed to assist emergency response organisations in the management of incidents involving the accidental or deliberate release of a toxic chemical. It is intended as a quick look-up-guide for first responders and can also be used as a tool in emergency planning and training exercises. It is due for publication shortly and will be distributed to the Ambulance Services and accident and emergency (A&E) departments in England and Wales.

The handbook was prepared by staff of the Health Protection Agency and was funded by the Department of Health. Technical assistance, advice and support were provided by the following organisations:

- Ambulance Service
- Defence Science and Technology Laboratory
- Department of Communities and Local Government
- Fire and Rescue Service
- Home Office
- National Counter Terrorism Security Office
- National Poisons Information Service
- Police
- Serious Organised Crime Agency
- University of Newcastle.

The handbook consists of three sections and their salient aspects are described in this paper.

Section 1: Emergency Guidance Monographs

The emergency guidance monographs are a collection of information sheets for a range of hazardous chemicals. Each monograph provides information and advice on various aspects of an incident including the management of patients, decontamination and evacuation (Table 1 and Figure 1). To provide further guidance and ease of use, the information presented in the monographs is categorised using a traffic light system.

- **Green indicates that there is an adequate provision for a given chemical**
- **Amber indicates that there is a partial provision or uncertainty**
- **Red indicates that there is no specific provision available**

Table 1: Layout of the emergency guidance monograph

Chemical name	Brief description of the chemical
Medical and health	Information on patient management including available antidotes and medical equipment, treatment contraindications and diagnostic tests Signs and symptoms of exposure including immediate, delayed and long-term health effects
Decontamination	Advice on personal decontamination Information on the Fire and Rescue Service and National Health Service mass decontamination capabilities
Information and advice	Provides the names and organisations to contact for scientific, clinical and public information and advice
Evacuation distances	Evacuation distances for small and large spills

MEDICAL AND HEALTH	
Aspect	Commentary/Qualifier
Antidote(s)	Atropine (if bronchorrhoea and/or bronchospasm)
Signs and symptoms	Headache, chest tightness, nausea, vomiting, diarrhoea, coughing, pin point pupils, blurred vision, sweating, hypersalivation and bronchorrhoea. Other symptoms include hypotension, sinus tachycardia or bradycardia and dyspnoea. In severe cases progressive cardiac and respiratory failure may occur
Latency period	None
Secondary contamination	Potential for secondary contamination
Hospital staff need PPE	Personal Protective Equipment (PPE) required
Diagnostic biological test	No test available
Therapy contraindications	Pralidoxime should not be required
Long-term health effects	The majority of cases will recover without effect. Neurological sequelae have been reported but are rare. Exposure during pregnancy: Harm may occur secondary to poisoning of the mother. Seek guidance from the UK Teratology Information Service
Specific fatality management	HPA/Home Office Fatality Factsheet available

Figure 1: Example of a medical and health section of a chemical monograph

Section 2: Indicative Toxicity Graphs

The graphs in this section provide a visual indication of the acute inhalation toxicity of various hazardous chemicals for exposure durations of up to eight hours (Figure 2). The data for the graphs were collated from a number of occupational and emergency reference sources including Acute Exposure Guideline Levels (AEGs), Workplace Exposure Limits (WELs) and Emergency Response Planning Guideline values (ERPG). The concentration of an airborne chemical can fluctuate significantly (by at least a factor of 100) in urban environments due to air turbulence. Furthermore, individual susceptibility to chemicals may differ by an order of magnitude. Therefore, these graphs are intended for guidance only.

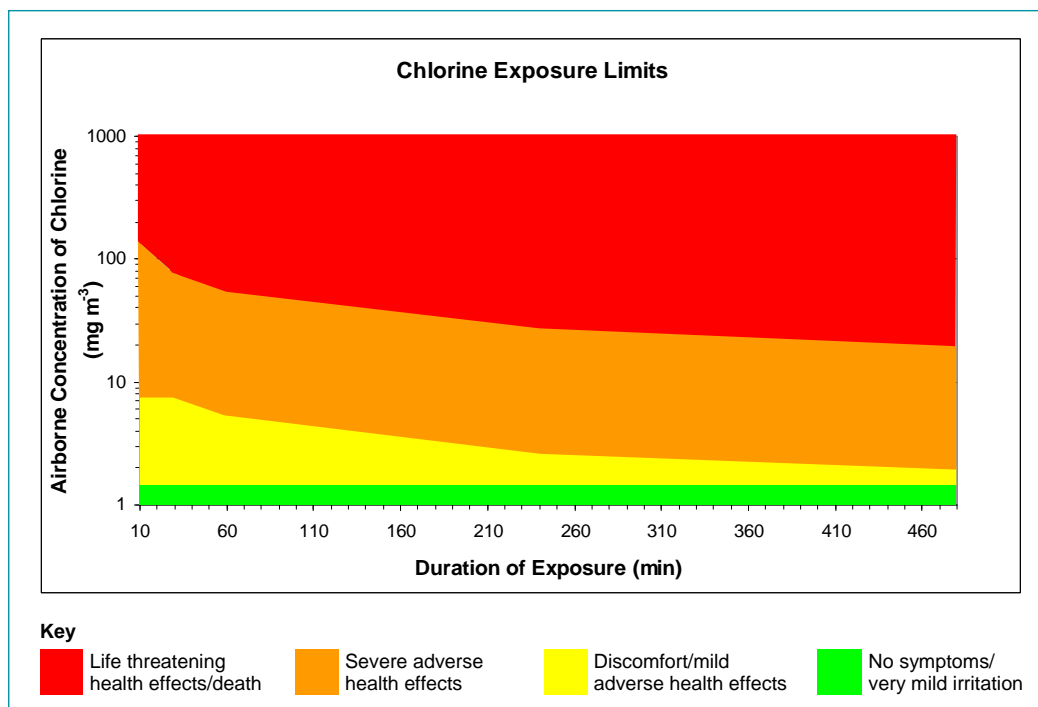


Figure 2: Example of a toxicity indicator graph

Specific uses for the graphs

If the airborne concentration of the chemical is known the graphs can be used to give an indication of the adverse health effects expected following exposure to a given concentration.

Further information and advice on the management of chemical incidents is available on the HPA website at www.hpa.org.uk/chemicals/compendium.

If the airborne concentration of the chemical is not known and there are casualties, the health effects observed can be used to provide an estimation of the airborne concentration of the chemical released. This information may be useful when selecting appropriate PPE.

Section 3: Precursor Guide

This is a list of precursors and solvents that may be used in the preparation (synthesis/extraction) of hazardous substances. The list only provides the class of chemical that may be potentially synthesised from a given precursor, not the specific product. Examples of the classes of chemicals included in the precursor guide are listed in Table 2.

Table 2: Classification system for the precursor guide

Class of chemical	Description
Blood agent (B)	An agent which prevents transmission of oxygen to tissues via the blood
Irritant (IR)	Materials which are highly irritating to the eyes, respiratory tract or skin
Vomiting agents (VO)	Substances which cause nausea or vomiting. Also known as unmasking agents
Plant toxin (PT)	Toxic substance extracted from a plant. A generic term – such toxins have a wide range of actions
Vesicant (blistering) agent (V)	Substances which may cause blistering and may also damage the respiratory system and eyes

Supporting the response to cases of lead poisoning

Bethan Davies¹, Catherine Keshishian¹, Ruth Ruggles²

1 Centre for Radiation, Chemical and Environmental Hazards, Health Protection Agency

2 Centre for Infections, Health Protection Agency

Introduction

The investigation of lead exposure is a relatively uncommon activity for individual health protection units (HPUs) and local authorities (LAs). The Centre for Radiation, Chemical and Environmental Hazards (CRCE) was involved in only 25 incidents in London and the South East Region over a four and a half year period¹. With the launch of the joint HPA and British Paediatric Surveillance Unit 'Surveillance of Lead in Children' (SLIC) study on 1 July 2010², CRCE expected that there would be an increase in lead poisoning cases and enquiries referred to HPUs, as clinicians reporting new cases of lead poisoning in children to the research team will be encouraged to notify local HPUs for health protection follow up².

In preparation for an increase in the number of reported lead cases and exposures, the HPA has developed a suite of resources to support the HPU and LA response. This article describes the process of developing a lead action card with supporting documentation and the programme for a series of lead exposure training events across the country.

Lead action card

The HPA lead action card was initially developed by Surrey and Sussex HPU³ and has now been further refined into an accessible document for on-call teams at HPUs. The action card was developed in consultation with staff from HPUs, CRCE and external stakeholders with a role in the management of lead exposures, including the Chartered Institute for Environmental Health (CIEH).

Four key steps in the response to a case of lead poisoning or in the identification of lead exposure are outlined in the action card: investigation of exposure; risk assessment; prevention or control of the hazard; and communication (Figure 1). The card is supported by a series of resources described below. All of these resources can be found on the HPA website at www.hpa.org.uk/chemicals/lead and on HPZone (the HPA incident management system).

Supporting resources

- **Roles of different organisations in responding to a chronic lead poisoning incident** This list describes potential partner agencies to involve depending on the lead source, and under which legislation their responsibility lies
- **Lead exposure questionnaire** Designed to assist HPUs in collecting the necessary information to identify the potential source and to inform the public health risk assessment
- **Legislation flowchart** (Figure 2) Developed in conjunction with the Chartered Institute for Environmental Health, this provides an

overview of the legislation and regulation applicable for remediation of a chronic lead exposure in a residential setting

- **Example scenarios** This document discusses the key considerations in the most common types of lead exposure scenario.

Training and courses

In June 2010, the HPA ran the first in a series of training days for public health and environmental health practitioners, including pollution and housing officers, who may be involved in the management or prevention of lead poisoning incidents. The aim of these training events is to raise awareness of lead poisoning, reduce exposure and improve the multi-agency response to lead poisoning incidents.

The June training day was built around an innovative case study design. Participants were taken through a case of chronic lead poisoning, from clinical presentation, to environmental investigation and remediation, by a range of expert speakers from the key organisations involved in the management and prevention of lead exposures (see the table). The day's learning was consolidated by a second interactive case study completed in small groups.

Table: Summary of presentations at a training day in London, June 2010

Topic	Speaker
Clinical presentation	National Poisons Information Service
Public health response	Health Protection Agency
Environmental sampling	WHO Collaborating Centre for Housing Standards and Health
Remediation	Local Authority
Legislation and regulation	Chartered Institute of Environmental Health

Similar training events on lead incident management are planned around the country; please see the HPA website for details, www.hpa.org.uk/chemicals/training.

The future

Although incidents of lead poisoning in the UK are rare, cases do occur and responders are often unfamiliar with their management. In order to improve the public and environmental health response, we hope that the new suite of resources and series of training days we have developed will improve awareness and understanding. We welcome any feedback or suggestions about these resources, which will be continually updated to reflect the experiences of HPUs and LA staff. Please send any comments to slic@hpa.org.uk.

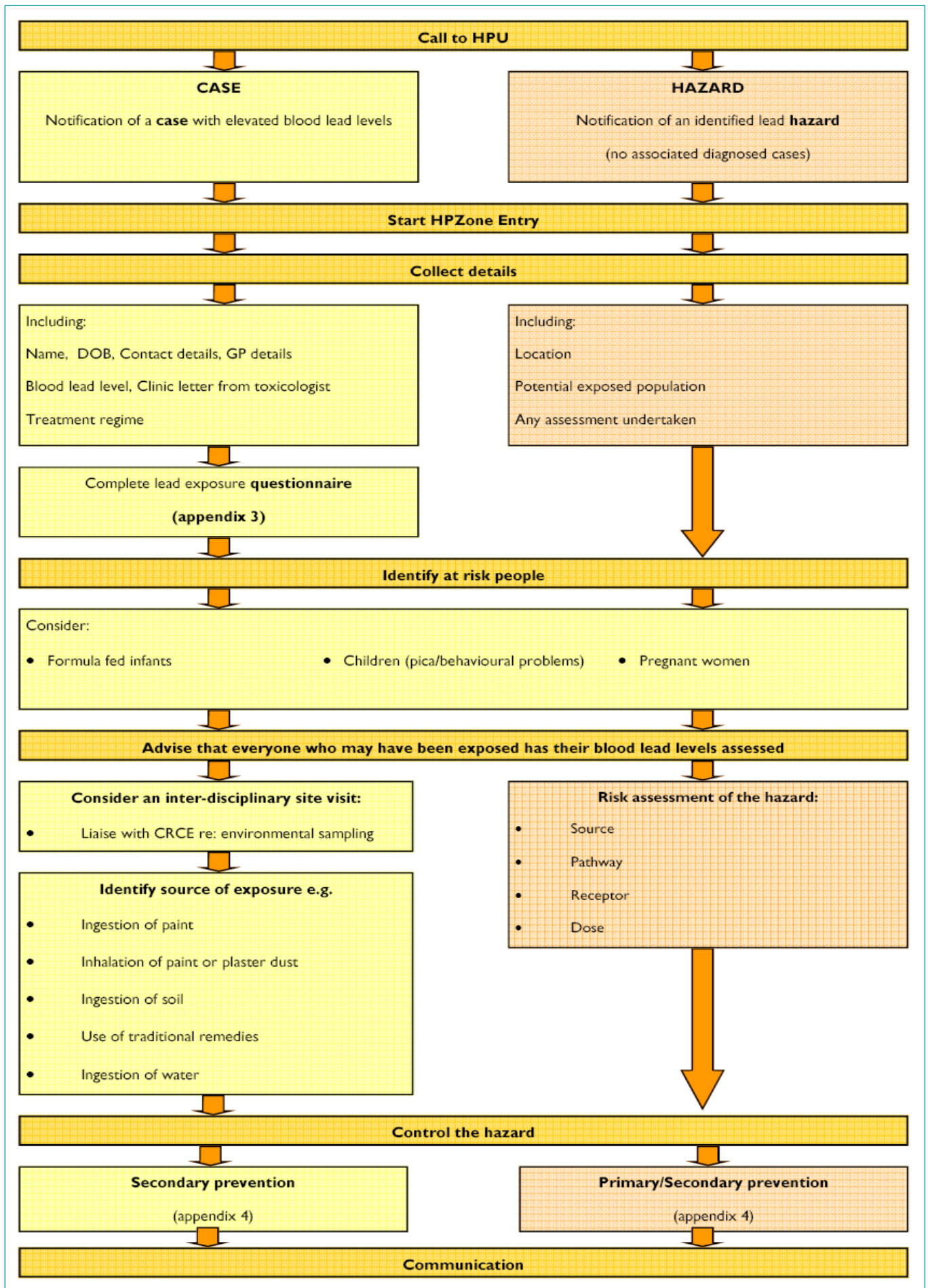


Figure 1: Lead action card flowchart for Health Protection Agency staff

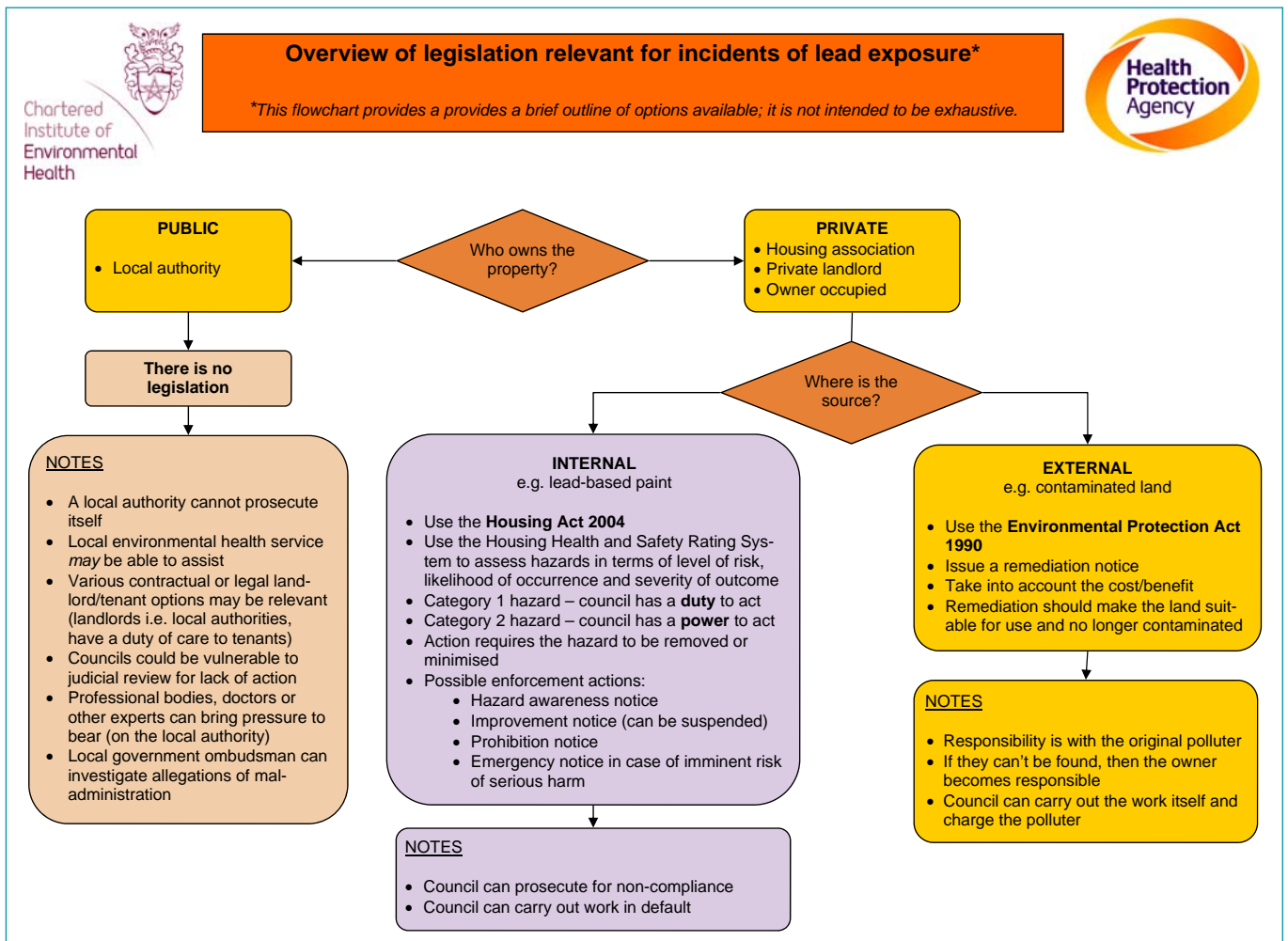


Figure 2: Legislative options for remediation of a property containing lead

The resources described are all available on the HPA website at www.hpa.org.uk/chemicals/lead.

Acknowledgements

We are grateful to Andrew Griffiths at the Chartered Institute of Environmental Health, David Ormandy at the University of Warwick, Sally Bradberry at the National Poisons Information Service, John Fisher at the London Borough of Waltham Forest and Virginia Murray at the HPA for their help in developing material for the lead action card and training events.

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Study on elevated blood lead levels in children: Report from a public focus group meeting

Edward Wynne-Evans¹, Iain Mallett²

1 Centre for Radiation, Chemical and Environmental Hazards, Health Protection Agency

2 Local and Regional Services, East of England, Health Protection Agency

Background

The British Paediatric Surveillance Unit¹ (BPSU) was jointly set up by the Royal College of Paediatrics and Child Health, the Institute of Child Health and a forerunner to the Health Protection Agency (HPA) in 1986. It is operated in co-operation with Health Protection Scotland (HPS) and the Faculty of Paediatrics of the Royal College of Physicians of Ireland.

The BPSU¹ undertakes active surveillance of rare paediatric disorders (less than 300 cases per year) that are of scientific or public health importance. Surveillance is carried out in the UK and the Republic of Ireland. A BPSU report card is sent to over 2400 consultant paediatricians and other specialists each month with a list of diseases, and clinicians mark the card with the cases they have seen or with "nothing to report". The BPSU informs the investigators from the relevant studies who then send the clinicians a short questionnaire. Of the report cards 90% are returned, and over 90% of subsequent questionnaires are completed.

Non-occupational lead poisoning is rare²; however, because of a lack of routine surveillance, we do not know how many cases actually occur. Previous UK studies^{3,4} have suggested that 3–5% of children may have elevated blood lead levels above 10 µg dl⁻¹ and a US study has highlighted an increased prevalence amongst those on low incomes⁵.

Previous HPA work has highlighted the risks from environmental sources⁶ and the public health impact of lead^{7,8}. Under the auspices of the BPSU, the HPA has launched a programme on the Surveillance of Lead in Children (SLIC)⁹.

It is a requirement of research projects agreed with the BPSU to include public consultation and collaboration as part of the process. Separately, the HPA is also required to regularly consult with the public. Therefore as part of SLIC, the HPA held a People's Panel Discussion Group in Newcastle in February 2010 and the results from this focus group are discussed here.

Aim

The aim of the focus group was to improve the information that the HPA provides to members of the public about chemical hazards and poisons in general and lead poisoning (especially in children) in particular.

Method

Focus groups are a form of qualitative research whereby members of the group are asked about their perceptions, opinions, beliefs and attitudes

towards the subject under discussion (in this case lead). They raise issues and ideas that the members think are important. As a research method, focus groups do not lend themselves to statistical testing or analysis and may have limited external validity as they elicit only the views of the participants of the group. However, their value is in highlighting themes and concepts that are difficult to quantify and they have both benefits and limitations as with any research method.

The seven participants (three males and four females) were all members of the HPA People's Panel living in the North East of England. They were recruited on the basis that they either were parents or cared for children.

Each participant had an opportunity to read the 'General Information' on lead from the HPA Compendium of Chemical Hazards² both beforehand and at the start of the focus group meeting.

The discussion guide used in the focus group was structured to initially look at general chemical poisoning before concentrating specifically on lead, including the current HPA advice about lead and a lead poisoning case study.

Following the focus group meeting, the moderators immediately met to highlight the key points that were raised. Themes raised by the group were then explored in further analysis.

Results

Exploring understanding and awareness of health advice on chemical hazards and poisons

The focus group's first task was to say what they knew about chemical poisons. They talked about poisonous household items easily accessible to children such as cleaners, bleach, pesticides and weedkillers. Car exhaust fumes were also mentioned. They felt that most chemical poisons came under a broad heading of 'man-made substances'.

One of the group described how their neighbour's child had drunk turpentine. They had been advised to avoid making the child sick and at hospital the child was given milk to dilute/neutralise the 'turps'. The participant said this was because "otherwise they would have burnt their throat by bringing it up".

Next the group was asked what they thought could cause lead poisoning in children. The group mentioned a television documentary about toys imported from China which contained lead paint. Also they mentioned some plastic toys (rubber ducks) that had been linked to lead poisoning after small children had chewed them. Thereafter followed a discussion about the regulation of imports from non-EU countries and what could be done to stop products containing lead entering the UK and being sold in shops.

One of the group talked about working in a factory many years ago that used lead. He said his employers gave him a pint of milk to drink every day. He wanted to know if there was any health benefit in drinking

milk, either as a prevention or as a treatment of lead poisoning. He said he understood that the best means of protection in a factory was to avoid exposure by wearing gloves and a mask (appropriate protective equipment).

The group was asked where they might seek advice if they believed themselves or their children to be affected by lead poisoning. The usual list of sources was mentioned: their family doctor, NHS Direct and websites. But most said that it is difficult to access their GP for general health advice, i.e. they would have to make an appointment. They also said that calling "NHS Direct often involves a long wait on the phone and then someone has to call you back; I don't like waiting for people to call me back". As a result they tend to rely on websites and search engines like Ask Jeeves, Google and Wikipedia. They didn't favour any particular health site over any other so while they used the NHS Direct website they didn't rate it as the best. Also Wikipedia was valued by some but others were cautious about its accuracy. The most cautious would only look at their GP's website. The way they decided if the information was accurate was to look for repetition of advice across many websites.

Even when members of the group used NHS Direct they felt it was less efficient at providing general health advice compared to advice in a medical emergency. Overall they thought NHS Direct did not employ medical experts. Ultimately they put more stock in the advice and experience of friends and family, despite saying that they thought facts were more important than people's personal opinions on health matters. They thought that this would also be the case for lead poisoning because the symptoms seemed vague and general; the participants said they would rely on instinct to tell them whether their child was really sick.

Social networking sites play an increasingly important role in providing health information. So while the group was cautious about websites claiming to provide high quality advice, some of the parents – especially the mothers – talked about using online discussion forums such as askamum and Facebook. Therefore through informal online networks parents would form their own opinion. They would review the exchange of conversation to filter out what they felt were 'old wives tales' and decide what advice might be safe and what was not. They felt that there are inherent risks in relying on these kinds of networks because "myths and misconceptions can still do the rounds like the scandal about the MMR vaccine".

General impressions of the HPA web based advice on lead²

The group understood that children could poison themselves from consuming soil and paint but said that the factsheet did not really specify what level of exposure would constitute a risk to a child's health. They suggested that the general information should include levels of exposure and were confused by the statement that any exposure to lead was a risk yet the general advice was that the usual level of exposure was unlikely to be a risk to their health.

The following questions were asked:

"The description of the symptoms seemed a bit vague and non-descript."

"How will I know if my child has lead poisoning?"

"How can you know how much lead is in the soil? And how much soil a child needs to eat before becoming unwell."

As a result of this vagueness people felt the only way they would know if their child had been exposed to lead would be if they saw the child licking paint or eating soil, i.e. consuming lead products.

The group suggested that it would be helpful to have a flowchart or check list of symptoms and circumstances in which a child might be exposed to lead. Then if the child matched some or all the criteria there would be a good chance that they could have lead poisoning and therefore the parent/carer should seek medical advice.

The group wanted to know if the seasons or other environmental factors affected exposure to lead – for example, temperature or moisture in the soil.

When the group realised that the industrial past of a region could have an impact on the amount of lead in the soil they asked if it was possible for the HPA to map areas with high concentrations of lead.

The group also wanted to know if environmental incidents or accidents might increase the chances of people developing lead poisoning – for example, could flooding or fires release lead into the wider environment or cause it to be more concentrated in specific areas.

Although the group understood that breathing in lead or swallowing it was a possible way of becoming poisoned, they also wanted more information about where it is deposited when it enters the body, whether it can accumulate over time and how easy is it to remove. A member of the group mentioned treatments like chelation so the group wanted to know more about the process, whether it is standard treatment for lead poisoning and whether there are any side effects.

In terms of the development of a specific factsheet for children, the group would want to know whether certain ages are more susceptible to lead poisoning, whether symptoms differ between different age groups and whether the long-term effects are more serious at certain ages. They suggested the information could be separated by age group (one year olds, two year olds, the over fives and teenagers etc).

A participant said:

"Now that people are doing more DIY there should be information in stores like B&Q and Homebase about the risks from pipes and paint. They should be told to wear gloves and masks and be especially careful around children."

The group wanted to know whether advice should be provided when DIY is being carried out on old paint and pipes¹⁰ as these may contain lead (which is no longer used in modern products). Hobbies involving lead were also mentioned. One participant talked about making their own fishing weights by melting down lead pieces. They wanted to know whether children should be kept away and not allowed to take part in this activity.

Scenario: lead paint in old houses¹¹

A scenario was described to the group in which a young family moves into a 1930s property in Hartlepool. The house had not been decorated in years so the family decide to renovate the property. During the renovations, one of the children became unwell: they were pale and irritable. The family was seen by their GP who found that the child was anaemic but also had elevated blood lead levels. Iron tablets were prescribed and the parents advised to prevent the child eating soil or paint flakes. In a follow-up home visit, elevated lead levels were not detected in water from the kitchen tap; however, elevated levels were found in samples of the original paint.

Other general points raised in the focus group session

Theme	Suggestion	Quote
When and where is lead used in industry	The group wanted to know whether it is possible to access information about lead in the local area	"Am I able to find out if my local industrial estate uses lead products and whether it represents a risk to local fields nearby where my children play?"
Training for professionals	Health visitor training should include giving them the skills to make environmental assessments on home visits	"On their first visit to a new parent's home, a health visitor could note the surroundings especially if they carry a risk of lead poisoning to the new born."
Retail campaigns	The HPA could work with Trading Standards to run campaigns about the risks from cheap imported toys or buying old toys like lead soldiers from antiques fairs	"EU regulations should acknowledge the risks from lead in toys and not just choking problems. And trading standards should be more vigilant about picking up lead paint and cadmium in toys."
General awareness raising	The group felt that most people think lead poisoning is a thing of the past and therefore need to be reminded that it can still be a problem	"I think people have become complacent about exposure to lead. They need to know that the risks haven't gone away."
Advice when buying older properties	When someone is purchasing an older property it should be part of the surveyor's environmental search to look for lead especially in flashings, paint and piping that might represent a risk and bring it to the attention of the prospective purchaser	"Surveyors reports should contain warnings about lead in old houses for the new owners."

The group was asked whether they thought the family received the right advice and treatment and whether they would have expected the same if they were in that position. Overall the group thought that the family were given the right information but were a little sceptical that their GP would be aware of the symptoms of lead poisoning and would think to have blood lead levels measured. Also the group was mindful of the current economic situation and if the tests for lead poisoning were expensive they questioned whether the local primary care trust would discourage the GP from carrying out these kinds of tests to save money.

At the very least they thought it might require some general awareness raising amongst healthcare professionals about lead poisoning, its signs and symptoms.

Some individuals were surprised to find out that lead poisoning was an issue today because they thought it was a disease of the past, now that lead had been removed from petrol and paint and lead water pipes were no longer used.

Discussion

Focus groups use qualitative methods. They are not able to quantify the extent of a given problem. However, they are useful in highlighting broader themes around given problems and offer insights into approaches to take to tackle the problems.

This particular focus group highlighted two main themes.

- The need for a proportionate response: striking a balance between the need to inform and the risk of creating a health scare. GPs need to know what questions to ask to identify children exposed to lead
- The HPA provides information aimed at members of the public, which is most useful when provided in a readily accessible format.

These themes are interconnected: if the information is not presented in a way the audience can understand then this can cause unnecessary anxiety.

The group was receptive to the information contained in the information sheet. However, they felt that the language used could be much simpler (e.g. 'man-made' rather than 'anthropogenic'). They also felt the symptoms described for lead poisoning are vague (which they are) and could be applied to a number of conditions. Whilst they recognised that the vagueness of the symptoms obviously cannot be changed, the group felt that how they are described, whether they apply to acute or chronic exposure, and whether or not they will resolve could all be better explained.

Similarly, there was a lot of anxiety about what did constitute a significant exposure. Here again, the group felt that distinction needs to be drawn between acute (usually occupational or households connected to occupational settings) and more chronic exposures. Specifically the last question and answer in the HPA FAQs did cause a lot of concern:

Q What should I do if I am exposed to lead?

A It is very unlikely that the general population will be exposed to a level of lead high enough to cause adverse health effects.

Participants felt this question dismissed any legitimate concern that they may have and did not direct them to other sources of information or advice.

Suggested recommendations

A series of recommendations, listed below, has been made as a result of the focus group discussions. Work to address these is ongoing within the HPA.

- Develop an improved lead information leaflet and frequently asked questions for the public.
- Develop awareness-raising campaigns on lead poisoning for a variety of audiences including the public and healthcare and non-healthcare professionals.
- Review health effects of lead information available on other UK websites to ensure a consistent message is delivered.
- Consider further information for new parents on the risks of lead in the home.
- Investigate the potential for mapping environmental lead exposure.

Conclusions

The focus group highlighted the need for the HPA to tailor its outputs to the audience that it is trying to reach. Information for members of the public should focus on conveying the messages that the HPA thinks are important along with what the members of the public want to know, in a manner which they can understand. Not all information will be subject to focus group testing before use; however, the principles of tailoring to an audience can still be used and perhaps communications and other members of staff not directly familiar with subject areas should be asked to review information for the public before it is released.

In the specific case of lead, the information needs to be simplified whilst at the same time including appropriate information for members of the public to consider whether or not they or their children are likely to have been exposed to lead, what they can do to prevent exposure, and where they can go for further information.

More information on the SLIC project can be found at www.hpa.org.uk/chemicals/slic.

Information for members of the public and professionals on lead is being updated on new web pages, following feedback from this focus group and professional training sessions, at www.hpa.org.uk/chemicals/lead.

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Conferences and Workshops

The Fifth Ministerial Conference on Environment and Health Protection: Children's health in a changing environment, Italy 2010

Raquel Duarte-Davidson, Virginia Murray
Centre for Radiation, Chemical and Environmental Hazards,
Health Protection Agency
email: cehape@hpa.org.uk

Introduction

In the late 1980s European countries initiated the first ever process to eliminate the most significant threats to human health. Progress has been driven by a series of ministerial conferences held every five years, co-ordinated by the World Health Organization's (WHO) European Environment and Health Committee (EEHC) and aimed at bringing together different sectors to shape European policies and actions on environment and health. The first conference was held in Frankfurt in 1989, followed by Helsinki in 1994, London in 1999, and Budapest in 2004.

The Fourth Ministerial Conference focussed on the measures that countries can take to address the impacts of environmental risk factors on children's health, and it adopted the Children's Environment and Health Action Plan for Europe (CEHAPE). This committed all 53 WHO Europe member states to develop national children's environment and health action plans. An intergovernmental mid-term review was held in 2007 in Vienna to take stock of progress on the Budapest commitments and to identify priorities for the Fifth Ministerial Conference.

To fulfil its commitments to CEHAPE, the UK produced the Children's Environment and Health Strategy for the UK¹⁻³, which was published in March 2009². This report made recommendations on how children's and young people's health could be improved through a better environment. The strategy was developed to enable the recommendations to be taken forward through existing policy and public health initiatives, as relevant, and has been instrumental in raising the profile of children's environment and health amongst government departments and throughout the UK.

Scope and purpose of the Fifth Ministerial Conference on Environment and Health

The theme for the Fifth Ministerial Conference was to protect children's health in a changing environment, following on from the CEHAPE process initiated five years earlier. The conference brought together ministers of health and of the environment with key partners and experts, including international and intergovernmental organisations, civil society and other partners. Delegates assessed the progress to date on issues related to health and the environment, renewed government pledges adopted in Budapest in 2004, addressed new challenges and developments, and discussed how these should be taken forward in Europe, in particular in relation to how to strengthen local and sub-regional implementation. The conference was organised by the WHO Regional Office for Europe and hosted by the Government of Italy in Parma, 10–12 March 2010.



Parma conference in the snow. Courtesy of Women in Europe for a Common Future (www.wecf.eu)

The conference focussed on three main priority areas:

- Progress made in environment and health in Europe since the first European conference in 1989 – in doing so, conference delegates focussed on countries of south-eastern Europe, the Caucasus and central Asia; evaluated the impact of the European Environment and Health Process; and reviewed the extent to which decisions taken in previous conferences had been implemented and acted upon
- Review of measures taken to address inequalities in environment and health such as socioeconomic, gender and age inequalities
- The health effects of climate change and how these will affect the WHO European region – an 'Institutional Framework' working paper was presented at the conference, led by the UK, establishing a European Environment and Health Task Force and Ministerial Board to help drive forward the European Environment and Health Process⁴.

An important component of this conference is the involvement of young people. In 2004 at the Fourth Ministerial Conference, a 'Youth Declaration' was presented to the ministers calling for youth representation on the EEHC and on the Task Force for the CEHAPE. As a consequence, the youth environment and health network has been involved throughout the process and participated in the Fifth Ministerial Conference. One of the objectives was to extend the youth network to all 53 countries in the European region and have a youth representative in each country delegation.

As part of the ongoing support to this initiative, the UK sent a delegation to the Parma conference, which included three youth representatives. The delegation participated in keynote interventions, chairing sessions, sharing what the UK has been doing and taking forward strategic thinking in this area. The UK sought a good outcome from the Parma Declaration, as well as to raise the profile of the health effects of climate change with other ministers.

Draft Parma Declaration on Environment and Health

The major policy outcome of the conference was the 'Parma Declaration on Environment and Health'⁵, as this outlines the actions that ministers have agreed to undertake. The Declaration is a short endorsement of general action on a wide range of public health issues. UK officials have successfully been involved in shaping the content of the Declaration to ensure consistency with current UK policies.

Ministers from countries of the European region of the WHO responsible for health and the environment made a commitment to build on the foundations laid in the European Environment and Health Process and act on the key challenges of our times. Areas of work include:

- the health and environmental impacts of climate change and related policies
- the health risks to children and other vulnerable groups posed by poor environmental, working and living conditions (especially the lack of water and sanitation)
- socioeconomic and gender inequalities in the human environment and health, amplified by the financial crisis
- the burden of non-communicable diseases, in particular to the extent that it can be reduced through adequate policies in areas such as urban development, transport, food safety and nutrition and living and working environments
- concerns raised by persistent, endocrine-disrupting and bio-accumulating harmful chemicals and (nano)particles and by novel and emerging issues
- insufficient resources in parts of the WHO European Region.

Outcomes from Parma relevant to the UK

The UK has fulfilled its commitments to CEHAPE through the production of the Children's Environment and Health Strategy for the UK¹⁻³, which was published in March 2009². This report made recommendations on how children's and young people's health could be improved through a better environment. The strategy was developed to enable the recommendations to be taken forward through existing policy and public health initiatives, where relevant, and has been instrumental in raising the profile of children's environment and health amongst government departments and throughout the UK. Many of the issues covered in the Parma Declaration follow on from CEHAPE and contain wide-ranging issues and broad objectives which are directly relevant to current government initiatives, such as health and gender inequalities, childhood obesity, promotion of physical activity and asthma and respiratory diseases.

It is also hoped that part of the remit of the environment and health process will be taken forward by a newly proposed UK Environment and Health Strategic Options Group (UKEHSOG), sponsored by the four Chief Medical Officers (CMOs) of England, Northern Ireland, Scotland and Wales. This group would address the need for a UK-level collaboration on environment and health aimed at driving and informing the integration of the public health agenda with climate change and sustainability at a practical and policy level. This would include mapping out the current activities in the area of environment and health and engaging a wider audience through a standing conference on environment and health. In taking relevant activities forward, the group would have to consider the recommendations made in the Children's Environment and Health Strategy and other relevant activities, as well as the outcomes from the WHO Fifth Ministerial Conference on Environment and Health in Parma.

Further information on the Fifth Ministerial Conference on Environment and Health can be found at <http://www.euro.who.int/en/home/conferences/fifth-ministerial-conference-on-environment-and-health>.

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International Conference and Workshops of the Society for Environmental Geochemistry and Health, Galway 2010

Laura Mitchem¹, Alex Stewart²

1 Centre for Radiation, Chemical and Environmental Hazards, Health Protection Agency

2 Cheshire and Merseyside Health Protection Unit, Health Protection Agency

The Society for Environmental Geochemistry and Health (SEGH) 2010 International Conference and Workshops, was held at the National University of Ireland (NUI), Galway from 27 June to 2 July 2010. The conference brought together participants from a range of disciplines including geology, epidemiology, chemistry, medicine and toxicology to discuss the relationship between the environmental impact of chemicals and human health, focussing on the relationship between human activities and environmental quality. Jointly organised by the National University of Ireland, Galway (NUI Galway), Environmental Change Institute (ECI) and Health Service Executive (HSE) West, Ireland, the conference was attended by international academic scientists, consultants, public health specialists, public servants and representatives of international government agencies.

The first keynote speaker, Professor Ian Thornton (Imperial College), recipient of the conference's lifetime achievement award, opened the conference, providing an introductory lecture which discussed the chemical nature of the urban environment and considered the relationships between geochemistry and human health and disease.

Following the introductory keynote presentation, parallel sessions ran throughout the conference, covering a wide range of topics.

House dust

The 'House Dust' session, included due to the topic's popularity at a previous SEGH conference, began with a presentation by Dr John Watt (The Centre for Decision Analysis and Risk Management, Middlesex University). Dr Watt discussed the need to consider inorganic contamination of house dust in residential settings resulting from indoor sources, along with outdoor ingress into the property. The presentation highlighted the need to consider how issues such as the type of residential floor covering, cleaning activities and recreational activities, can influence contamination levels.

Subsequently Dr Pat Rasmussen (Healthy Environments and Consumer Safety Branch, Health Canada) presented a four-year national Canadian House Dust Study aimed at assessing background levels of chemicals, in particular lead, within urban house dust. A three-tiered risk based approach was used to assess the potential human health risk associated with exposure to lead levels identified and this was used to communicate results to the owners where appropriate remediation was deemed necessary.

A similar study, the American Healthy Homes Survey, was presented by Dr Karen Bradham of the US Environmental Protection Agency. Dust, soil and wipe samples, taken from residences across the US were analysed

for lead, mould, arsenic and insecticides. Results of the study will be used in strategies aimed at reducing the health risks from environmental hazards in the US.

Bioavailability and bioaccessibility

Two papers from the 'Bioavailability and Bioaccessibility' session stimulated questions about the part environmental iodine plays in the aetiology and prevention of iodine deficiency disorders: the possible preventative role of inhaled iodine released from coastal algae (Dr Peter Smyth, School of Medicine and Medical Science, University College Dublin) and the inexplicable prolonged supply of iodine following irrigation with small amount of iodine (Qiang Ren, Institute of Population Research, Peking University).

Exposure to polycyclic aromatic hydrocarbons

The second keynote speaker of the day, Professor Shu Tao (College of Environmental Sciences, Peking University, Beijing), discussed the 'Emission, fate and respiratory exposure risk of polycyclic aromatic hydrocarbons in China'. Modelled geographical distributions of PAH emissions were presented, the majority of which originate from biomass burning, in particular the burning of coal and coke. Air mass trajectory calculations were used to simulate the atmospheric transport of PAHs across China and neighbouring countries. Lung cancer risk resulting from inhalation exposure to the modelled PAH levels was calculated and used to predict excess annual lung cancer incidence rate in certain regions of China, in which 20% of the population live. Overall, the population attributable fraction for lung cancer due to PAH inhalational exposure was 1.6%.

Air pollution and health

Sessions on the second day of the conference included 'Medical Geology', 'Soil Geochemistry', 'Contaminated Land' and 'Air Pollution and Health'. Keynote speaker Professor Luke Clancy (Director General of the Research Institute for a Tobacco Free Society) presented 'Air Pollution and Health in Ireland – Outdoors and in Pubs'. This well-attended presentation began with an overview of a severe Dublin air pollution episode which occurred in 1982, mimicking and perhaps surpassing in ill-health on a population for population basis, the London smog episode of the 1950s. The combination of coal burning in residential properties and an atmospheric temperature inversion led to high levels of particulates and a corresponding increase in fatalities. Subsequent bans on the residential use of coal resulted in a reduction in particulate levels and a corresponding decrease in mortality. The presentation concluded with results of a study which identified a reduction in PM_{2.5} levels and benzene levels in pubs following the introduction of the smoking ban.

Priscilla Pegas (University of Aveiro, Portugal) presented results from a study which investigated indoor air quality in schools in Lisbon (Portugal). The study, which measured levels of carbon monoxide, carbon dioxide, volatile organic compounds (VOCs) and nitrogen dioxide within the

classroom environment, concluded that inadequate ventilation can lead to the accumulation of pollutants, in particular VOCs which originate from indoor sources such as synthetic carpets, insulation and cleaning products. Levels were often found to be higher than the outdoor surroundings and the need to improve ventilation in schools was concluded.

Interesting snippets included a presentation on dental fluorosis in Ambrym, Vanuatu, attributed to volcanic offgassing (Rachel Crimp, Institute of Natural Resources, Massey University, New Zealand), changes in soil salinity enabling the emergence of mosquito-borne Ross River Virus disease in SW Australia (Professor Philip Weinstein, University of Queensland, Australia) and a review of airborne fungal spores in Austria, with 5% of PM₁₀ in the growing season being fungal spores (Dr Heidi Bauer, Institute of Chemical Technologies and Analytics).

Atmospheric dust

On the final day of the conference parallel sessions covered topics including 'Waste and Waste Management', 'Food Contamination' and 'Climate Change Impact'. Dr Jose Centeno (US Armed Forces Institute of Pathology, Washington DC) discussed the impact of dust from geological sources in Iraq on public health, in particular the need to consider the size, shape and physical and chemical composition of atmospheric dusts.

Urban geochemistry

In this session, Dr Louise Ander (British Geological Survey) presented the results of a study aimed at 'Measuring the Impact of Urbanisation on Soil Chemistry'. Through the collection of rural and urban soil samples from 25 urban centres across England, the British Geological Survey's G-BASE project has quantified contaminants including lead and arsenic with the aim of assessing the impact of urbanisation, i.e. construction, industry and transport, on soil contaminant levels. The study concluded that the impact is not consistent. Levels are not always elevated in urban areas; elevated levels often arise from the parent (bedrock) material.

Conclusion

Overall the conference highlighted the need for joint working between geologists, environmental scientists and medical specialists, in the assessment of the impact of environmental risk factors on human health and the need to encourage communication between experts to improve the implementation of risk management strategies. The attendance of delegates from a wide variety of scientific disciplines, brought together in the beautiful surroundings of Galway, encouraged extensive discussion of how to achieve these aims.

Next year's conference, which will be held at Edge Hill University, Liverpool, in April 2011, will include topics such as the threat of terrorism and chemical weapons and the development of a better understanding of the role of the environment in the development of the iodine deficiency disorders. There will also be sessions devoted to the latest understanding of and responses to the interactions between the environment and health for which a call for abstracts will come later this year.

Lessons from six years of the HPA/LSHTM course: Introduction to Environmental Epidemiology

Irene Kreis¹, Giovanni Leonardi^{1,2}, Virginia Murray¹

1 Centre for Radiation, Chemical and Environmental Hazards,
Health Protection Agency

2 London School of Hygiene and Tropical Medicine

Introduction

'Introduction to Environmental Epidemiology' was first organised in 2004 by the Health Protection Agency (HPA) in collaboration with the London School of Hygiene and Tropical Medicine (LSHTM) and taught at the LSHTM, and has since been run annually. Each time, the course has been evaluated using very similar tools. Over the years 15 to 20 students attend each course, with increasing numbers from outside the HPA. The most recent course in 2010 had three HPA students with all others being from overseas. So, what is this course aiming to do, who tends to attend and what do they think about it?

What do we want to do?

At the start of the course the following objectives/aims were formulated:

- 1 to summarise basic concepts in epidemiology, statistics and environmental health
- 2 to explore the key concepts in environmental measurement for epidemiology, exposure assessment, and health measurement for environmental epidemiology
- 3 to examine the scope and uses of environmental epidemiology in local agency response to public health and health protection issues
- 4 to explore study design and practical consequences of choices made when planning and undertaking an environmental epidemiology study, including an appreciation of the influence of finance, politics and time constraints on the choice of study
- 5 to review the advantages and difficulties of multidisciplinary and multi-agency working in environmental epidemiology
- 6 to use strategies for communicating risks concerning investigation of environmental hazards.

Aims 1 and 2 use pre-course reading, lectures, individual exercises and group work. The other aims are to be achieved using the long case study 'Zinc Violet'¹. These aims fit in the overall plans for training within the HPA and for the programmes as formulated for environmental streams of public health physicians^{2,3}.

According to Spiby (2006)³ a course in environmental epidemiology should address the epidemiology and investigation of common environmental exposures, such as water contaminants, air particulates, environmental tobacco smoke, radon in homes, toxic waste sites, electromagnetic fields, exposure to lead and the risks of identifying related adverse health outcomes. The main emphasis of the course is on methods of investigating environmental hazards; estimation of exposure and problems of measurement; analysis of health and exposure data including using geographical information systems (GIS);

basics of occupational epidemiology; disease cluster investigation, analysis and management; fundamentals of surveillance; and the critical appraisal of evidence methods. The course covers most of these more methodological aspects.

Another benchmark is the competencies formulated during a two-year European-wide project on public health (environmental) physician competencies⁴. This project recognised the need for training in environmental science, environmental epidemiology, environmental public health/environmental health, toxicology, risk assessment and communication, project management/research skills and crisis management. However, the project did not further specify what needed to be in courses for these areas but did recognise the advantages of the current HPA system with three levels of training in all these topic areas².

Annually our course has been evaluated to determine if it reached its aims. Using evaluation and feedback the long case study fulfilled most of the objectives and was found to have great learning benefits.

So, the course as run by the HPA does address the need for an introduction into environmental epidemiology at level three for specialist health protection personnel, such as regional epidemiologist specialists, chemical/environmental scientists, engineers, environmental/toxicology scientist epidemiologists or public health practitioners².

Who do we want to attend?

The initial audience for this course was HPA employees or trainees wanting to update their environmental epidemiology skills. From the start the course was open to non-HPA employees from similar fields, master level students from the LSHTM or King's College and international participants from relevant backgrounds. International participants attended all courses and by 2010 the course attendees were almost entirely international participants. The HPA employees have been found to have experience in either epidemiology or environmental health but have not necessarily been heavily academically oriented, whereas the international audience tends to be the more academically trained but a less practically experienced group of participants.

What do the participants tell us?

In every run of the course, both a daily and an overall evaluation were undertaken where possible. The final day evaluation sessions are particularly valuable. The best overview of the feedback is presented in a selection of the responses to the 'what was most surprising' question as presented in Box 1.

Overall, the course is received very positively. The structure of lectures with the large case study is generally well received. The teaching level in the course is generally perceived as challenging but useful. To have more structured pre-course reading, assignment of a handbook would be widely supported by the students.

Box 1: 'What was surprising?'

- 1 As a toxicologist, to find that epidemiology was good fun
- 2 We covered more ground than we thought
- 3 To discover that there are many possible ways of doing an environmental epidemiology study, and none are necessarily right or wrong
- 4 The fact that you can't explain epidemiological outcomes to a public meeting if you don't understand it
- 5 That you need a range of skills to manage an epidemiological project with the communication skills being dominant in the public meetings
- 6 How you manage the process
- 7 The public meeting exercise was very useful
- 8 The whole study format – unique
- 9 Was surprised that there weren't more statistics
- 10 It was surprising to find the very wide range of skills needed for environmental epidemiology

Feedback from participants over several years

Box 2 'Take home messages'

- 1 Environmental exposures are exceedingly difficult to measure accurately. Proxies are the rule. However, the implications of misclassification of exposure may be a false negative study finding, and the resultant vindication of a truly hazardous environmental exposure
- 2 Crude measures of environmental exposure in broad populations are liable to miss high risk in smaller sub-populations
- 3 Body 'burden' of a toxin is a valuable measure of risk, but is frequently impractical to measure
- 4 Geographical information systems are an unparalleled tool in studying environmental exposures. Potential environmental hazards should be identified, studied, and mapped proactively, ready for if an event should occur. This resource must be strengthened in Israel. Confidentiality remains a major limiting factor
- 5 Public perception of risk is usually subjective, and the voice of objective scientific evidence is not easily heard. Wise management of public opinion and the media is a critical skill to cultivate and master
- 6 The questions posed will necessarily affect the answers received. Aspire that the questions asked best reflect the needs of those served by the investigation
- 7 Don't work alone. Collaborate. Search for experts, locally and internationally, with expertise relevant to your work
- 8 In response to high-profile events, always consult the most visible experts in the field, even if their opinions are known or not directly relevant
- 9 There is no substitute for an on-site visit
- 10 In investigating putative environmental exposures, do not promise health surveys, because they are time-consuming and often impractical to perform
- 11 Document the investigation and decision making processes, preferably with photographs and a diary. This may be found useful in retrospect
- 12 Be aware of the public and political implications of your work, and try to plan for them from the outset. Present your findings with consideration of the sensitivities of the populations affected

Participant 2010

The week-long case study 'Zinc Violet' is evaluated separately. In general, the participants were very positive about the case study and the way it operates. Some frustration has been generated by technical hiccups of the current use of a CD-ROM version but developments are underway to make it a web-based case study. Many students have found it a challenging case study causing some stress at "being thrown in at the deep end", even though they understand that this helps to drive the educational process. Once the students realise that they have expert support they can ask when they encounter a problem, they tend to start really learning and at this point on many say they are "having fun" and "really enjoyed the case study, still surprised how much was learned". Following the recent 2010 course one student added to his evaluation by sending us an email of the important 'take home messages' to his future involvement in epidemiological and environmental issues in Israel (Box 2).

So, from the feedback it is clear that the ideas behind the structure of the course, an emphasis on complex practical learning and lectures about a wide range of aspects of environmental epidemiology, is one that is appreciated. It is also clear that as always, improvements can still be made.

What do we still need to do?

Overall we are pleased with this feedback and we are committed to conduct this course again in the following years. It is clear that several aspects of the feedback can be addressed by providing reading materials in advance of the course which will be covered by the 'Essentials of Environmental Epidemiology for Health Protection – a handbook for field professionals', a textbook which is in preparation by the HPA. Also, we need to maintain a good mix of lectures and ensure the range of relevant topics gets regularly updated.

In summary, the course was a well planned and comprehensive introduction to the field of environmental epidemiology. Most of the lessons learned are readily applicable to our approach to environmental hazards in Israel. Interestingly, many of these suggestions appear relevant to epidemiological work in general. As I see myself continuing in the field of public health and epidemiology, and possibly in environmental epidemiology, these lessons are likely to affect my work in a very practical manner.

Part of the summary by participant 2010

Acknowledgements

We thank Dr Shephard Singer (Ministry of Health, Israel) and Dr Nannerl Herriott (formerly HPA) for their contribution to the evaluation of the course.

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Private water supplies – the new regulations, six months on, Royal Society for Public Health, London, July 2010

Gary Lau
Centre for Radiation, Chemical and Environmental Hazards,
Health Protection Agency

On 1 January 2010, new private water supplies regulations for England came into force. Local authorities and owners of private water supplies have subsequently had to interpret the legislation, reassessing safety and organising risk assessments, monitoring programmes and enforcement policies as part of the new approach.

This conference acted as a six-month review of the regulations. It also sought to clarify any confusion inherent in the regulations. Experienced practitioners, legislators and experts from England, Scotland (where similar regulations have been in force for three years) and Wales spoke at the conference and talked about their experiences, ideas and suggestions.

Speakers included:

- Peter Jiggins, Department for Environment, Food and Rural Affairs (Defra) – Private Water Supplies Regulations 2009
 As the Head of Water Supply and Regulator in Defra, Peter provided an account of how the final regulations were decided. Regulatory changes in areas such as enforcement powers and small private water supplies (e.g. risk assessment and monitoring every five years, water standards and monitoring) were explained and discussed.
- Teresa Isaacs, Drinking Water Inspectorate (DWI) – Private Water Supplies Regulations 2009
 Teresa is Inspector of the DWI and discussed progress of the 2009 regulations and good practice. Details and information regarding local authority submissions to the DWI, the Chief Inspector Report 2009, guidance and a leaflet to assist local authorities in dealing with private water supplies were all provided during her presentation. Teresa also mentioned that there would be separate guidance available on private distribution networks¹ (distribution of drinking water derived from a mains supply) in the near future and that a first notice was served for breach of regulations since the 2009 regulations had come into force.
- Geoff Nemeč, Springhill Water Services Limited, UK Water Treatment Association (UKWTA) – views from the treatment industry
 Geoff is managing director and chair of Springhill Water Services Limited and UKWTA, respectively. Several case studies were described and he highlighted concerns from the treatment industry with particular emphasis on regulation 5 (use of products or substances in private supplies) of the 2009 regulations². It was suggested that materials and equipment that have traditionally been used for private water supplies without any adverse health effects, should continue to be used. There was also concern and anxiety about a lack of guidance and support from the DWI. Position statements from the UKWTA in relation to regulation 5 were discussed.
- Deanna Fernance, National Trust – views from owners of private water supplies
 Deanna is water manager of the National Trust and presented issues associated with maintaining private water supplies in country house estates, e.g. having to employ ground staff. Apparently, National Trust policy uses a water hierarchy starting with local water, which encourages properties to reinstate and update their historical infrastructure and to share the stores with the public. Deanna used Tyntesfield in Somerset as an example and provided insight into historical details. In addition, in-house risk assessments and implications of climate change, e.g. private water sources becoming scarce and stormier weather increasing pollution risk, were discussed.
- Liam Cooper, Leeds City Council – practical experiences of risk assessments
 Liam is a technical officer of Leeds City Council and presented problems encountered while he was carrying out his duties. Leeds has 47 private water supplies, of which 13 are large private water supplies, 20 are small private water supplies and 14 are to single dwellings. Source contamination (e.g. due to poor security or lack of vermin proofing) was a common issue and other areas regarding paperwork, general management of private water supplies and the water safety plans³ (a source-to-tap risk assessment/management approach recommended by the World Health Organization) were discussed in relation to his role as an environmental health officer.
- Chris Moss, Shropshire Council – practical experiences of organising the monitoring programme
 As the water quality officer in Shropshire Council, Chris presented issues and problems encountered, e.g. the increasingly large number of private water supplies (currently 2100) in the area, while organising a monitoring programme for private water supplies in the area with no practical experience. Chris demonstrated a database currently employed for recording details of private water supplies in the area and informed the participants about pricing policy for risk assessments in Shropshire Council.
- Dr Jackie Hyland, National Health Service (NHS) Fife – Scotland three years on
 Dr Hyland, Consultant in Public Health Medicine, of NHS Fife, outlined the legislation in Scotland with regard to private water supplies – the Private Water Supplies (Scotland) Regulations 2006, and presented data, findings and outcomes of biological and chemical contaminations, i.e. colour, copper, iron, lead, pH and manganese. Dr Hyland mentioned that grants of up to £800 are available from local authorities to help improve private water supplies and, since the introduction of the 2006 regulations, the quality of private water supplies has been improved though more owners are moving to mains water supply. On the other hand, the reluctance of owners to comply remains one of the many problems encountered in dealing with private water supplies.

- Sarah Johns, Pembrokeshire County Council – what's happening in Wales?

Sarah is a senior environmental health officer of Pembrokeshire County Council. She discussed the management system in place for private water supplies in Wales and provided details of stakeholders for water health under the Water Health Partnership for Wales, which aims to ensure joined-up responses to public health issues that arise from drinking water. A transitional grant scheme (£100 per supply) is available from the Welsh Assembly Government to compensate local authorities for the cost of undertaking risk assessments for the initial five-year period and, as a consequence, no charge for risk assessments in Wales should be made.

- Dr Steve Tuckwell, Water Regulations Advisory Scheme (WRAS) Limited – fancy a drink?

Dr Tuckwell, managing director of WRAS Limited, covered technical issues regarding drinking water plumbing practices, i.e. nature of plumbing, condition of plumbing, risk of ingress and regulations on water fittings – the Water Supply (Water Fittings) Regulations 1999. Several case studies were presented and emphasis was made on the prevention of contamination by backflow. In addition, Dr Tuckwell explained and presented the roles and works of the WRAS, e.g. promoting water fitting regulations and approval of water fittings and materials.

Summary

It appeared that the conference catered mainly for professionals from the water industry. It was made clear that local authorities were under pressure due to the new risk assessment approach incorporated in the 2009 regulations. On the other hand, a lack of authoritative guidance and information in certain areas of the 2009 regulations left some professionals with frustrations when dealing with private water supplies. Although the 2009 regulations may not be good news for everyone, they have certainly increased the demand for better quality in drinking water derived from private sources.

References

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Upcoming Conferences and Meetings of Interest

The Emergency Services Show, November 2010



The Emergency Services Show promotes multi-agency collaboration by bringing together everyone in the UK involved in an emergency (not just the emergency services) – from the strategic planners and first responders to the manufacturers and suppliers of equipment used by these leading professionals. Launched to facilitate collaboration following the publication of the Civil Contingencies Act 2004, the Emergency Services Show provides access to the latest technology, ideas and initiatives focussed on improving public safety and protecting the environment and the critical national infrastructure.

The Emergency Services Show takes place from 24–25 November 2010 at Stoneleigh Park in Coventry.

For more information, see www.ess2010.com

Environmental Health 2011 – Resetting our Priorities, February 2011



This conference will provide an interdisciplinary platform to exchange knowledge and learn about the latest issues in environmental health. The main themes of this conference will include environmental health research, impacts of technological innovations (including analytic methods), globalisation and policy changes to environmental health, climate change, global environmental disparities, environmental health emergencies, environmental health ethics, human capital resources and opportunities for new partnerships at all levels.

Environmental Health 2011 takes place from 6–9 February 2011 in Salvador, Brazil.

For more information, see www.environmentalhealthconference.com

The International Conference on Environment and Health, April 2011



The International Conference on Environment and Health will incorporate the 28th European Society for Environmental Geochemistry and Health Meeting. The conference provides an internationally recognised forum for interaction the exchange of research between researchers and workers in multidisciplinary area of environment and health. Under the broad theme of 'Environment and Human Health', the conference will explore geographical perspectives on the relationships between environment and human health including geochemistry of air, water, sediments and soils, environmental pollution, medical geology and **public health protection**, contaminated land and waste management, biogeochemistry of radionuclides, GIS technologies, chemical transport and understanding exposure within urban environments, climate change, aviation and vehicular pollution, communication of environmental health risks and social inequality.

The conference takes place from 10–15 April 2011 at Edge Hill University in North West England.

For more information, see <http://www.segh.net/calendar.php>

Training Days for 2010–2011

The Centre for Radiation, Chemical and Environmental Hazards (CRCE) considers training in chemical incident response and environmental contamination for public health protection a priority. The 2010–2011 programme has been developed to offer basic and more detailed training, along with the flexibility to support Local and Regional Services initiatives as requested.

Training events are available to people within the Health Protection Agency and to delegates from partner agencies, such as local authorities, the NHS and emergency services.

One-day training events

Carbon monoxide workshop

12 November 2010, Sheffield
Spring 2011, London
Other dates TBC around the UK

These multi-agency awareness events are designed for health and other professionals with responsibility in carbon monoxide incident response or prevention, including: Health Protection Agency staff (local and chemicals specialists), environmental health practitioners (including pollution, housing, health and safety), paramedics, fire and police, hospital staff, Health and Safety Executive, policy makers and industry.

Aims:

- to raise awareness of carbon monoxide (CO) and reduce the number of CO incidents
- to improve multi-agency response to CO incidents.

Topics covered:

- toxicology and health effects of CO
- CO surveillance, reporting and mortality in England
- methods for biological and environmental monitoring of CO, their potential utility and limitations
- emergency and local response to CO incidents
- roles and responsibilities of different agencies in investigating and managing CO incidents
- tools available to responders for CO incident management
- government, regulatory, health service and other programmes preventing CO exposure
- examples of local level programmes to raise awareness of, minimise or eliminate CO poisoning
- information about research initiatives in CO poisoning.

There will be a charge for these events; please see page 60 for booking details.

How to respond to chemical incidents

27 January 2011, London
24 February 2011, London
Other dates TBC, London

These courses are designed for all those on the public health on-call rota, including Health Protection Unit staff, Directors of Public Health and Primary Care Trust staff; hospital emergency department professionals; paramedics, fire and police professionals; and environmental health practitioners who may have to respond to incidents arising from the transport of chemicals.

Aims:

- to provide an understanding of the role of public health in the management of chemical incidents
- to provide an awareness of the appropriate and timely response to incidents.

Topics covered:

- processes for health response to chemical incidents
- types of information available from the HPA Centre for Radiation, Chemical and Environmental Hazards to help the health response
- resources available for understanding the principles of public health response
- liaison with other agencies involved in incident management
- training needs for all staff required to respond to chemical incidents.

There will be a charge for these events; please see page 60 for booking details. A maximum of 40 places are available.

Training Days for 2010–2011

Operational lead workshop

Dates TBC around the UK

These multi-agency awareness events are designed for public health and environmental health practitioners with responsibility for the management or prevention of lead poisoning incidents, including Health Protection Agency staff (local and chemical specialists), environmental health practitioners (including pollution, housing, health and safety), hospital staff, Health and Safety Executive, policy makers and industry.

Aims:

- to raise awareness of lead poisoning and reduce exposure to lead
- to improve multi-agency response to lead poisoning incidents.

Learning objectives:

- to understand the role of environmental and public health practitioners in managing cases of lead poisoning
- to be aware of the toxicology and health effects of lead
- to be aware of the methods for biological sampling
- to understand the process of environmental inspection, sampling and remediation
- to be aware of legislation for the investigation and management
- to be familiar with HPZone and the lead 'action card' for Health Protection Units
- to be aware of current research initiatives for lead poisoning incident surveillance.

There will be a charge for these events; please see page 60 for booking details.

Understanding public health risks from contaminated land

Spring 2011, London

This course is designed for those working in public health from the Health Protection Agency and environmental health practitioners who have to respond to incidents involving land contamination.

Aims:

- to explain the legislative and organisational frameworks that underpin contaminated land risk assessment
- to understand the role of public health in the management of contaminated land investigations.

Topics covered:

- principle and current issues relating to the management of contaminated land incidents and investigations including:
 - ◆ the toxicology underpinning derivation of tolerable concentrations
 - ◆ Soil Guideline Values
 - ◆ the local authority perspective on implementing Part II A
 - ◆ the risk assessment process
 - ◆ the nature of public health risks from contaminated land and risk communication
- process for public health response to contaminated land issues
- types of information available and potential limitations of risk assessment models used by different agencies investigating contaminated land
- roles and responsibilities of different agencies involved in investigating and managing contaminated land.

There will be a charge for these events; please see page 60 for booking details. A maximum of 40 places are available.

Training Days for 2010–2011

Incidents during transport of hazardous materials

Spring 2011, London

This course is designed for those working in public health from the Health Protection Agency and Primary Care Trusts, paramedics, fire and police and environmental health practitioners who may have to respond to incidents arising from the transport of chemicals.

Aim:

- to provide an awareness of the public health outcomes from incidents during the transport of hazardous materials.

Topics covered:

- transport of hazardous materials in the UK
- information available from the 'Hazchem' labelling of transported chemicals
- processes for response to transport incidents
- liaison with other agencies involved in transport incident management.

There will be a charge for these events; please see page 60 for booking details. A maximum of 40 places are available.

One-week training courses

Essentials of environmental science

29 November – 3 December 2010, King's College London

This five-day course is designed for those working in public health, health protection, environmental science or environmental health and who have an interest in or experience of environmental science and public health protection and would like to develop their skills.

The aims of this short course are to summarise the key concepts of environmental science, the study of the physical, chemical, and biological conditions of the environment and their effects on organisms. The course will concentrate on the basics of environmental pathways – source, pathway and receptor – and consider the key issues in relation to the health impacts of air, water and land pollution and the principles of environmental pollutants and impacts on health. Environmental sampling will also be covered: its uses and limitations for air, land and water, leading to a consideration of environmental impact assessment and links to health impact assessment. Awareness of the main environmental legislation will be provided along with an understanding of the process of determining environmental standards, what standards are available, how to access them and how to utilise them. Sessions will be based upon examples of incidents associated with health protection which may lead to adverse health effects. The course will also provide an overview and understanding of the advantages and difficulties of multidisciplinary and multi-agency working in environmental science, and the use of strategies for communicating risks associated with the investigation of this science.

The fee for this course will be around £600 for HPA staff and £1000 for non-HPA staff. A maximum of 30 places are available.

Participants will receive a CPD certificate, or may elect to submit a written assignment and take a test to receive a formal King's College London Transcript of Post Graduate Credit.

Please see page 60 for booking details about this event.

Training Days for 2010–2011

Introduction to environmental epidemiology

14 – 18 February 2011, London School of Hygiene and Tropical Medicine

This five-day course is designed for those working in public health, health protection or environmental health and who have an interest in or experience of environmental epidemiology and would like to improve their skills.

The aims of this short course are to summarise the key concepts in environmental epidemiology, to explore the key concepts in exposure assessment and cluster investigation, to examine the scope and uses of environmental epidemiology in local agency response to public health and health protection issues. The course will also show how to explore study design and the practical consequences of choices made when planning and undertaking an environmental epidemiological study. This will include an appreciation of the influence of finance, politics and time constraints on the choice of study, to review the advantages and difficulties of multi-disciplinary and multi-agency working in environmental epidemiology, and to use strategies for communicating risks concerning investigation of environmental hazards.

The fee for this course will be £825. A maximum of 20 places are available.

Please see page 60 for booking details about this event.

Essentials of toxicology for health protection

May/June 2011, King's College London

This five-day course is designed for those working in public health, health protection or environmental health and who have an interest in or experience of toxicology and public health protection and would like to develop their skills.

The aims of this short course are to summarise the key concepts in toxicology, toxicological risk assessment, exposure assessment, and to examine the scope and uses of toxicology and tools of toxicology in local agency response to public health and health protection issues. Training sessions will use examples of real incidents to demonstrate how toxicology may be applied in the context of health protection. The course will also provide an understanding of the limitations associated with the lack of data on many chemicals, chemical cocktails and interactions. The course will provide an understanding of the advantages and difficulties of multi-disciplinary and multi-agency working in toxicology and the use of strategies for communicating risks associated with the investigation of toxicological hazards.

The fee for this course will be around £600 for HPA staff and £1000 for non-HPA staff. A maximum of 30 places are available.

Participants will receive a CPD certificate, or may elect to submit a written assignment and take a test to receive a formal King's College London Transcript of Post Graduate Credit.

Please see page 60 for booking details about this event.

Table: Competency levels (HPA Workforce Development Group)

Level	Professional	Example	Examples chemical and environmental competencies
1	General public health	DPH on call, responsibilities for population public health protection	Safe on-call Triage enquiries, answer simple enquiries, conduct basic investigations and advise on health protection measures Know when and where to seek advice and pass on enquiries
2	Generic health protection	CCDC and health protection specialists Competence across all fields: communicable disease, chemicals/environment, radiation, emergency planning	Safe on-call and second/third on-call advice and operational support Lead local investigation of chronic environmental health concerns
3	Specialist health protection	Regional Epidemiologist Environmental Scientist Toxicology Scientist	Specialist chemical/environmental scientists, engineers, epidemiologists or public health practitioners
4	Super specialist	Named individuals in specialist divisions and teams	

2010–2011 Calendar of Chemical Training Courses

Date	Title	Length of event	Level of event*	Venue
12 November 2010	Carbon monoxide workshop	One day	2/3	Sheffield Town Hall, Sheffield
29 November –3 December 2010	Essentials of environmental science	Five days	3	King's College, London
27 January 2011	How to respond to chemical incidents	One day	1	151 Buckingham Palace Road, London
14 –18 February 2011	Introduction to environmental epidemiology	Five days	3	London School of Hygiene and Tropical Medicine
24 February 2011	How to respond to chemical incidents	One day	1	151 Buckingham Palace Road, London
Spring 2011	Carbon monoxide workshop	One day	2/3	London
Spring 2011	Understanding public health risks from contaminated land	One day	2/3	151 Buckingham Palace Road, London
Spring 2011	Incidents during transport of hazardous materials	One day	2/3	151 Buckingham Palace Road, London
May/June 2011	Essentials of Toxicology for Health Protection	Five days	3	King's College, London
TBC	Operational lead workshop	Half day	2	Dates around the UK
TBC	Carbon monoxide workshop	One day	2/3	Dates around the UK

* Please see the table (page 59) for details of competency levels

Booking Information

Regular updates to all courses run by CRCE can be found on the Training Events web page: www.hpa.org.uk/chemicals/training

Those attending CRCE courses will receive a Certificate of Attendance.

For booking information on these courses and further details, please contact Karen Hogan on 0207 759 2872 or chemicals.training@hpa.org.uk

Other training events

CRCE staff are happy to participate in local training programmes across the country and develop courses on other topics. To discuss your requirements, please contact Karen Hogan on 0207 759 2872 or at chemicals.training@hpa.org.uk

If you would like to advertise any other training events, please contact Karen Hogan.