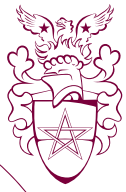

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Chartered Institute of Environmental Health

EDITORIAL

Editorial board

Julie Barratt

Julie is the Director of the Chartered Institute of Environmental Health Wales, with responsibilities including liaison with the National Assembly for Wales, local authorities and non-governmental organisations, promoting and representing the CIEH's policies, and generally seeking to raise the profile of Environmental Health in the Principality. She has had close involvement in a number of high-profile campaigns, including the ban on smoking in public places, the trade against illegal meat and, most recently, the Tattoo Hygiene Rating Scheme. She is a regular contributor to BBC radio and television on consumer and environmental health-related issues and writes extensively on these. Julie is a visiting lecturer in law and legal practice at Cardiff Metropolitan University.

Dr Chris Day – Editor

Chris qualified in Environmental Health in 1979 and after eleven years of working as an EHO set up as a freelance trainer and adviser, before taking up an appointment as a lecturer at King's College London, eventually leading the accredited MSc Environmental Health programme. Chris's teaching and research interests have spanned the field of Environmental Health, though his particular research interest lies in the epidemiology of infectious intestinal disease and the role performed by surveillance in informing (and sometimes misinforming) the aetiology of food-borne illness, which was the subject of his doctoral thesis. Chris's appointment as Education Officer of the CIEH in January 2011 has provided new challenges including the editorship of JEHR and with it the profession's wish to encourage greater research activity and publication amongst students and EHPs.

Dr Jill Stewart

Jill Stewart's environmental health and housing career began in local government, leading to her current post as Senior Lecturer and Research Lead in the School of Health and Social Care at the University of Greenwich. She teaches at undergraduate and postgraduate levels across public health, environmental health and housing subject areas. She is a Chartered Member of the CIEH, a Member of the Chartered Institute of Housing and Fellow of the Royal Society for Public Health. Her main research interests include evidence-based practice

and the effectiveness of front-line strategies and interventions. In this field she recently developed the CIEH's Private Sector Housing Evidence Base working collaboratively with a wide range of practitioners and academics around the country. She is currently involved in researching public health history.

Dr Marie Vaganay

Marie is a lecturer at the University of Ulster and the course leader for the Masters in Environmental Health Management programme. Marie has diverse research and teaching experience but her main interests lie in epidemiology and public health. Over the years Marie has lectured, supervised, reviewed and published widely on these subjects and is a member of several review panels and government committees. She holds a doctorate in accident prevention. Marie is the immediate past Editor of the JEHR.

AIMS AND SCOPE

The *Journal of Environmental Health Research* is a peer-reviewed journal published online.

The Journal publishes original research papers, review articles, literature reviews, commentaries on technical and professional matters, book reviews, workshop/conference reports and short communications covering the diverse range of topics that impinge on public and environmental health. These Include: occupational health and safety, environmental protection, health promotion, housing and health, public health and epidemiology, environmental health education, food safety, environmental health management and policy, environmental health law and practice, sustainability and methodological issues arising from the design and conduct of studies.

A special category of paper – the 'first-author, first-paper' – is designed to help build capacity in environmental health publications by encouraging and assisting new authors to publish their work in peer-reviewed journals. Here the author will be given active assistance by the editors in making amendments to his or her manuscript before submission for peer review.

The Journal provides a communications link between the diverse research communities (academics, students, practitioners and managers) in the field of public and environmental health and aims to promote research and knowledge awareness of practice-based issues. Beyond this it aims to highlight the importance of continuing research into environmental health issues.

Editorial correspondence
Items for publication, letters and comments on the content of the Journal and suggestions for book reviews should be sent to the editors, by email, to c.day@cieh.org

Details regarding the preparation and submission of papers ('Notes for Authors') can be found at the back of this issue and at www.jehr-online.org

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EDITORIAL

Welcome to a new era

by Dr Chris Day, editor, CIEH

It is with great pleasure, tinged with relief, that I contribute this editorial to herald the reappearance of the *Journal of Environmental Health Research* as an online resource. Relief, because there has been a regrettable delay since the last edition, and whilst there were good reasons for this, we would not have wanted it this way. May I take this opportunity to apologise to the authors of papers that have had to wait so long to see their work published and thank them for their patience.

However, first, can I thank Ben Crocke, Head of Policy and Communications and Kimberley Anderson, Digital Marketing and Content Manager for setting this in train, and especially Zoë Simek, Design Manager, in making it happen for this edition. None of this would have been possible without them.

Before introducing this edition I should just like to acknowledge my immediate predecessor, Dr Marie Vaganay, who took over the reins from Prof. Harold Harvey and saw JEHR to its 12th edition. Marie has done a great job seeing the Journal through a much-extended inter-regnum and agreeing to join the Editorial Board. My thanks, also, to Dr Jill Stewart and Julie Barratt who are our fellow Board members.

With the decision taken to discontinue production of JEHR in hard copy, and instead to produce the Journal specifically for Web access and download, it passed to me to steer the Journal into a new era. From the start it was vital to maintain academic standards whilst bringing about changes that would make JEHR essential reading for members and others.

In seeking to continue making papers central to the purpose of JEHR, the aim will be to maintain the Journal's good name for scholarship. However, the CIEH has expressed its desire to see JEHR have a tangible influence on practice, and this means encouraging research into matters relevant to the practical application of environmental health. Accordingly, we intend to have space assigned in each edition to articles, commentaries and literature reviews focusing on practice, plus at least one book review, and in time to reinstate the 'guest editor' column, which previously attracted some excellent contributions.

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Space for other, occasional, pieces may need to be found, but I should like the new Editorial Board and you, its readers, to direct me on this.

I hope that regular readers of JEHR will find that in its new online manifestation it has the good features of the 'old', but in its design, layout and font size has the capacity to be navigated and read with greater ease. Also, that a lighter editorial 'touch' is evident such that the Journal can extend its appeal beyond the academic community and so attract the interest of students and practitioners.

In this regard we would ask authors to feel less self-conscious and to offer 'points of view' that challenge the status quo. So long as any new-found 'edginess' is tempered by scholarship we hope to see the Journal as a force for change and for good.

Before I introduce the contributions and contributors to this edition, can I make an urgent appeal to everyone reading this to consider contributing a piece to JEHR, either now or in the future. Whilst the Board is routinely in receipt of a ready supply of papers on 'environmental science', much of this does not have the essential ingredient to see it into the Journal. Yet more submissions are so deeply applied to a particular activity or discrete geographical area that there can be little chance of the conclusions having pertinence to anything or anywhere else.

It has been a source of concern that so few papers based on research conducted by students or academics at UK universities have been submitted. The Board hopes that 2014 will see a resurgence of interest in seeing work conducted in our academic institutions published.

However, my greatest hope is that environmental health practitioners of whatever persuasion are encouraged to discover the transforming power of research, and by this means tell others of their experiences and the challenges they face. The search for a quality evidence base begins with practitioners 'telling their story' and this should not presuppose that everyone knows it already.

I rather doubt that politicians called to legislate or allocate resources on housing understand what a House in Multiple Occupation is, let alone know what it might be like to spend one's childhood in two rooms, sharing a bathroom and with a scrap-yard as a 'garden'. We must be advocates for those who have no voice, and the pen is a mighty weapon in the right hands. Our 'workplace' is the world where the social determinants of health are played out in every hour of every day, yet we appear largely silent on what goes on in it.

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Contributors to this edition of JEHR are clearly seeking to redress this imbalance and I so I should begin with the book review, or rather, the e-Book review, the efforts of the founders of the Environmental Health Research Network – EHRNet – entitled: *'Evidence, research and publication: a guide for environmental health professionals'*. This is a rather special work that for the first time 'gets down to brass tacks' in terms of environmental health research and goes beyond extolling its virtues (though it does a particularly good job at this) and provides practical advice and guidance to would-be researchers, and, as far as I'm concerned, those not so new to the game!

One of the members of EHRNet – Surindar Dhesi – is a contributor of an Article in her own right, this one exploring her experience as an EHP conducting doctoral research into the contribution of EHPs to the 'new' public health administration in England. Surindar's piece looks at how practitioner-researchers researching 'their own' may acquire special insights but this comes with certain duties and responsibilities.

Beyond this we have a co-authored paper from Lisa Cairns and Dr Stephen Battersby on EDMOs. This work began life as an MSc dissertation but has been subsequently expanded, one of the many advantages that comes from forming research partnerships for the purpose of writing and submitting papers. The outcome appeals for the resources necessary to make this initiative 'work' and so turn empty properties into homes, helping to reduce the chronic housing shortage.

Another, with a housing theme, is by Dr Jill Stewart and co-authors who describe the challenges faced by front-line practitioners in and around Margate in east Kent. Far from being a seaside idyll this is an area beset by the problems of a transient population struggling to establish 'roots' and reduced to living in overcrowded HMOs with little or no security or means of accessing support and services. Jill's paper reports the reflections of practitioners who seek to find ways of relieving the plight of these vulnerable families.

Environmental exposure to toxic agents features in two pieces – the first, a paper documenting a project conducted in Guernsey by its Deputy Chief Environmental Health Officer (CEHO), Tobin Cook, that illustrates, amongst other things, just how difficult it is to relate measured radon levels to the various environmental factors that have a bearing on exposure. The other, an article contributed by Dr Gary Lau of Public Health England, reports on the reduction in the prescribed level of lead in drinking water which is due to be implemented on Christmas Day this year, and using case studies drawn from incidents investigated by the Centre for Radiation, Chemical and

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Environmental Hazards, suggests the impact of the reduced concentration of lead in water.

Environmental hazards are the subject of a Literature Review submitted by Alastair Tomlinson, Senior Lecturer in Environmental Health at Cardiff Metropolitan University and Huw Brunt, Consultant in Environmental Health Protection at Public Health Wales, but here the focus is on the huge number of complaints of 'annoyance' that are received by environmental health departments in the UK, and asks whether these represent a more potent health issue than currently thought.

Finally there is a paper contributed by another member of the CIEH but resident abroad, David Musoke of the Department of Disease Control and Environmental Health at Makere University, on the impact of applying environmental measures in the control of malaria in Uganda.

Hopefully, the appearance of the re-emergent JEHR will encourage researchers to submit their work for publication and so together take the journal into a new and even more successful era.

Chris Day, December 2013

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PAPER

Empty Dwelling Management Orders in London: the role of EDMOs in bringing empty property into use – do they assist in better utilisation of the housing stock?

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ABSTRACT

The Housing Act 2004 introduced a new legal provision enabling local authorities to take over the management of long-term empty property: The Empty Dwelling Management Order (EDMO). This paper describes how EDMOs have been used and also how London Boroughs have approached the issue of empty properties at a time of a housing shortage. It poses the question why in London, an area of acute housing need, there has been little interest in EDMOs; by December 2011 London Boroughs had made only 14 applications since the provision came into force.

The paper describes the responses to a questionnaire sent to all London boroughs (response rate 79 %) in 2009 which aimed to identify the action being taken to bring long term empty property into use at that time. In addition, nine local authority professionals participated in a semi-structured interview discussing the usefulness of EDMOs as a tool for dealing with empty properties.

It appears that the majority of officers considered EDMOs risky and resource intensive. Those taking EDMO action were found to have done so largely on ill-suited property, suggesting that genuine interest in EDMO is lower than might be expected given the shortage of housing. It is suggested that local

authority officers perceive the legislation as already too heavily weighted in favour of property owners and that other provisions are deemed more effective for bringing empty properties back into use. However, if used on the right type of property, EDMOs can be effectively utilised to help address the problem. The paper also discusses changes introduced in 2012 to EDMO qualifying criteria and other aspects of the Government's housing and empty homes strategy.

Key words: EDMO, enforcement, vacant property, empty home, empty property, empty dwelling, UK housing.

INTRODUCTION

In 2011 there were estimated to be over 720,000 vacant properties in England, with 279,000 long-term empties (empty for more than six months). Some 74,553 empty homes were in the Greater London area (EHA, 2011). Historically, local authority action has focussed upon tackling empty properties that impact negatively on communities and devalue neighbouring premises (CLG, 2009). Whilst this remains a priority for local authorities today, there is a growing consensus that empty property represents a wasted resource at a time of unprecedented housing need. Politicians and the media have increasingly debated the issue of empty properties as the need for additional housing supply intensifies.

Demand for housing in the UK far outstrips current housing availability and new build housing supply. Rapid population growth, coupled with changes in population demographics, have resulted in an increase in the total number of UK households requiring a home. The number of households in the UK increased by 6.4 million between 1971 and 2008, reaching 26.3 million households in 2011 (ONS, 2011, ONS, 2012) and is projected to increase by a further 6.5 million by 2033 (CLG, 2010).

Statistics show a large increase in the number of single-person households as a consequence of increased levels of relationship breakdown and divorce, an increased number of young people living alone, and medical advances contributing to increasing numbers of single and/or widowed older people living alone for longer periods (GLA, 2008). Across all tenures, supply of new housing in England has struggled to keep up with the increasing levels of demand. The number of new homes being built declined as a result of the economic crisis affecting the UK, with developers experiencing difficulties in obtaining finance, coupled with a slowdown of house sales.

According to Department of Communities and Local Government data, social housing waiting lists in England are at an all time high with the number of waiting households rising from 1.4 million to 1.8 million over the ten years to 2011. In 2011 the number of households on housing waiting lists in London was 366,613 (CLG, 2012). Social Housing stock has become substantially depleted through the 'right to buy' policy introduced in 1980 coupled with a reduction in social house building. In London in 2010/11 housing associations developed just 12,179 affordable homes including 10,026 brand new homes, which represented 55% of all new homes completed (NHF, 2011).

In response to the severe housing shortage in the UK, the previous Government set an ambitious target in the Green Paper: *Homes for the future: more affordable, more sustainable*, to build two million new homes by 2016 and three million by 2020 (CLG, 2007). The importance of maximising the use of existing stock in order to minimise the number of new homes that need to be built was emphasised (CLG, 2009) with the previous Government stating that 'empty homes represent a 'lost opportunity' to house someone in need at a time of significant demand for housing' (CLG, 2006). The Coalition Government's Housing Strategy for England (*Laying the Foundations*) (CLG, 2011b) expressed similar sentiments on empty homes, declaring that it wants *'to increase the number of empty homes that are brought back into use as a sustainable way of increasing the overall supply of housing, and to reduce blight on neighbourhood'*.

Housing in London is amongst the least affordable in England, with the majority of the cheapest housing costing on average at least eight times lower quartile earnings (HCA, 2009). High demand for housing has had a knock on effect on the cost of renting in the private sector contributing to an increase in the number of families living in cramped and overcrowded conditions (Shelter, 2011). The current recession has meant that mortgage finance has become difficult for first time buyers to obtain, leading to more people seeking government assistance and many young families unable to save the deposit required to buy a home. As more families have found that they cannot afford to buy a home or continue existing mortgage payments, demand for social housing in the capital has increased resulting in acute levels of housing need, higher than any other area of the UK (GLA, 2009a).

The percentage of empty homes to total housing stock in Greater London is lower than the overall percentage for the whole of England of 3.22%, yet empty property in London has the capacity to provide accommodation for over 74,000 households (EHA, 2011). Empty property as a source of housing was recognised in 'The London Plan' published by the Greater London Authority in 2004 where it was stated that London boroughs should *'promote the efficient use of the*

existing stock by reducing the number of vacant, unfit and unsatisfactory dwellings' (GLA, 2004). A target for London authorities of bringing 1,350 vacant dwellings per year into use was incorporated into new housing provision targets. Building on the London Plan, The Mayor of London, Boris Johnson, announced £60 million of funding over three years in July 2008 with a target set for local authorities to reduce the number of long-term vacant properties to no more than 1% of total housing stock (GLA, 2009b).

Local authorities in England have held the power to compulsorily acquire ownership of long term empty property through a Compulsory Purchase Order (CPO) at least since the Housing Act 1957. However, it was felt that local authorities needed an additional enforcement tool that was less draconian than CPO (EHA, 2009). Following active campaigning by the charity, the Empty Homes Agency (EHA), the Empty Dwelling Management Order (EDMO) was introduced in The Housing Act 2004. Lord Rooker, introducing the amendments to the Housing Bill to introduce EDMOs said:

> '...[the] *objective is to persuade owners in these circumstances to pass the responsibility of bringing the property back into housing use to a local authority. Of course, we want this to be with their consent. But where that consent is not forthcoming, we do not apologise for granting local authorities powers to secure occupation without the need to obtain consent.*' (Hansard, 2004).

The Coalition Government have since made amendments to restrict the use of EDMOs 'to protect civil liberties' (CLG 2011b), despite very few being made. The original research on which this paper is based aimed to investigate the use and perceived effectiveness of EDMOs in London. The objectives were to: investigate the varying types and extent of enforcement action taken on empty property by London boroughs; and, discover the attitudes of practicing professionals to the use of EDMOs.

This paper explores further the barriers to the use of EDMOs and whether current proposals will help reduce the number of empty dwellings.

METHODS

Following an initial literature search of issues surrounding empty homes, a questionnaire was sent via email to all London boroughs which aimed to establish:

- the level of staffing dedicated specifically to empty properties;

- whether an empty property strategy was in place;
- the type of grant funding available / conditions attached; and,
- the extent/type of enforcement action taken over the previous twelve months.

A request for information was submitted to the Government Office for London for a list of all housing CPOs carried out by London boroughs during the period April 2006 to July 2009. Information on the number of EDMOs carried out by London boroughs during the same period was obtained from the Residential Property Tribunal website and verified by telephone.

This information was used to establish the most active of the boroughs in terms of CPO action as well as identifying those boroughs that had been through the application process for an interim EDMO. The information was used in conjunction with information obtained from the questionnaires to segment the boroughs based on a combination of level of enforcement activity and extent of enforcement tools used in the last year.

The ten housing professionals chosen for interview were selected purposefully so that inner and outer boroughs were represented and at least one borough from within each sub-region. Beyond this, the sample included:

- the two most active boroughs in CPO action (these boroughs were selected as they appeared to be very active in empty property enforcement but had not yet applied for an interim EDMO);
- the two boroughs that had not undertaken enforcement action in the preceding twelve months (these boroughs were selected as they appeared to have a more informal/grant based approach to empty property);
- three boroughs that had made application to the Residential Property Tribunal (RPT) for interim EDMOs (these boroughs were selected from the four authorities that were known to have applied because their views were considered to be particularly important since they would be informed by the experience of having undergone the EDMO process).

In the event only nine individuals were able to participate in the research which sought through the semi-structured interview to provide a better understanding of how their boroughs dealt with empty property and perceived the usefulness of EDMOs.

RESULTS

A review of existing literature found social, moral and economic arguments for action to be taken to bring empty property into use. The GLA (2006) reported the public subsidy spent on new Housing Association stock was on average around 60% of the total cost, equivalent to approximately £105,000 in London, and the estimated average cost of works required in refurbishing an empty property was said to be £12,000. Other estimates ranged between £6,000 and £30,000 depending upon the condition of the property (EHA, 2008, The Halifax Bank, 2008).

There have been a number of studies exploring the reasons why homes are left empty which aim to investigate the obstacles preventing occupation and the assistance that could be provided to owners (Ipsos Mori 2004 and 2006a, 2006b).

Three common themes emerged from these studies:

- a substantial number of respondent owners in the studies stated that they had purchased the properties - this challenges the assumption that empty property owners are accidental or reluctant owners;

- about half of respondents rated the condition of their property as 'fairly/very good', suggesting that disrepair is not the main reason for these properties being empty. In addition, Scottish Government research (2009) found disrepair not to be a common cause of homes becoming empty, rather that disrepair occurred as a result of them remaining unoccupied for a long period. This tends to support the notion that acquisition was for a capital gain in a rising market, rather than to enter into the rental market; and,

- findings suggested that the majority of owners do not want local authority assistance to bring their property into use, suggesting that a financial support-based approach (grant or loan) may be limited in its effectiveness.

Previous research has been carried out into the different approaches taken by local authorities in bringing empty property into use (Dominion Housing Group, 2007, and Scottish Government, 2009) and these have found the offer of grants alone to be ineffective in dealing with long-term empty property. Local authorities who combined incentives with the use of enforcement powers were found to have the highest success rates in bringing empty property into use, supporting the findings of the Ipsos Mori research.

The use of EDMOs in bringing empty property into use was found to be low, yet no explanation could be found for this in the literature. Recent studies have indicated that local authorities are often reluctant to take 'formal' enforcement action (CIEH, 2008 and Battersby, 2011). Indeed it has been found the most common reason why local authorities intervene is because of complaint rather than any strategic approach. This may explain why as at June 2009, just twenty-four interim EDMOs applications had been made in the whole of England (RPT, 2009), and by December 2011 just 14 applications had been made in London by just four of the 33 London Boroughs (RPT, 2012).

Evidence emerged from the literature review to suggest that an approach to tackling empty property that was based on financial assistance alone may be ineffective. With this in mind, this study sought to discover why there had been such limited enforcement action in London.

Questionnaire responses

Questionnaires were returned by 26 of the 33 local authorities in London. 22/26 of the authorities confirmed the existence of an Empty Home Strategy and in all but one a member of staff with full- or part-time responsibility for dealing with empty properties, ranging from a 0.5 FTE to '4.5 plus a manager'. Although the number of responding authorities was too small to support statistical analysis, there seemed to be a positive relationship between the staff resource, as measured by the number of dedicated 'empty property officers' (or their equivalent) and enforcement activity reportedly taken in the previous 12 months.

In 24/26 grant monies were reported to be available, with all of these (24/24) confirming that grants were linked to leases (which allows the council to use the property for nominated tenants for a set period of time), though in 3/24 the authority indicated that the grant would only be linked in the case of 'large grants' or 'in some cases'. When asked the extent to which the grant might cover the cost of works, 9/24 said that it would cover the 'Full' cost, 14/24 'Partial' and 1/24 both. The responses received indicated that a sub-regional approach to empty property strategy and grant funding had been adopted by the majority of the London Boroughs.

In terms of reported enforcement action taken to deal with long-term empty property, Compulsory Purchase Orders (either under housing or planning legislation) (9/26) and action under Section 215 of the Town and Country Planning Act (8/26) were both cited in the case of the authorities that responded. Just three authorities indicated that an EDMO had been used and 9/26 indicated that they had not taken any enforcement action for this purpose during the last 12 months.

Responses to interview questions

The interviews with housing professionals found that 4/9 considered existing levels of enforcement activity to be 'about right' and the remaining 5/9 feeling it was 'too little', with 4/9 stating the Government were right to call for firmer action on empty homes. In the majority of the boroughs represented, enforcement action was most often instigated by complaints from residents or Council members and focussed particularly on empty homes that were causing particular problems to neighbouring property and were an 'eyesore'. However, some indicated a rather more proactive approach to the identification and follow-up of empty properties and taking this through to enforcement action.

When participants were questioned about the number of properties that had been brought back into use through grant funding during the last year, the figures, where available, were low in comparison to the overall number of empty houses in each borough, averaging at between 10 and 30 properties per year.

Invited to list the different forms of enforcement action that had been taken during the previous two years, the interviewees reported a panorama not dissimilar to that produced by the questionnaire; ranging from inaction to a substantial CPO programme. CPO was found to be the enforcement tool primarily utilised, with several respondents reporting that properties had been brought back into use by the threat of CPO action alone.

Six interviewees indicated that they had not yet made an interim EDMO application and had no plans to do so at that time, with the main reasons given as the 'time and effort' (6/9), 'manpower' (3/9) and not having a management system in place (3/9). Two respondents said that since their borough operated a successful CPO programme they saw no reason for EDMOs.

Perhaps, not surprisingly, since three of the boroughs chosen to be represented in the interview phase of the survey had applied for, and been granted, interim EDMOs, their representatives said that they would apply again, though, when asked why EDMO had been chosen over other forms of enforcement action, the reasons differed – *'pressure from councillors'*, *'publicity'* and *'lower cost compared to compulsory purchase'*, the final response apparently reflecting the experience of several very expensive CPOs.

All of the 'Interim EDMO' applications were made in respect of long-term, empty properties in a poor state of repair. In some cases the internal condition of the property was unknown at the time of application to the RPT and the feasibility of whether repair costs could be recovered during a 'Final EDMO' had not been considered.

One borough had since proceeded to 'Final EDMO' stage with the property now occupied and another intended to proceed to 'Final EDMO' but was experiencing 'major reluctance' from councillors. The representative of the borough that had undertaken EDMO action to raise publicity stated that there was never any intention of proceeding to the Final stage with any of the 'Interim EDMO' properties due to their poor condition, though 'Interim EDMO' action was considered successful in that four owners had taken it upon themselves to bring their properties back into use.

Amongst the comments received as to the usefulness of EDMOs were that they were: cheaper than CPOs; more expedient; and, the mere 'threat' of EDMO action can be effective. On the negative side they were considered: excessively time-consuming and labour intensive; overly complex; and, likely to impose demands of the authority to arrange insurances, drawing up specifications and recovering costs if the property was dilapidated.

When asked why, in general, EDMOs had not been popular amongst London Boroughs respondents suggested:

- that the Residential Property Tribunal was generally perceived as being biased towards landlords;
- EDMOs were a relatively new procedure and local authorities were still getting used to the process;
- the majority of empty homes required significant repair/modernisation rendering EDMO unsuitable;
- negative past experience of control orders with which the legislation is perceived as having similarities;
- local political bias against on the grounds that as long as a property is not having an effect on the neighbourhood, the owner should be able to leave it empty;
- physical location of the Empty Property Officer (considered to be less likely to take enforcement action on an empty property if the EPO was located in the housing department compared with the environmental health department).

Interviewees were asked whether they felt that any changes were needed to the current legislation in order to make the EDMO process easier, prompting

comments like: *'not been very well thought through'* and *'designed by someone who did not understand how local authorities work'*, with one respondent describing EDMOs as a *'legislative nightmare'*. Suggestions as to how improvements might be made to the legislation included changing the way that costs are recovered and extending the Final EDMO period to at least 10 years.

A general feeling amongst those interviewed was that EDMOs in their current design were too generous in favour of the owner, with the work involved perceived to outweigh any benefits. Several interviewees suggested owners should be penalised in some way, further suggesting that this could be achieved by payment of a fee to the local authority or that they should receive only a percentage / none of the surplus rental income. One respondent commented: *'I don't like the way that you are almost rewarding the owner, who gets rent as well as the benefit of having their property completely renovated.'*

Those working for authorities that regularly took CPO action were amongst the most critical of EDMOs, with one respondent expressing the opinion that: '*EDMOs are a watered down CPO for those not prepared to use CPO and* [so] *a fudge*', and another stating: *'...if you are going to that much trouble you may as well do a CPO.'*

DISCUSSION

A wide range of factors were found to influence local authority empty homes policy, each borough developing their own approach based upon a combination of factors including the political make-up, staff resources and level of grant funding available. In addition, the majority of boroughs had tailored their approach specifically to meet the needs of their particular community or to tackle area specific issues. At the time this research was initiated and the survey conducted, local authorities had the power to apply to the Residential Property Tribunal for an 'Interim EDMO' where a property had been vacant for a minimum of 6 months and did not fall into any exemption category set out in The Housing (Empty Dwelling Management Orders) (Prescribed Exemptions and Requirements) Order 2006 (SI 2006 No 367). In November 2012 the legislation was amended and now requires properties to have been empty for a period of two years and causing sufficient annoyance for the community which must be in support of the Council making the order.

Where an 'Interim EDMO' is granted, the local authority can put arrangements in place to prepare the property for occupation. The owner's consent must be obtained before the property is let to tenants. An 'Interim EDMO' may last for a period of up to 12 months.

Where it remains unlikely that the property will become occupied, the local authority can proceed to declare a 'Final EDMO'. Before this is made the local authority must draw up a management scheme detailing any works that are required to be performed and an estimate of the cost, how much rent will be charged and how the property will be managed. The owner must be given the opportunity to comment on the proposed scheme and may appeal to the RPT if they are not happy with the terms.

The 'Final EDMO', lasting up to seven years, allows the local authority to take temporary possession of the property, carry out any works necessary to make the property habitable and to make arrangements for a tenant to rent the property without the owner's consent. Properties subject to a 'Final EDMO' can be managed on behalf of the council by a registered social landlord or private letting agent, and it is anticipated that this would be the normal practice. Any management costs, together with costs incurred from repair and maintenance work, are recoverable from the rent and any surplus is paid to the owner. Rent must be set at market rent.

The consensus view of the interviewees was that EDMO's involve a substantial amount of work, particularly if a 'Final EDMO' is declared and there might be a risk of the council failing to recover its cost; the combination of the two outweighing any possible benefits to be gained from the temporary acquirement of additional accommodation. The burden of management placed upon the local authority during a 'Final' EDMO was an especially negative factor.

Research commissioned on behalf of the East London Renewal Partnership (Dominion Housing Group, 2007) evaluated the empty home strategies implemented by six East London boroughs with the aim of identifying good practice. The key outcome was that in order to manage long-term empty homes proactively, local authorities needed an empty homes team comprising three or four staff experienced in enforcement work, whereas this survey found, on average, less than two dedicated empty property staff in each borough. This would indicate that London boroughs do not have the resources to properly implement an empty homes strategy that uses EDMOs where appropriate.

This study has found that the overall volume of enforcement action taken was low and in all cases was an intervention 'of last resort' after offers of advice/assistance had failed. This may perhaps explain why some respondents considered EDMOs to excessively reward owners after months or even years of dealing with uncooperative owners, to the extent of suggesting that owners *'...should be penalised in some way'*.

Boroughs that *had* applied for an interim EDMO seemed not to have based the decision on it being the most appropriate course of action and appeared to have chosen largely inappropriate properties requiring substantial repair works. This suggests a lack of genuine interest in EDMOs as an enforcement tool and is consistent with other studies that have shown many local authorities are reluctant to take enforcement action, choosing instead to take 'informal' action in order to persuade owners to comply or bring properties back into use.

Following the analysis of the responses given during the interviews in 2009, a meeting was arranged with the Chief Executive of The Empty Homes Agency (EHA). He was duly asked to comment on the findings of the research and as the EHA had been instrumental in developing the concept of compulsory leasing that led to the creation of EDMOs, explore whether the finished article was as it had been anticipated. The point was emphasised that EDMO's were seen by the Empty Homes Agency as being intended for cases where the underlying problem was management (or lack of), there was a reasonable prospect of rental income and the level of disrepair was not great, points that were identified by interviewees in this research. Whereas interviewees thought that the legislation was in need of review, the Chief Executive of the Empty Homes Agency considered the legislation was largely working to plan and was not in need of change.

The findings of this study would seem to call into question the initiatives of the present Government on empty homes. Rather than addressing the issues raised by the empty property professionals interviewed in 2009, EDMO legislation remains complex and therefore rarely utilised. Despite the findings of this and previous studies that an informal or grant-based approach is capable of achieving only limited success, the Government have failed to equip local authorities with a suitable enforcement tool that may be utilised where appropriate. Current Government policy may appear, perhaps, to be too heavily focussed on protecting the interests of empty property owners, rather than in sourcing much needed additional accommodation. The newly introduced requirement for a property to have been empty for at least two years means that the EDMO will fail to provide any speedy answer to the lack of housing supply in London.

CONCLUSIONS

It is clear from the wider research undertaken that EDMOs can be an effective tool in bringing empty properties back into use. However, it is highly questionable whether they have been used on the right properties, since in

London, as elsewhere, enforcement is largely complaint led and so focussed on 'problem' empty properties that are likely to be in serious disrepair. EDMOs, by design, would be most effective if utilised for empty property requiring little or no repair. The properties where EDMOs have been made were found to have been expensive to bring into a condition suitable for letting, resulting in potential difficulties in the local authorities recovering their costs. Despite this, the Government holds disrepair to be qualifying criteria for the revised EDMO regulations. By the same token, the requirement that the property must have been empty for two years will favour properties that are vacant because of disrepair and so more challenging for local authorities considering EDMO action. For this and other reasons discovered by this study, CPOs will remain the favoured enforcement tool to the extent that EDMOs might be considered virtually redundant.

In order to be effective, housing strategies should focus on meeting need rather than be solely complaint driven, and if there is serious intent to tackle empty homes and increase the available housing stock through EDMO action then a coherent strategy, adequate finance and dedicated staff resources will be required in support. Until then, one fears, EDMOs are destined to remain an ineffective tool in the drive to bring empty homes back into use.

REFERENCES

Battersby SA (2011). Are private sector tenant beings protected adequately? – a study of the Housing Act 2004, Housing Health and Safety Rating System and local authority interventions in England (a report for MPs Karen Buck and Alison Seabeck, Available at: *http://www.sabattersby.co.uk/documents/HHSRS_Are%20tenants%20protected.pdf* [Accessed: 31st March 2012].

Chartered Institute of Environmental Health (CIEH) (2008). The CIEH Survey of Local Authority Regulatory Activity under the Housing Act 2004: Results of a questionnaire survey, London. Available at : *http://www.cieh.org/uploadedFiles/Core/Policy/Publications_and_information_services/Policy_publications/Publications/Housing%20survey.pdf* [Accessed 31st March 2012].

Department for Communities and Local Government (CLG) (2006). Guidance note on Empty Dwelling Management Orders. Available at: *http://www.communities.gov.uk/documents/housing/pdf/151111.pdf* [Accessed 8th July 2009].

Department for Communities and Local Government (CLG) (2007). Homes for the Future: More Affordable, More Sustainable- Housing Green Paper. Available at: *http://www.communities.gov.uk/publications/housing/homesforfuture* [Accessed 8th July 2009].

Department for Communities and Local Government (CLG) (2009). Housing: Empty homes. [Online]. Available at: *http://www.communities.gov.uk/housing/housingmanagementcare/emptyhomes/* [Accessed 13th July 2009].

Department for Communities and Local Government (CLG) (2010). Household Projections, 2008 to 2033 England. Available at: *http://www.communities.gov.uk/publications/corporate/statistics/2033household1110* [Accessed 31st March 2012].

Department for Communities and Local Government (CLG) (2011a), Laying the Foundations: A Housing Strategy for England. Available at: *http://www.communities.gov.uk/publications/housing/housingstrategy2011* [Accessed 31st March 2012].

Department for Communities and Local Government (CLG) (2011b). CLG Press Notice, Pickles acts to protect the rights of home owners, 7 January 2011. Available at: *http://www.communities.gov.uk/news/corporate/1812629* [Accessed 31st March 2012].

Department for Communities and Local Government (CLG) (2012). Table 600 Numbers of households on local authorities' housing waiting lists, by district: England, 1997-2011. Available at: *http://www.communities.gov.uk/housing/housingresearch/housingstatistics/housingstatisticsby/rentslettings/livetables/* [Accessed 9 March 2012].

Dominion Housing Group (2007). Empty Homes 'A Review of Best Practice in East London Local Authorities and Partnership Working with RSL's'. Unpublished.

The Empty Homes Agency (EHA) (2008). Greener homes for the future: an environmental analysis of the government's house building plans. Available at: *http://www.emptyhomes.com/documents/publications/briefings/EAC%20Greener%20homes%20inquiry%2017-04-08.doc* [Accessed 27th June 2009].

The Empty Homes Agency (EHA) (2009). Guide to Empty Dwelling Management Orders. Available at: *http://www.emptyhomes.com/documents/publications/edmo/edmoguide_word.doc* [Accessed 14th July 2009].

The Empty Homes Agency (EHA) (2011). Statistics. Available at : *http://www.emptyhomes.com/statistics-2/* [Accessed 28th March 2012].

Greater London Authority (GLA) (2004). The London Plan, Spatial Development Strategy for Greater London. Available at: *http://static.london.gov.uk/mayor/strategies/sds/london_plan/lon_plan_all.pdf* [Accessed 31st March 2012].

Greater London Authority (GLA) (2006). Empty homes in London 2005-6. Available at: *http://www.london.gov.uk/archive/mayor/housing/docs/empty_homes_2005.pdf* [Accessed 14th July 2009].

Greater London Authority (GLA) (2008). Housing in London. The evidence base for the London Housing Strategy. Available at: *http://www.london.gov.uk/mayor/housing/strategy/docs/housing-in-london.pdf* [Accessed 2nd July 2009].

Greater London Authority (2009a). Greater London Strategic Housing Market Assessment 2008: Report of Study Findings. Available at: *http://legacy.london.gov.uk/mayor/housing/prices/docs/SHMA-main-report.pdf* [Accessed 31st March 2012].

Greater London Authority (GLA) (2009b). The London Housing Strategy. Draft for public consultation. Available at: *http://www.london.gov.uk/mayor/housing/strategy/docs/london-housing-strategy09.pdf* [Accessed 14th July 2009].

Halifax Bank (2008). Press Release: more than a quarter of a million private empty homes in England. Available at: *http://www.lloydsbankinggroup.com/media/word/01_11_08EmptyHomes.doc* [Accessed 2nd July].

Hansard (2004), House of Lords. HL Deb 13 September 2004 cc905-911.

Homes and Communities Agency (HCA) (2009). Managing empty homes in the current economic climate. Filling empty homes workshop: new strategies for successful regeneration projects. Chartered Institute of Environmental Health. 16 July 2009, London.

Ipsos Mori (2004). Survey of empty homes in the London Borough of Hammersmith and Fulham. Available at: *http://www.emptyhomes.com/documents/publications/research/MORI-301104.doc* [Accessed 8th July 2009].

Ipsos Mori (2006a). Survey of empty homes in the East of England. Available at: *http://www.goeast.gov.uk/goee/docs/192869/192874/200541/361897/CTAppNoTable.pdf* [Accessed 2nd July].

Ipsos Mori (2006b). Survey of empty properties. Research study conducted for North London sub-region. Available at: *http://www.goeast.gov.uk/goee/docs/192869/192874/200541/361897/CTAppNoTable.pdf* [Accessed 14th July 2009].

National Housing Federation (NHF) (2011). Home Truths 2011 Fixing our broken housing market. Available at: *www.housing.org.uk* [Accessed 9th March 2012].

Residential Property Tribunal (RPT) (2009). RPTS Case Archive: London Housing Act Cases. [Online]. Available at: *http://www.rpts.gov.uk/Indexes/raps_case_archive_lon_ha.htm* [Accessed 2nd August 2009].

Residential Property Tribunal (RPT) (2012). Browse Decisions. Available at: *http://www.residential-property.judiciary.gov.uk/Indexes/LON_HA_LEDMO.htm* [Accessed on 1 March 2012].

The Scottish Government (2009). Bringing Private Sector Empty Houses into Use: research findings. Available at: *http://www.scotland.gov.uk/Publications/2009/03/23123744/2* [Accessed 4th July 2009].

Shelter (2011). 1 in 4 London children overcrowded. Available at: *http://england.shelter.org.uk/news/july_2011/1_in_4_london_children_overcrowded* [Accessed 31st March 2011].

The Office for National Statistics (ONS) (2011). Social Trends. Available at: *http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-218733* [Accessed 28th March 2012].

The Office for National Statistics (ONS) (2012). Families and Households, 2001 to 2011. Available at: *http://www.ons.gov.uk/ons/rel/family-demography/families-and-households/2011/stb-families-households.html* [Accessed 31st March 2011].

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PAPER

Beside the seaside: perceptions from the 'front line' on the support needs of families living in the private-rented sector in Margate

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ABSTRACT

Margate was once a thriving seaside town but with loss of local tourism it is now multiply deprived, its many hotels and guest houses converted into privately-rented houses in multiple-occupation (HMOs). The community is transient, demographically skewed, with greater numbers of children in care and economic migrants who present a special demand on local services. Despite a growing interest in setting policy in respect of other issues, there is little published on the state of the privately-rented housing sector in seaside towns and how conditions might be addressed effectively.

This paper establishes a context for effective partnerships working in seaside towns through the selected findings of interviews with front-line practitioners invited to describe the challenges faced in supporting families living in privately-rented housing in Margate. Particular attention is paid to the reasons why people move to the seaside, the 'fluid' nature of the community and how partnerships are developing to tackle private sector housing enforcement, community support and social care needs.

PAPER

Beside the Seaside: perceptions from the 'front line' on the support needs of families living in the private-rented sector in Margate Dr Jill Stewart, Maureen Rhoden, Anneyce Knight, Nevin Mehmet and Lynn Baxter

Key words: Seaside, coast, Margate, deprivation, privately rented housing, house in multiple occupation

INTRODUCTION

English seaside towns have traditionally been associated with health and holidays (*see* for example Stewart and Meerabeau, 2009), and though there is some evidence of a revival in domestic tourism, holidaying overseas predominates. This has created significant levels of deprivation in some seaside towns, aggravated by the physical decline of the built environment and accelerated by coastal weathering of building materials (English Heritage, 2007). Many seaside towns have struggled to find new identities, though the research is limited as to the nature and extent of the complexities of socio-economic and environmental dynamics and the pressures experienced (Agarwal and Brunt, 2006). The evidence that exists suggests that seaside resorts have failed to receive the same attention and sensitivity from Government or policy makers as inner city or rural areas, although there has been a growing interest in recent years with calls for more evidence (Fothergill in ODPM, 2006; CLG Select Committee, 2007; Fothergill, 2008).

Margate, in Kent, has particular deep-rooted problems, with large numbers of former hotels and guest houses converted into poor quality and low(er) cost privately-rented houses in multiple occupation (HMOs). This has contributed to an unbalanced housing market and high numbers of benefit-dependent households (*see* for example CLG, 2007; Rickey and Houghton, 2009). The sharing of accommodation has been shown to be a factor in social disadvantage (Heath, 2008) correlating with social exclusion and loss of control over one's personal environment, which in turn may lead to reduced life choices, poorer physical and mental health and lower social participation (Knight, 2009; Percy-Smith, 2000). The 2010 Indices of Multiple Deprivation suggests that the rankings for the area covered by the Margate Task Group (established to focus on complex, local, inter-related socio-economic issues) have deteriorated, with three Large Scale Output Areas (geographical unit used in index of multiple deprivation) in the top 100 in the country (CLG, 2011).

A consequence of the large number of HMOs in the town, and so the availability of an abundance of cheap accommodation for those young households that remain in Margate (including care leavers), and the arrival of a transient population, including young migrants from the EU accession states, has in Margate, as elsewhere, raised tensions. This only adds to the existing evidence of social exclusion, entrenched cycles of deprivation related to incapacity and worklessness (claims for social benefits stand at three times the

regional average) and significantly lower house prices compared to the rest of South East England.

The distorted housing market occasioned by the demand for low-cost rented accommodation provides an on-going and 'difficult to break' cycle resulting in a skewed local population. As a consequence, it has been particularly challenging to address the 'concentration of need' that this creates (Shared Intelligence, 2008; Walton and Browne, 2010). Research on young families, especially those featuring teenage parents, suggests a particular vulnerability to a multiplicity of deprivation factors, including poverty, poor health, social exclusion, multiplicity of partners and domestic violence (Reeves and Gale, 2009). One would expect that poor housing could only exacerbate these problems.

These complex and inter-related issues present a major challenge for those working at the front line of service delivery, especially so as there is no consensus as to how best strained local public services should address the problems encountered at local level (*see* Fothergill, 2008), though new partnerships such as the Margate Task Force are working to better understand and address them.

This paper presents some of the findings of a qualitative research project carried out in 2011 exploring some of the issues faced on a daily basis by front-line practitioners seeking to deliver housing and support services to young families living in privately-rented accommodation in Margate. It sought to draw from them what they perceived to be the challenges and opportunities and so contributes to a limited literature in this area where the problems, much less the solutions, remain little known.

METHODS

This qualitative study explored the perceptions of those delivering front-line services to families living in privately-rented housing in Margate in terms of the challenges and opportunities presented. Interviewees were drawn from environmental health, housing, children's services, the voluntary sector, the Margate Task Force and related partners charged with helping vulnerable families find decent housing and access local amenities and services in their neighbourhoods and communities, and thus provide opportunities to promote positive change for those families.

This paper reports on part of this research in which semi-structured interviews were conducted with front-line practitioners working in the Margate Central and Cliftonville West Wards. It focuses on families living in private sector housing in

these deprived areas, where social and economic regeneration strategies are being pursued. Although an interview guide was used, the interactions were largely led by the participants so as to capture as far as possible their perspectives. Ethics approval was obtained prior to the project commencing which required participants to give their express consent to record their responses.

RESULTS AND DISCUSSION

A total of 11 interviews were conducted with practitioners between April and July 2011 which lasted from 45 to 90 minutes and were transcribed verbatim. Each member of the project team received anonymised copies of each of the interview transcripts for them to scrutinise and identify content themes.

Margate: a community of nomads?

A picture emerges from these interviews of a 'fluid' community which presents special challenges for partnership working directed at families living in privately rented housing in Margate. Whilst some had seemingly moved to Margate for its seaside location, housing availability, accessibility and affordability emerged as key factors in the community demographic. Accordingly, the area was seen to attract low income households, care leavers, EU migrant workers and 'imported homelessness' from other boroughs. These families featured in Interviews 1, 10 and 11.

The nature of a built environment, originally designed for mass tourism, is recognised as presenting a major challenge when now it is required to provide permanent residential accommodation. Not surprisingly these areas are characterised by having a high concentration of low quality HMOs, and strategies to address both the poor quality environment and fluid, low income, communities, require substantial investment and skill in order to address problems associated with education, behaviour, relationships, overcrowding and low social capital. This especially emerged from Interviews 2 and 5. Interview 1 indicated that it was not simply the lack of availability of services locally, but an unwillingness or an inability to make use of them, so requiring outreach and projects aimed at identifying and responding to a rapidly-changing community need.

The fluidity of the community was an issue repeatedly highlighted in the interviews as an especially challenging aspect of any effort to bring about regeneration, with transient young families in the privately-rented sector presenting particular challenges to those seeking to engage with, and develop services for, the community. As Interviewee 1 put it:

> '*You can be in Cliftonville, you can see someone with a pushchair or a buggy, and I ask them where the local children's centre is... and they will say 'Oh no, we haven't used that yet, we moved down a week, two weeks, three weeks ago', so I think there's an issue around transience and how we... engage some of our young families in services.*'

The same respondent drew attention to the difficulties these 'new families' presented by their mobile lifestyles in terms of not registering with a GP or accessing health services, the unauthorised absence of their children from school and whether they were living in decent housing. Above all, transience prevented engagement.

The community (as in other deprived seaside towns) includes a higher than expected number of families comprising adults who had themselves been 'children in care', belonged to a workless household or otherwise needy family, some across generations. Many of these families are reported as having multiple needs and prove particularly difficult to engage with as they have more pressing priorities, including being faced with eviction, or having a relative in prison.

Interviewee 7 reported:

> *'I know from the statistics that Margate Central and Cliftonville West... have really, really high deprivation* [indices]*... and some of the circumstances that families actually find themselves in are just really, really difficult* [the respondent cites literacy problems and low skill levels and families whose circumstances are unlikely to change much] [though] *the biggest thing is the **level** of deprivation in the area and the **number** of* [needy] *families.'* [Author's emphasis.]

Many of those interviewed suggested that some of the 'chaotic lives' of those they were supporting day-to-day was sometimes confusing and hard to sustain within an already complex community with many other troubled families. Such rapid community turnover meant that the area was deplete in social capital, confounding attempts to develop community capital and cohesion, which, *'never really gets a chance to build up, but funnily enough, you can go a couple of miles in any direction from Cliftonville and that isn't the case'*. (Interviewee 5.)

However, there was also a perception that there may in fact be pockets of social capital within some of the communities. One interviewee (6) defined very local household mobility between, and even within, buildings as a '*micro-community*'

and another (10) described his estimate of: '*half of the population actually staying in the area but moving around.*'

A frequently repeated observation was that it was hard to know who was living where, either formally or informally. The community turnover was variously described as '*massive*' (Interviewee 1) '*incredible*' and '*they just disappear*' (Interviewee 2). So, there was not just a single divided community, but divided communities, interspersed amongst a largely static community, with generations living in and returning to Margate. There were also residents' groups who did engage, where there were positive outcomes to efforts to improve the community and local environment (Interviewees 1 and 10).

Other interviewees commented that they had invested enormous amounts of energy with families who then moved on, resulting in a '*...continual process of revisiting… working with new families and getting them engaged*' (Interviewee 7). The issue of a transient community is well summarised by the following quote:

> *'You've... got that transient community which is very, very hard to engage with, and the police evidence shows that it's the highest crime area in Thanet* [with] *60%... of the crime committed in Cliftonville, committed by people who live in Cliftonville, so you've got this core of people* [who] *have an offending background… who don't actually really care about their community. It is a real massive challenge.'* (Interviewee 1.)

Overcrowding was frequently reported as being problematic due to households seeking a lower shared rent (Interviewees 2,5,7 and 10), particularly in immigrant communities who were reported as having different housing expectations, and where there were multiple families at the one address (Interviewee 7). The following quote is representative:

> *'there are very often young children who are in inappropriately small accommodation* [including one] *family living in a two bedroomed flat* [with] *a small internal room that had been created by the current landlord… being used by the two youngest children in the family, and I served a prohibition order. That kind of thing goes on in very, very low income families who can't afford larger properties… and they're putting themselves, or being put into, an inappropriately small place...'* (Interviewee 5.)

There was some confusion, and a lack of information, surrounding some of the local families especially in the migrant communities as to the numbers of people housed in particular accommodation and a range of unmet needs.

Some examples were given during the interviews, including that of a Czech Roma family with several children living in a two bedroom flat with no electricity, gas or heating. The authorities were unclear as to their source of income and the family had stopped paying rent. None of the children had school places or were registered with a GP and one had learning difficulties, whereupon they were referred to social services but then suddenly disappeared to an unknown location (a situation described by Interviewee 1).

Several interviewees including, here, Interviewee (2), described the unusually high number of privately rented properties, absentee landlords and lack of social care packages offered, adding to the sense of alienation and anomie.

Margate's privately rented housing: dilemmas and successes

Dealing with poor quality, privately rented, housing whilst seeking to simultaneously nurture social capital and develop communities, is fraught, with an underlying tension created by enforcement activity on the one hand, and cooperation on the other. This has resulted in the Margate Task Force continually seeking new ways of working in order to address local needs.

Private sector housing enforcement, never, in itself, straightforward, was reported as particularly problematic in densely built and populated Margate where many tenants have an interest in keeping their rent as low as possible. Consequently, enforcement is always challenging, complex and requires considerable persistence. As elsewhere, intervention sometimes results in eviction of a vulnerable tenant who then needs somewhere else to live, a situation described by Interviewees 2, 3 and 6. Prosecutions presented an enormous resource commitment, although there had been recent successes where landlords had been continually uncooperative (Interviewee 6), and another interviewee (2) described housing officers being able to work more closely and interact well with more responsible landlords through the Landlords' Forum.

Partnership working was reported as 'challenging', again in terms of trying to balance enforcement protocol with community development, whilst meeting residents' other social care needs. Interviewee 3 commented:

> *'...there's a lot of things that have to be brought together and I don't see how, as our team in private sector housing, can influence families living in certain accommodation, other than using our enforcement panels, which isn't always the right thing.'*

However, the Margate Task Force was identified by Interviewees 2 and 8 as having been able to respond to many of the challenges faced and proven to be

pivotal in co-ordinating and helping meet need; this, in spite of the acute housing shortage and its poor quality, and the fact that most of the temporary accommodation was situated in this area. These emerging service partnerships, that bring providers very closely together, are highly valued at practitioner level in delivering better quality and more tailored services.

It was reported repeatedly that the key focus was now on the family, and getting services mobilised to meet their needs, though with the situation constantly evolving and families' difficult housing experiences seen as needing a great deal of support. This was especially the case in terms of such things as secure tenure, poor housing conditions, safety and overcrowding. Sometimes help was for practical issues, such as referral/'signposting' to the right people such as the re-housing of a young mother following her eviction from the private-rented sector (Interviewee 7). However some cases remained extremely difficult, as the quote from Interviewee 9 below illustrates:

> *'We've had a number of instances when parents have actually bought in photos because something like the bathroom roof has fallen in, and then they don't know what to do... perhaps when relationships... have foundered... so then they end up in a refuge and... have to wait to be re-housed, and obviously that does have a huge impact on a child's wellbeing...'*

Interviewee 8 reported on the support offered by housing and allied services to those presenting as homeless, including help with tenancy sustainment, floating support, initial monitoring, for example, around housing benefit payments and support in cases of domestic abuse, and the offer of assistance to secure training, education or employment where possible. Interviewee 9 referred to the problem of short-term tenancies, general housing instability and frequent mobility which was seen to affect a child's opportunities in education as a result of having to change schools, and fear of people in the community.

For some families, their difficulties were compounded by the length of time taken for enforcement to improve poor living conditions to take effect. One interviewee (7) reported the frustrations for families trying to get ahead: *'they do report things* [but] *they don't necessarily get done, and they're in really... difficult conditions for quite a long period of time, so sometimes they give up hope... or they just move from place to place to place* [in temporary accommodation].'

There were clearly serious attempts made to identify the 'hard to reach' families for whom many of the services were intended. Interviewee 7 reported their belief that many families were still not aware of the services available, and there were on-going efforts to have a named 'link' or 'lead', for example, Children's

Services linking with Social Services and the Housing Department. By this means a victim of domestic violence might have a contact to help address the problem and provide physical assistance such as panic alarms etc in the home, or being able to advise on tenants' rights. This appeared to help encourage more families to register with a centre which was seen as very positive:

> *'(Our) ...children's centre has only been open 18 months but 67% of the families in the area are now registered and are really actively using it. Families have said how much they value having that service... health visitor clinics and ante-natal clinics and (other) things going on in a children's centre, so people are feeling 'well actually, I've got somewhere to come where... I can get support'.'* (Interviewee 7.)

Help to mobilise action to alleviate some of the worst impacts of unsuitable housing came through partnerships which were able to identify gaps in provision and provide a range of targeted services. In this regard it was reported that one of the main beneficial outcomes in terms of children was that, *'...the child gets used to being around children again, because when you're in a small confined* [space]*... it does have a knock-on effect for the mum* [who] *is stressed out* [and] *the child feels it, so... you try and give them different things to go to'*. (Interviewee 10).

Interviewee 7 reported on the 'Home Safety Equipment Scheme' which included the provision and installation of amongst other things pointing out: *"...quite a lot of families will say 'Oh I'm a bit worried... I'm not sure if I'm meant to drill into the walls' and this kind of thing, so making sure that they are aware that there are* [some] *sorts of stair-gates... that you don't need to drill into the walls or get* [a] *landlords' permission to do..."*.

'Family Intervention Projects' (FIPs) were regarded by Interviewee 1 as particularly interesting in seeking to support families with multiple problems and to develop 'Total Place' initiatives, looking at new ways in which agencies might be brought together to pool resources around complex and high-cost families. The Margate Task Force had drawn on evidence of the efficacy of FIP's in other areas (Westminster, Blackpool and Swindon) in seeking a tailored approach locally in order to: '(look) *at the whole area of safeguarding families and how we maximise and use our services to the best effect.'*

On FIPs, Interviewee 1 described how they had been pioneering in helping secure service input and engagement with families, and making clear what was being offered by the local agencies. They reported that this was changing the nature of conversations and especially serving to involve the probation service

more actively, commenting: *'...the next step would be to* [look] *at the offender in their wider context, the impact on the* [whole family]*... to maybe intervene earlier so that where we have got a young offender... in the family, we can start looking at the children and how to work with* [them]*, so that hopefully they don't end up going down the same pathway.'*

This same interviewee (1) provided an example of a FIP status family who had lost their tenancy, but were re-housed locally, and subject to the interventions described above, all were involved together in decision making with, to date, a beneficial outcome. The interviewee reported that the family had adhered to their Acceptable Behaviour Agreements and that one of the children had been moved into a non-mainstream school. The interventions were seen to have been successful because of the close working with, and agreement and input from, the family.

One organisation was particularly proactive in recognising the barriers presented by a poor experience of other service provision in the past and saw the value of positively promoting outreach work via a range of events at different venues and involving different colleagues. This, Interviewee 7, maintained, overcame a major barrier, which for some was simply to seek help in the first place, though providing, by way of illustration, a family who might have sought and received help once, but:

> *'...if a family might be interested in coming* [back] *but maybe there's some barriers, mental health issues or just uncertainty* [if] *they see somebody they know, they're much more likely to come back...* [commenting on the Thanet area having amongst the highest registration and participation rates] *which we think is... partly down to this proactive outreach work... and helping to bring families in.'*

Those interviewed demonstrated a clear commitment to new and more effective ways to intervene in the private housing sector. This was apparent in their approach to enforcement for poor housing conditions and the wider social support provided within the community, striving to find new ways of working and plugging 'holes' in service provision (Interviewee 1).

CONCLUSIONS

The findings of this research have consolidated front-line practitioner's perceptions of challenges and barriers faced in supporting families living in privately-rented housing in Margate and its environs, many of whom face multiple disadvantages and vulnerabilities. Arriving or staying in this seaside

town, a family's problems are often compounded by the accommodation that they have little or no choice in taking. These include the stresses of living in the multi-occupied, private-rented housing sector, sometimes managed by poor landlords with the accompanying insecurity of short-term tenancy and where enforcement action is taken, the length of time this sometimes takes.

Despite the continued rise in deprivation indices and on-going housing challenges to those living in this sector such as housing benefit limits, all front-line practitioners interviewed in this research were highly committed to the cause. They appeared sufficiently flexible to work in emerging partnerships focusing on new ways of working in meeting the needs of this special community profile. In particular, the Margate Task Force has provided a major impetus in consolidating the range of statutory and non-statutory organisations and providing a pivot for action and mobilisation.

Community and family stability remains a key problem but attempts at addressing this are difficult given the number of privately-rented houses accommodating low income households with multiple needs. Concentrated enforcement intervention, allied to activities focused on developing more stability, might help encourage people to stay in the area, and in this direction the demand for education and training might prove positive. Certainly, the area has many assets, not least the potential for an increased and improved housing stock, its open spaces, scope for upward mobility, a highly committed cadre of professionals helping to support families living in the private rented sector, and, of course, the seaside.

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REFERENCES

Agarwal S and Brunt P (2006). Social exclusion and English seaside resorts. *Tourism Management*, 27, 654-670.

Communities and Local Government Select Committee (CLG) (2007). Communities and local government committee coastal towns: second report of session 2006/7. London: HMSO.

Communities and Local Government (2011). The English Indices of Deprivation 2010. Available at: *www.communities.gov.uk/documents/statistics/pdf/1870718.pdf*

English Heritage and Urban Practitioners (2007). An Asset and a Challenge: Heritage and Regeneration in Coastal Towns in England. Final Report, October 2007. English Heritage.

Heath S (2008). Housing choices for young people in the UK. York: Joseph Rowntree Foundation.

Fothergill S (Centre for Regional Economic and Social Research Sheffield Hallam University) (2008). England's Coastal Towns: a short review of the issues, evidence base and research needs (For NCRA Panel). London: Communities and Local Government Committee of the House of Commons.

Office of the Deputy Prime Minister (ODPM) (2006). Housing, planning, local government and the regions committee: coastal towns session 2005-06, Written Evidence. London: House of Commons.

Percy-Smith J (2000). Policy responses to social exclusion. Towards Inclusion. Buckingham: Open University Press.

Reeves J and Gale L (2009). Young women who have children by multiple partners. (Unpublished research). University of Greenwich.

Rickey B and Houghton J (2009). Solving the riddle of the sands: regenerating England's seaside towns. *Journal of Urban Regeneration and Renewal*, 3(1), 46-55.

Shared Intelligence Policy Roundtable (2008). What future for England's struggling seaside towns: briefing paper 4th July. York: Shared Intelligence.

Stewart J and Meerabeau E (2009). Lay perceptions of health, housing and community on the Kent Coast, England. *Journal of Environmental Health Research*, 9(2), 69-80.

Walton JK and Browne P (Eds) (2010). Coastal regeneration in English resorts 2010. London: Coastal Communities Alliance.

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ARTICLE

Lead in drinking water: a public health perspective

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INTRODUCTION

Lead is a naturally-occurring element in the Earth's crust and groundwater, although it is rarely found in groundwater in the UK (DWI, 2010). Lead is toxic and exposure in drinking water is predominantly due to the presence of a lead service pipe and/or lead-containing plumbing materials including fittings, tank linings and solders. Although the use of lead in plumbing has been prohibited across Europe since the late 1970s (DWI, 2010), it remains a potential public health concern for older properties.

Until 25th December 2013, the prescribed concentration for lead in drinking water in the UK is 25 µg/l, which applies to both public and private water supplies (water supplies which are not provided by water companies or licensees) (DWI, 2011). Thereafter, a new prescribed concentration of 10 µg/l will have to be met in order to comply with the parametric value included in Council Directive 98/83/EC, which is a provisional, non-health-based guideline value set by the World Health Organization (WHO) (WHO, 2011).

Established on 1st April 2013, Public Health England (PHE) brings together public health specialists from more than 70 organisations, including the Health Protection Agency, into a single public health service (PHE, 2013a). The Centre for Radiation, Chemical and Environmental Hazards (CRCE) of PHE provides public health and toxicological advice, research and services to protect the public from hazards resulting from exposure to chemicals and poisons (HPA,

2012a). Statistics compiled by CRCE between January 2007 and January 2012 and case studies are presented below to illustrate:

- typical exposure settings and scenarios encountered by incident responders;
- the challenges faced by water companies to ensure compliance with the new prescribed concentration;
- the lack of public awareness in terms of the health risks associated with chronic lead exposure and the significance of complete lead source removal;
- the need for experience and judgement by public health professionals when applying toxicology in supporting incident response and management in the absence of a health based guideline value; and,
- the importance of effective and efficient risk communication amongst incident responders and stakeholders.

EXPOSURE TO LEAD

Although not considered a raw water contaminant, lead is identified by the WHO as one of the six key chemical entities (the others being arsenic, fluoride, nitrate, selenium and uranium) potentially responsible for causing health effects on a large scale through drinking water (WHO, 2011). Lead is a chronic or cumulative toxin, with toxicity mostly arising from ingestion or inhalation and rarely from dermal or ocular exposures (HPA, 2011).

In the general European population, cereals, tap water and vegetables were found to be the most important contributors to lead exposure. When taken up by the body, lead is transferred to organs such as the liver, kidneys and soft tissues, and to bone tissue, where it accumulates with age. Half-lives for lead in blood and bone are approximately 30 days and 10 to 30 years respectively, and excretion is primarily in urine and faeces (Panel on Contaminants in the Food Chain, 2010).

Whilst acute exposure to high concentrations of lead may cause gastrointestinal disturbances, neurological effects and hypertension, chronic exposure may cause anaemia, damage to kidneys, liver and the cardiovascular system, effects on male and female reproductive function and cognitive impairment in children, as indicated by lower intelligence quotient points. There

appears to be no clear threshold for critical lead-induced kidney damage and effects on the cardiovascular system in adults, and effects on neuro-development in children. Lead is classified as probably carcinogenic to humans by the International Agency for Research for Cancer (HPA, 2011).

Plumbosolvency

Drinking water from a water treatment works is virtually free of lead (Cardew, 2009). Lead contamination in drinking water results primarily from the dissolution of lead (plumbosolvency) from lead-containing plumbing materials e.g. brass or bronze fittings, or a lead service pipe rather than natural sources (WHO, 2011). Plumbosolvency or lead corrosion is of particular public health concern as water pipes containing lead are still common in old properties and lead solders have been used widely for jointing copper tubes in the UK (Scottish Executive, 2006).

Plumbosolvency is at its greatest in drinking water with a low pH (<8) and low alkalinity (carbonate and bicarbonate). Therefore, whilst it may be possible to apply adjustment to pH (typically in the range of pH 8 to 8.5) as an interim control mechanism pending replacement of any lead-containing plumbing materials, other aspects of water treatment may be compromised as a result e.g. chlorine disinfection (Scottish Executive, 2006).

In hard water areas, the lime-scale that coats the inside of water pipes has a protective effect against plumbosolvency. However, in soft water areas, where the formation of lime-scale is limited, the subsequent elevated level of plumbosolvency can be significantly reduced by treating the drinking water with corrosion inhibitors such as orthophosphate (DWI, 2010; UK Water Industry Research Limited, 2011).

Lead service pipe

Prior to the late 1970s in the UK, lead, because of its flexibility, was widely used in plumbing practices and as water pipes connecting properties to the water mains in the street (Affinity Water, 2013). In properties built later, or which have since been modernised, the connecting pipes will probably be made of copper or plastic (Thames Water Utilities Limited, 2013a).

The water pipe that connects a property to the water mains in the street is commonly referred to as the service pipe. Typically, a service pipe consists of two parts: a communication pipe (street end) and a supply pipe (property end), jointed by a stop valve. Whilst the communication pipe belongs to the water company and hence is their responsibility, the supply pipe is the sole responsibility of the property owner (DWI, 2010).

Depending on the level of plumbosolvency, small amounts of lead can dissolve into drinking water passing through a lead service pipe (Affinity Water, 2013). In addition, elevated levels of lead can result if the drinking water has been standing in a lead service pipe for long periods e.g. overnight (DWI, 2010).

Since exposure to lead is mostly due to a technical issue, remedial action i.e. removal of lead-containing plumbing materials or part of a lead service pipe and replacement with non-hazardous equivalent, often have financial and time implications. Consequently, it is recognised that not all drinking water will meet the new provisional guideline value (10 µg/l) set by the WHO (WHO, 2011). In the meantime, control measures such as orthophosphate dosing and pH adjustment will need to be continued.

Drinking water testing, simple checks and measures

Plumbing materials containing lead are dark grey in colour and if they are scraped, the shiny, silvery soft metal underneath will be exposed, thus offering a simple means of checking whether there may be an issue with lead contamination in drinking water (Affinity Water, 2013; DWI, 2010; Thames Water Utilities Limited, 2013b).

Although all the plumbing within a property to the kitchen tap is the responsibility of the property owner, a customer on a public water supply who suspects that their drinking water may be contaminated with lead may request to have their drinking water sampled and tested by their water company (DWI, 2010). On the other hand, owners of properties with a private water supply should contact their local authority for a risk assessment.

In the UK, water companies are legally required to replace their lead communication pipe free of charge if all of the following criteria are met (DWI, 2010):

- test results show that the level of lead in drinking water is above the new prescribed concentration of 10 µg/l;
- the owner agrees to replace the lead supply pipe for which they are responsible; and,
- the owner requests the replacement of the lead communication pipe in writing to the water company.

Simple, short-term protective measures, such as running the kitchen tap for 30 to 60 seconds (Scottish Executive, 2006), or until the kitchen sink is full, before

drawing off water for cooking and drinking (pending any testing or replacement of any lead-containing plumbing materials or a lead service pipe) can remove standing water in a pipe up to 40 m distant. This, alone, may significantly reduce the risk of exposure to lead in drinking water (DWI, 2010), although this will clearly have implications in terms of cost and convenience.

Lead action card for chronic exposures and other resources available for managing drinking water related chemical incidents

CRCE has produced a lead action card (HPA, 2010), which aims to assist public health professionals in the UK in responding to a lead exposure incident. The lead action card outlines roles and responsibilities of partner agencies as well as actions covering the following incident response activities:

- investigation of exposure – medical and environmental;
- risk assessment;
- prevention – control of the hazard; and,
- communication.

For each reported incident, there are two possible exposure scenarios referred to as 'Case', where there are elevated blood lead levels (>10 µg/dl), and 'Situation' where the lead hazard presents as elevated levels in drinking water, though with no identified cases. Based on the identified exposure scenario, a public health professional is able to follow specific actions recommended in the lead action card to deal with a chronic lead exposure incident.

In addition, CRCE has developed specific online resources for professionals responding to incidents involving lead as well as guidance for members of the public who may be worried about sources of lead in their home (HPA, 2012b).

'Incidents' involving lead contamination in drinking water reported to the Centre for Radiation, Chemical and Environmental Hazards

Between January 2007 and January 2012 a total of 23 'incidents' involving lead contamination in drinking water were reported to CRCE by statutory responders such as local authorities, public health professionals and water companies. For the purposes of this study, general enquiries, such as those received from members of the public, were not considered.

The majority of the reported incidents were related to lead-containing plumbing materials or a lead service pipe rather than source quality, and as

Region	Private	Public	Total
East of England	–	2	2
East Midlands	1	1	2
London	–	3	3
North East	–	1	1
North West	1	–	1
South East	–	3	3
South West	1	–	1
Wales	2	2	4
West Midlands	2	2	4
Yorkshire and Humber	2	–	2
Total	9	14	23

Table 1
Regional distribution of incidents involving lead contamination in drinking water reported to CRCE between January 2007 and January 2012.

Setting	Private	Public	Case	Situation	Total
Commercial	2	1	–	3	3
Educational	–	2	–	2	2
Residential	7	11	1	17	18
Total	9	14	1	22	23

Table 2
Exposure scenarios ('Case' or 'Situation') and settings of incidents involving lead contamination in drinking water reported to CRCE between January 2007 and January 2012.

Table 1 indicates, there was no apparent regional variation, with all nine regions in England and Wales represented in the data.

As a result of local authorities and water companies employing random sampling protocols, the relatively small number of reported 'incidents' may represent a considerable underestimation during the observed period. The data may also have been affected by changes in alerting criteria and inconsistencies in data collection within the same period. Furthermore, as Table 2 illustrates, it should not be assumed that lead exposure is significantly less likely to occur from private water supplies.

Case study 1

An incident was reported to CRCE involving lead contamination in drinking water from a public water supply. The water company had a test request from the owner of a residential property with a known lead service pipe. Test results showed lead levels to be as high as 7,000 µg/l pre-flush; this is equivalent to 280 times the UK prescribed concentration (25 µg/l) for lead in drinking water, and <25 µg/l post-flush. The communication pipe was subsequently replaced by the water company as it was their legal

responsibility, but the owner decided not to replace the supply pipe despite its lead content.

The incident presented an ongoing issue since the owner decided not to replace the supply pipe – the only sensible solution to eliminating the lead problem – thus the only protective measure was to flush the kitchen tap before drawing off water for cooking and drinking.

Although flushing might be expected to reduce lead levels to below 25 µg/l, it may be insufficient when the prescribed concentration falls (10 µg/l on 25th December 2013) and this level cannot be met. In this case, the protective impact of the measures advised might only serve to minimise the risk of lead exposure.

Case study 2

An incident involving lead contamination in drinking water supplied to a specialist school catering for 59 children aged between two and 11 with speech, language and communication needs was reported to CRCE. One of the school buildings, which dated back to the post-war period, was believed to contain lead pipes, something that prompted the school to start using bottled water for cooking and drinking.

Source	Pre-flush (µg/l)	Post-flush (µg/l)
Kitchen tap	42.20	8.68
Tank fed tap	17.60	23.00

Table 3
Test results of samples taken at the kitchen tap and tank-fed tap in the playroom.

Subsequently, the school requested testing by the water company. Test results are shown in Table 3 for samples taken at the kitchen tap and a tank-fed tap in a playroom, which some kitchen staff had previously used for cooking. Post-flush, the results at the tap had risen, which was likely due to standing water being drawn into the tank from internal lead pipes.

The water company had identified a lead service pipe connection to the building and arranged to have the communication pipe replaced. The school was advised by the water company to replace all lead pipes within the building and the supply pipe and stop using the tank-fed tap in the playroom for cooking and drinking. In the meantime, prolonged flushing before use e.g. five minutes, was advised at the kitchen tap in the mornings as the length of lead pipes were estimated to be 60 m.

Although the post-flush lead levels were below the UK prescribed concentration (25 µg/l) for lead in drinking water, total removal should be possible once the

lead service pipe and any lead-containing materials within the plumbing system were replaced. Although no symptoms of lead poisoning had been reported, there were concerns over whether the school children and staff might have been subject to lead exposure over a prolonged period. Accordingly, consideration was given to this through a toxicological risk assessment similar to that recommended by the European Food Safety Authority Panel on Contaminants in the Food Chain for its assessment of dietary exposure to lead (Panel on Contaminants in the Food Chain, 2010).

Although it was impossible to rule out a potential risk of nephrotoxicity in adults and developmental neurotoxicity in children, by using worst-case exposure assumptions that took into account other site-specific exposure factors, it would be possible to come up with a rational public health approach to the incident. These assumptions were:

- that, realistically, it was unlikely that the water consumed or used in food preparation from either of the taps would be consistently high;
- only one meal was taken at the school and given the daily attendance pattern, any lead exposure at the school via drinking water was likely to be transient and of limited duration thus reducing the likelihood of a cumulative effect; and,
- although no set use pattern was reported, water might have been drawn from the kitchen tap for other purposes apart from cooking and drinking e.g. cleaning, which would help flush out lead within the plumbing system.

Based on the fact that none of the post-flush test results actually exceeded the UK prescribed concentration of 25 µg/l, it was concluded that the risk of exposure was 'low', though this, itself, would not rule out the possibility of chronic exposure, merely that the levels were likely to have been low. However, CRCE identified the follow-up actions detailed below to minimise potential exposure:

- prolonged flushing should continued until all lead pipe-work had been replaced and testing by the water company confirmed this satisfactory;
- given that test results were based on a one-off sampling, further monitoring should provide verification;
- other school buildings should be investigated in order to identify other sources of potable water potentially contaminated with lead allowing protective measures and remediation to be implemented there too; and,

- although no cases of lead poisoning had been identified, the situation was communicated to parents and staff reassuring them that it was unlikely to have had a detrimental effect on their health.

Case study 3

CRCE was notified of an incident involving lead contamination in drinking water from a private water supply serving a showground in the country where a range of diverse activities were undertaken. These included: dairy farming, a fitness and sports facility, nursery, restaurant, site office and caravan site. Events of some sort took place on most weekends.

Initial test results (pre-flush) of samples taken at the office kitchen tap indicated an initial lead level of 460 µg/l although this had dropped to 96 µg/l a month later. Further sampling to provide pre- and post-flush results in various locations were duly scheduled a month hence, and for these to be performed by the local authority. In the meantime the advice was to:

- flush drinking water taps thoroughly prior to use;
- provide an alternative source of potable water (ideally, bottled) for children in the nursery and for pregnant women; and,
- review and evaluate the public health advice based on the test results obtained from subsequent sampling.

Despite the fact that the showground was a popular venue, it was not anticipated that visitors would be consuming large volumes of drinking water supplied on-site, since they tended to purchase bottled water or soft drinks. This was especially the case as there were few points on-site where water could be drawn for drinking.

The test results obtained subsequently from the sampling conducted by the local authority at various locations around the site are shown in Table 4.

Location	Pre-flush (µg/l)	Post-flush (µg/l)
Borehole (pump room)	4.7	0.77
Caravan site	22	0.61
Nursery	1.1	0.17
Office kitchen	1,000	3.1
Restaurant	2.3	0.53

Table 4
Test results of samples taken by the local authority at various locations.

Aside from the pre-flush sample taken at the office kitchen which indicated a very significant exceedence, all of the others, pre- and post-flush, were well below the UK prescribed concentration of 25 µg/l for lead in drinking water. Based on the findings, CRCE and the local authority identified the follow-up actions detailed below:

- drinking water taps should be flushed prior to use especially those that have stood unused for some time;
- any lead-containing materials in the plumbing system serving the office building, and pipe-work serving the caravan site, should be replaced;
- a letter should be sent to all outlets on-site advising them of lead contamination in drinking water and the impacts this might have on health; and,
- pursue further monitoring of supplies as a risk-assessment measure and so identify trends over time.

CONCLUSION

From 25th December 2013 a new prescribed concentration of 10 µg/l of lead in drinking water will apply in the UK as a means of minimising the adverse health impacts caused by exposure to lead. This primarily focuses on the potential neuro-development effects in children. However, since there is no defined threshold on which toxicity is considered more or less likely, the new prescribed concentration may be subject to further revision if it is thought not to provide adequate health protection for the most sensitive target group.

Whilst complete removal of lead sources remains the ideal solution where at all feasible, it has been shown that where the property is served by a lead service pipe, replacement of the communication pipe alone may not ensure compliance with the new prescribed concentration. In such cases dosing with a corrosion inhibitor is required at least until the supply pipe and ancillary lead-containing materials can be replaced (UK Water Industry Research Limited, 2011). In light of the reduction in the prescribed concentration, simple protective measures such as flushing drinking water taps after long periods of standing – itself a significant waste of water – may be inadequate.

The investigation of incidents involving potable supply provides an insight into the problem and offers opportunities to effect control measures, but their

numbers suggest major under-reporting. However, the reduction in the prescribed concentration might be expected to cause an increase in the numbers of incidents attributed to lead contamination in drinking water reported to CRCE in the future, and with this the potential to better understand lead exposure from different sources and through different pathways.

Preventing long-term exposure to lead and providing a means of early diagnosis are together critical to public health. Further efforts should be made to inform existing occupants and those buying properties with issues of lead, thereby increasing the public's awareness and understanding of the causes and effects of chronic lead exposure.

REFERENCES

Affinity Water (2013). Is there lead pipework in my property? Available at: *https://www.affinitywater.co.uk/water-quality-lead.aspx* [Accessed: 30th September 2013].

Cardew PT (2009). Measuring the benefit of orthophosphate treatment on lead in drinking water. *Journal of Water and Health*, 7 (1), 123-131.

Drinking Water Inspectorate (DWI) (2010). Lead in drinking water. London: Drinking Water Inspectorate. Available at: *http://dwi.defra.gov.uk/consumers/advice-leaflets/lead.pdf* [Accessed: 30th September 2013].

DWI (2011). Drinking water 2010: private water supplies in England. London: Drinking Water Inspectorate. Available at: *http://dwi.defra.gov.uk/about/annual-report/2010/private-england.pdf* [Accessed: 30th September 2013].

Health Protection Agency (HPA) (2010). HPA lead action card – chronic exposures. London: Health Protection Agency. Available at: *http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1274092896741* [Accessed 30 September 2013].

HPA (2011). HPA compendium of chemical hazards: lead. Chilton: Health Protection Agency. Available at: *http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1194947319565* [Accessed 30 September 2013].

HPA (2012a). Centre for Radiation, Chemical and Environmental Hazards. (Updated 2011.) Available at: *http://www.hpa.org.uk/AboutTheHPA/WhoWeAre/CentreForRadiationChemicalAndEnvironmentalHazards/* [Accessed 30 September 2013].

HPA (2012b). Lead incidents. (Updated 2012.) Available at: *http://www.hpa.org.uk/chemicals/lead* [Accessed 30 September 2013].

Panel on Contaminants in the Food Chain (2010). Scientific Opinion on lead in food. European Food Safety Authority Journal 8 (4). Available at: *http://www.efsa.europa.eu/it/efsajournal/doc/1570.pdf* [Accessed 30 September 2013].

Public Health England (PHE) (2013a). What we do. Available at: *https://www.gov.uk/government/organisations/public-health-england/about* [Accessed 30 September 2013].

Scottish Executive (2006). Private water supplies: technical manual. Edinburgh: Scottish Executive. Available at: *http://www.privatewatersupplies.gov.uk/private_water/files/Full%20Doc.pdf* [Accessed 30 September 2013].

Thames Water Utilities Limited (2013a). Lead pipes. Available at: *https://www.thameswater.co.uk/help-and-advice/651.htm* [Accessed 30 September 2013].

Thames Water Utilities Limited (2013b). How to check for lead pipes. Available at: *http://www.thameswater.co.uk/help-and-advice/5884.htm* [Accessed 30 September 2013].

UK Water Industry Research Limited (2011). Executive summary: alternatives to phosphate for plumbosolvency control. London: UK Water Industry Research Limited. Available at: *http://dwi.defra.gov.uk/research/completed-research/reports/DWI70_2_260exsum.pdf* [Accessed 30 September 2013].

World Health Organization (2011). Guidelines for drinking-water quality. 4th ed. Geneva: World Health Organization. Available at: *http://whqlibdoc.who.int/publications/2011/9789241548151_eng.pdf* [Accessed 30 September 2012].

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PAPER

Factors impacting on domestic radon exposure in Guernsey: a study designed to inform public health policy

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ABSTRACT

According to Public Health England's classifications, Guernsey is an 'intermediate probability radon area' and is therefore also defined as a 'radon Affected Area' (Health Protection Agency, 2011). Indoor radon levels were measured in 71 domestic properties in Guernsey using passive track etch detectors for the purpose of assessing the impact of geographical, geological and structural factors on human annual exposure levels.

The results demonstrated a significant correlation between measured levels greater than Public Health England's Target Level (100 Bq m^{-3}) and properties built on metamorphic rock. However, there were no further correlations relating to specific sub-categories of rock formation. There was a significant correlation between properties with radon levels exceeding Public Health England's Action Level (200 Bq m^{-3}) and an island parish although caution is advised regarding conclusions that may be drawn from this link due to the limited sample size and potential sampling inaccuracies.

This study failed to find significant associations between properties with basements having levels above the Target Level or between the flooring construction (solid concrete slab construction, suspended flooring, mixed or unspecified) and exceedances of the Target Level.

PAPER

Factors impacting on domestic radon exposure in Guernsey: a study designed to inform public health policy Tobin Cook and Ruth Briggs

Radon is, and will remain, a risk on Guernsey and local public health policy makers acknowledge that this risk is best addressed through structural adaptation (where necessary) and not exacerbating radon risks through behavioural change (i.e. smoking cessation). Due to the lack of spatial, geological or structural correlations with radon levels, measurement is recommended on an individual property basis.

Key words: Radon, radon survey, indoor radon exposure, building characteristic, radon and geology, domestic radon exposure, public health policy, Guernsey.

INTRODUCTION

Radon is a naturally occurring, colourless, odourless and tasteless radioactive gas which is a decay product from all rocks and soil to a varying extent (Health Protection Agency, 2009). Radon readily disperses to harmless concentrations in the open air but can reach elevated levels in enclosed spaces. Human exposure to radon can be through ingestion (e.g. contaminated groundwater), physical contact and inhalation, although inhalation has been demonstrated to be the main source of human exposure (Health Protection Agency, 2009).

Radon is typically measured in the SI unit of becquerels (Bq) (Taylor and Thompson, 2008). One becquerel is the activity of a quantity of radioactive material in which one nucleus decays per second. Radioactivity is often expressed in becquerels per unit volume (Bq m^{-3}), to express how much radioactive material is contained in a sample.

Radon is classified as a Class 1 carcinogen (International Agency for Research on Cancer, 2013) and pooled analyses (Lubin *et al*., 2004; Darby *et al*., 2005; Health Protection Agency, 2009) have demonstrated that long-term exposure to increased levels of radon in the home correlates with an increased risk of lung cancer. Residential radon exposure poses demonstrable health hazards, notably for smokers and ex-smokers, and approximately 2 % of all deaths from cancer in Europe can be attributed to domestic exposure to this radioactive gas (Darby *et al*., 2005).

Domestic exposure to radon poses the highest dose of any source of natural ionising radiation, with the geology of bedrock upon which a property is built, the manner of construction of the property and the air exchange rate through the property (itself affected by the heating and ventilation of the dwelling) impacting upon the level of radon concentration and thus the level of potential human exposure.

There is an increased risk of high radon levels in basement rooms compared with rooms at ground floor and above (Gooding, 1999). This risk is exacerbated in radon Affected Areas i.e. an area with a greater than 1% chance of a house having radon above the Action Level (Health Protection Agency, 2011). There is also a significant correlation between indoor radon levels and geological features such as radium content and permeability of building ground (Sundal *et al*., 2004), although geological factors alone cannot be used to estimate radon levels within a property. However, knowledge of the geological radon potential of an area (based upon the radium content and permeability of the bedrock) can assist in delivering appropriate advice on radon (Sundal *et al*., 2004).

The health risk from radon is proportionate to the long-term exposure of an individual and there is no lower threshold for potentially safe exposure levels. Public Health England has a three-tier hierarchy of intervention for domestic radon exposure (Health Protection Agency, 2011);

- the Target Level is 100 Bq m^{-3} and no action is necessary for levels below this level (Level 1)
- between 101-199 Bq m^{-3} action is recommended to reduce levels below the Target Level, especially if the occupant is a current or ex-smoker (Level 2)
- 200 Bq m^{-3} is the Action Level above which householders should take action to reduce the indoor radon concentration (Level 3)

For the purposes of this paper the authors have used data provided by a survey undertaken by the States of Guernsey's Office of Environmental Health and Pollution Regulation (OEHPR) in 2012.

The magnitude of influence of different factors on indoor radon exposure has been considered across several countries (Sundal *et al*., 2004) but the research behind this paper sought to identify potential correlations between radon concentrations in domestic properties and their geographical location, geological bedrock and floor construction, including the presence of basements, and then to consider how these data might be used by public health practitioners to inform radon control policies and public health interventions so as to reduce the risk of exposure of Guernsey residents to potentially harmful levels of radon.

STUDY AREA

The study area was the island of Guernsey. Guernsey is located in the Bay of St Malo and is approximately 30 miles from France and 70 miles from England (Policy Council, 2013b). Guernsey has an area of approximately 62 km^2, and in March 2001 a population of 62,915 (Policy Council, 2013b). As of December 2012, there were 26,172 domestic housing units on Guernsey (Policy Council, 2013a) comprising a diverse range of property types and forms of construction. The island is divided into ten parishes, with St Peter Port being the most heavily populated and the location of the island's main town of the same name (States of Guernsey, 2002).

Guernsey's geology can be considered to be split into two main, but not equally divided, areas; the lower-lying northern end of the island is formed of igneous rocks (e.g. granite, diorite and gabbro) and the southern end which is generally formed of metamorphic rocks (notably Icart and Perelle Gneisses) (Roach *et al*., 1991; de Pomerai and Robinson 1994).

METHODS

The sampling methodology was designed in accordance with acknowledged radon mapping principles (Zhukovsky *et al*., 2012), with the island being divided into a grid of 1 km^2 squares. Properties were picked for inclusion to cover the geographic breadth of the island (across the 1 km^2 grid and across each parish), the main geological formations and to cover a variety of property constructions.

The owners of each of the initial 60 properties that were identified were contacted and subsequently provided radon monitors free of charge. The survey was also promoted in the local media, with additional householders being given the opportunity to join the programme by purchasing radon monitors at discounted rates. In consenting to participate in the study, the householders agreed that their results would be sent to them and copied to the OEHPR.

All 60 householders of the properties selected for survey chose to participate in the scheme. However, data for this study were collected from a total of 71 domestic properties; 60 paid for by the OEHPR and 11 additional households that sought to participate in the survey on their own volition.

Each of the properties that took part in the survey were provided with two passive track etch detectors by Public Health England. The detectors were sent with instructions to place one in a bedroom and the other in a living room, as

these are the areas where occupants might be expected to spend most of their time at home and so would provide comparable data. The detectors were left for a period of three months and were then returned in pre-paid envelopes to an accredited laboratory for analysis.

Ahead of returning the detectors the householder was requested to complete a short questionnaire providing details of the specific locations of the detectors, the construction of the ground floor (i.e. solid concrete slab construction, suspended flooring, mixed or unspecified) and detailing whether the property had a basement.

The results provided by the laboratory showed the measured radon levels in both rooms and an annual average radon level calculated by incorporating a correction factor to compensate for seasonal variations, since radon levels are typically higher in the summer than the winter.

How the evidence emerging from such a survey should be best used to inform policy and public health initiatives was established through semi-structured interviews conducted with the Director of Environmental Health and Pollution Regulation and the Medical Officer of Health/Director of Public Health.

RESULTS

4% (3) of the overall number of properties tested (71) had an indoor radon concentration above the Action Level (200 Bq m^{-3}), 10% (7) were within the recommended Action Level (101–199 Bq m^{-3}) and 86% (61) were within the 'no action needed' level (<100 Bq m^{-3}). This confirms Public Health England's classification of Guernsey as an 'intermediate probability radon area' and the status of the island as a 'radon Affected Area' (Health Protection Agency, 2011).

Chi-squared analysis was used when considering the data, to determine statistically significant associations (i.e. a P-value <0.05) between the measured variables.

Geology

Table 1 illustrates the number of properties at each action level (as defined in the 'Introduction') for the various types of bedrock across the island.

All of the properties that were above the Action Level (Level 3) were within a geographic spread of approximately 1.2 miles and were situated on metamorphic Icart Gneiss bedrock. None of these properties had a basement

	NUMBER OF PROPERTIES		
Rock Type	Level 1	Level 2	Level 3
Bordeaux Diorite Complex	14	1	0
Cobo Granite	2	0	0
Icart Gneiss Group	18	4	3
Perelle Gneiss Group	14	1	0
St. Peter Port Gabbro	6	0	0
Castle Cornet Gneiss	1	0	0
Diorite (Guernsey)	1	0	0
Mixed	5	1	0
Total	61	7	3

Table 1
Radon levels and bedrock composition

and the floor types were detailed as 'solid', 'mixed' and 'unspecified'. Icart Gneiss is the most widespread form of bedrock across Guernsey and 35% (25) of all of the properties tested were situated on this rock type. However, the number of properties situated on Icart Gneiss that exceeded the Action Level was not a statistically significant proportion of those properties on this rock type.

Perelle Gneiss is the second most prevalent type of bedrock on Guernsey with 21% (15) of properties tested located on this rock type, but just one of these properties figuring within the middle tier (Level 2). As with Icart Gneiss, there was no statistical significance in the number of properties on Perelle Gneiss that were above the Level 2 Action Level.

Save for one, all of the properties that presented in the Level 2 and 3 Action Levels were located on some form of metamorphic rock. The exception was a property situated on igneous Bordeaux Diorite, although the radon level was within the recommended Action Level. Of the 71 properties tested, 24 (34%) were on forms of igneous rock, 41 (58%) were on metamorphic rocks and 6 (8%) were on mixed or indeterminable bedrock. Whilst the association between measured radon levels >100 Bq m^{-3} was significant in respect of metamorphic rocks if not in terms of igneous rocks, there was no statistical correlation between the properties on metamorphic rock and levels exceeding the Target Level of 100 Bq m^{-3}.

Geography

Table 2 illustrates the number of properties at each action level per parish.

Four of the parishes (Castel, Forest, St Peter Port and St Pierre du Bois) representing 29 of the 71 (41%) properties surveyed did not have any

	NUMBER OF PROPERTIES		
Parish	Level 1	Level 2	Level 3
Castel	14	0	0
Forest	3	0	0
St. Andrews	6	1	0
St. Martins	2	2	3
St. Peter Port	10	0	0
St. Pierre du Bois	2	0	0
St. Sampson	6	1	0
St. Saviour	7	1	0
Torteval	2	1	0
Vale	9	1	0

Table 2
Radon levels by parish

properties above the Target Level. A further five parishes (St Andrews, St Sampson, St Saviour, Torteval and Vale) had one property per parish that was measured as being above the Target Level but below the Action Level i.e. 101–199 Bq m^{-3}. In contrast, one parish (St Martins) had two properties in Level 2 and three properties in Level 3.

As mentioned above, the three properties that exceeded the Action Level were within 1.2 miles of each other. Whilst the correlation between exceedance of the Action Level and St Martin's geographical location was found to be significant, no further correlation or association was found in terms of the flooring construction.

Spatial analysis of all of the properties exceeding the Target Level did not show any clusters or geographic similarities.

Floor construction and basements

Table 3 expresses the number of properties at each action level according to whether or not the property had a basement.

	NUMBER OF PROPERTIES		
Basement	Level 1	Level 2	Level 3
No Basement	47	5	2
Basement	5	2	0
Unspecified	9	0	1

Table 3
Radon levels and basements

	NUMBER OF PROPERTIES		
Ground Floor Type	Level 1	Level 2	Level 3
All Solid	31	3	1
All Suspended	5	0	0
Mixed	17	4	1
Unspecified	8	0	1

Table 4
Radon levels and ground floor construction

Of the three properties that had levels exceeding the Action Level, two did not have basements and one did not specify. Two of the seven properties within the Level 2 (action recommended) zone had basements, whereas five did not, and there was no correlation between the existence of basements and raised concentrations of radon.

Finally, Table 4 indicates the radon level according to the nature of the ground floor construction.

The three properties with radon levels greater than the Action Level, were detailed as having: 'solid, concrete slab construction'; 'mixed' i.e. both solid and suspended flooring and 'unspecified' flooring constructions. Of the seven properties with Level 2 readings, three had 'solid, concrete slab construction' flooring and four reported 'mixed' construction. All of the five properties where owners reported having suspended flooring had levels lower than the Target Level. Interesting as they are, none of these data demonstrated a statistical correlation between flooring construction and levels exceeding either the Target or Action Levels.

Furthermore, the small sample size, the number of participants that failed to indicate the floor construction and presence of basements, and the potential unreliability of self-reported structural details suggested that it would be inappropriate to cross-tabulate constructional features with the underlying bedrock.

Synthesis of evidence in policy/practice

The outcome of the interviews with the Director of Environmental Health and Pollution Regulation and the Medical Officer of Health/Director of Public Health were considered in order to see how evidence from the survey might help to underpin future strategies to influence public health for the better on Guernsey.

Both interviewees were as one in suggesting that the survey presented good value for money and baseline data for the island. However, they agreed that

care should be taken when making extrapolations from the data due to the limited sample size, and whereas radon must be acknowledged as a risk to the inhabitants of Guernsey this should not be exaggerated so as to attract unnecessary stigmatisation.

Both local public health leads agreed that there was insufficient clarity on the geographic and geological risk from radon exposure and that individual property owners should seek to have radon levels measured in their properties.

Both respondents held to the view expressed by the Director of Environmental Health and Pollution Regulation that domestic radon exposure should be addressed through property-specific interventions, primarily focussing on efficient ventilation, and that radon protection measures (e.g. impermeable membranes in concrete slab foundations) should be specified through local planning guidelines. Moreover, global research has demonstrated that in radon Affected Areas structural adaptations to properties have proved effective in reducing domestic exposure to radon whether implemented during the construction or retrospectively (Rahman and Tracy, 2009).

However, the Medical Officer of Health (MOH) believed that the dominant public health message should be to reiterate that smoking notably exacerbates the negative health impacts of radon and that smoking cessation has manifold health benefits. The MOH commented: *'For every 100 cases of lung cancer around 95 will have been caused by smoking alone, about four will be due to the combined effects of smoking and radon exposure and only one will be due to radon exposure alone.'* Accordingly, in his opinion *'the most sensible thing anyone can do to reduce their risk of getting lung cancer is to stop smoking'*.

DISCUSSION

Whilst there is a significant correlation between radon levels exceeding the Target Level and properties built on metamorphic bedrock, no further significant associations could be made relating to geological sub-types. The type of bedrock is not the only geological factor affecting radon levels and emanation coefficients (i.e. the amount of radon released through rock/soil pores as opposed to that which remains embedded), moisture content, permeability and other issues will determine radon emission rates (Sundal *et al*., 2004). Great caution must therefore be exercised when considering what public health action should follow the collection of data based on particular geological characteristics.

The finding that there was no significant correlation between either the floor construction or prevalence of basements in the properties and exceedances of the Target or Action Levels appears to contradict the evidence established by Harley and Harley, 1990, Archer, 1991, and Gooding, 1999, but this may have more to do with the small sample size and the limited knowledge of homeowners when it comes to constructional matters as indicated by the fact that 13% failed to specify the nature of their homes' floor construction. Bringing together data on the underlying geology, details of property construction and radon exposure are essential in order to inform this discussion even if it was beyond the capacity of this project to so demonstrate.

Closer examination of the results of the three properties that had levels exceeding the Action Level indicated that in two cases the data-sets provided notable differences between the radon levels measured in the living areas and bedrooms (1,700 and 130 Bq m^{-3} respectively in one property, and 470 and 170 Bq m^{-3} in the other) suggesting the need to look in more detail at constructional matters.

All of the homeowners of the properties that exceeded the Action Level were contacted by Environmental Health Officers from the OEHPR in order to provide them with advice regarding remedial action and to discuss where the detectors were located within the properties. One of the homeowners did not respond and another confirmed that they had started significant building works during the monitoring period and that the living area detector had been moved by a builder for an unspecified period into an unknown location. It was not deemed necessary to discount these figures outright, although this adds to the need for caution when considering in further detail the properties that exceeded the Action Level.

Due to limited finances, this survey only covered a very small number of properties, accounting for around 0.25% of the island's total number of housing units. Whilst the survey sought to represent geographical and geological variations across the island, and was designed in accordance with internationally-acknowledged radon mapping principles (Miles *et al*., 2007), the sample size was too small to produce a radon map of the island. Radon mapping of England and Wales uses the nearest 30 domestic radon measurements to define the radon potential of each square kilometre (Miles *et al*., 2007) and although we included at least one property within each square kilometre, the small scale must impact negatively on the internal and external validity of conclusions drawn from the analysis.

Whilst again we should stress that the survey size was a limiting factor, the methodological rigour ensured that the survey retained some merit by

providing baseline radon data for Guernsey, and so evidence to inform public health precautions that can be implemented locally.

When considering policy and practice interventions, this study should not be considered in isolation. There is an extensive global evidence base that can inform local public health measures and interventions. In this respect, whilst one should be persuaded by the health impacts of smoking, and accept the limited relative impact of radon exposure alone, there remains a case for delivering an equitable health policy that seeks to prevent the exacerbation of existing social inequalities.

CONCLUSION

This study has established an average, annual, indoor, domestic radon level in Guernsey ranging from <10 to 620 Bq m^{-3}, with a median value of 45 Bq m^{-3} and a mean value of 64 Bq m^{-3}. Radon levels of greater than >100 Bq m^{-3} were found in ten properties with three of these being >200 Bq m^{-3}.

The data from this survey provide a useful baseline from which to understand better the general radon potential for the area and so appreciate why Guernsey is described as an intermediate probability, radon Affected Area but the wide variations suggest that radon levels can only really be effectively estimated by carrying out monitoring in individual properties rather than drawing conclusions based on property type, bedrock or location.

Given the small sample size for this study, and that the majority of the island consists of metamorphic bedrock, further sampling is recommended, with additional consideration of other geological factors in order to assess the true impact of local geology on radon levels. By this means it should be possible to compile a radon map of Guernsey, thereby acquiring a better understanding of the various factors influencing radon level.

Given the size of the island and its population, and with the conclusions reached from this survey, it is difficult to justify funding further sampling on the grounds of public health protection. However, an ongoing arrangement between the OEHPR and Public Health England allows islanders to purchase radon detectors at discounted rates on the proviso that the results are shared with the OEHPR. Additional data from householders having their properties surveyed may elucidate closer associations between radon levels and the factors investigated in this paper, and the OEHPR will continue to compile and analyse the data. Nevertheless, this study has been acknowledged by

public health policy makers on Guernsey and the outcome will serve to further inform the local authority's response to the risk of radon on-island, thus ensuring that proportionate measures continue to be taken to safeguard public health.

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REFERENCES

Archer VE (1991). A Review of radon in homes: health effects, measurement, control, and public policy. *Applied Occupational and Environmental Hygiene*, 6(8), 665-671.

Darby S, Hill D, Auvinen A, Barros-Dios JM, Baysson H, Bochicchio F, Deo H, Falk R, Forastiere F, Hakama M, Heid I, Kreienbrock L, Kreuzer M, Lagarde F, Mäkeläinen I, Muirhead C, Oberaigner W, Pershagen G, Ruano-Ravina A, Ruosteenoja E, Schaffrath Rosario A, Tirmarche M, Tomásek L, Whitley E, Wichmann HE and Doll R (2005). Radon in homes and risk of lung cancer: collaborative analysis of individual data from 13 European case-control studies. *BMJ* (Clinical research ed.), 330(7485), 223.

Gooding T (1999). Basement workplaces. *Environmental Radon Newsletter*, (21), p.3.

Harley NH and Harley JH (1990). Potential lung cancer risk from indoor radon exposure. *CA: A Cancer Journal for Clinicians*, 40(5), 265-275.

Health Protection Agency (2009). Radon and Public Health RCE 11, Didcot: Health Protection Agency.

Health Protection Agency (2011). Radon FAQs. Health Protection Agency. Available at: *http://www.hpa.org.uk/Topics/Radiation/UnderstandingRadiation/FrequentlyAskedQuestions/RadonFAQs/* [Accessed November 25, 2012].

International Agency for Research on Cancer (2013). IARC Monographs on the evaluations on the carcinogenic risk to humans (Volumes 1-37), Lyon.

Lubin JH, Wang ZY, Boice JD, Xu ZY, Blot WJ, De Wang L and Kleinerman RA (2004). Risk of lung cancer and residential radon in China: pooled results of two studies. *International Journal of Cancer*. 109(1), 132-7.

Miles JCH, Appleton JD, Rees, DM, Green BMR, Adlam KAM and Myers AH (2007). Indicative atlas of radon in England and Wales, Chilton: Health Protection Agency.

Policy Council (2013a). Guernsey Annual Housing Stock Bulletin, Guernsey.

Policy Council (2013b). Guernsey Facts and Figures 2012, Guernsey.

De Pomerai M and Robinson A (1994). The Rocks and Scenery of Guernsey, Guernsey: La Societe Guernesiaise.

Rahman NM and Tracy BL (2009). Radon control systems in existing and new construction: a review. *Radiation Protection Dosimetry*, 135(4), 243-55.

Roach RA, Topley CG, Brown M, Bland AM and D'Lemos RS (1991). Outline and Guide to the Geology of Guernsey, Stroud: Alan Sutton Publishing Group Ltd.

States of Guernsey (2002). 2001 Guernsey Census: report on the census of population and households, Guernsey.

Sundal AV, Henriksen H, Soldal O and Strand T (2004). The influence of geological factors on indoor radon concentrations in Norway. *The Science of the Total Environment*, 328(1), 41-53.

Taylor B and Thompson A (Eds) (2008). The International System of Units (SI) (2008 ed., p. 97). Washington: National Institute of Standards and Technology.

Zhukovsky M, Yarmoshenko I and Kiselev S (2012). Combination of geological data and radon survey results for radon mapping. *Journal of Environmental Radioactivity*, 112, 103.

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PAPER

Factors associated with prevention of malaria and other diseases transmitted by mosquitoes at household level in Wakiso district, Uganda

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ABSTRACT

Malaria, and other diseases transmitted by mosquito vectors, can be reduced by appropriate measures at household level. These include: installing screening in windows and ventilators; removing stagnant water around homes; eliminating vessels that can hold water for mosquito breeding; and clearing unnecessary vegetation around homes. The study was aimed at quantifying the risk factors associated with occurrence of malaria and other diseases transmitted by mosquitoes at household level.

Observational checklists were administered to 1,208 households in eight study villages in Wakiso district, Uganda. They sought to assess the presence of: screening in windows and ventilators, stagnant water, potential vessels for mosquito breeding, and vegetation around homes.

The study established that 91% of the households lacked proper screening in windows and ventilators, 41% had water pools around the houses, 75% had vessels for potential mosquito breeding, and 71% had overgrown vegetation within five metres of their houses.

These results suggest more effort should be invested by environmental health practitioners and others involved in health promotion, to increase awareness of the need to implement basic hygiene measures in order to reduce the occurrence of malaria and other mosquito-borne diseases.

Key words: Malaria, mosquitoes, screening, breeding sites, vegetation, Uganda

INTRODUCTION

Malaria is a major public health challenge in sub-Saharan Africa (WHO, 2009). In Uganda, malaria is the leading cause of morbidity and mortality, especially among children under five years of age (Kiwanuka, 2003; MOH, 2005a). The disease accounts for up to 40% of out-patient consultations, 20% of admissions and 14% of in-patient deaths in health facilities (MOH, 2005b).

In Africa, most malaria vector control strategies have focussed on the use of Insecticide Treated Nets (ITNs) and Indoor Residual Spraying (IRS) (Mabaso *et al*., 2004; WHO, 2006; Lengeler, 2004). These strategies have been found to reduce the risk of malaria in communities where they have been used effectively. However, a number of additional measures can be implemented at household level to significantly reduce mosquito vectors responsible for transmitting malaria and other diseases such as dengue and yellow fever. These measures include installing screening to windows, ventilators, and eaves to prevent entry of mosquitoes; eliminating breeding places of mosquitoes, notably stagnant water; and reducing vegetation near houses where mosquitoes might find harbourage (CDC, 2008; Ng'ang'a *et al*., 2008).

Anophelene mosquitoes transmit malaria to humans by biting them usually at night (Schlagenhauf, 2007) so normally while people are in their homes (Gillies and DeMeillon, 1968). Access is normally achieved through windows, ventilators, eaves, and ceilings (Ogoma *et al*., 2009; Kirby, 2008), thus screening of windows and ventilators serves to prevent entry and so reduce the occurrence of malaria (Schofield and White, 1984; Lindsay *et al*., 2002) and other mosquito-borne diseases transmitted indoors. Although it has been demonstrated for many years that people can be protected from malaria by screening their homes against mosquitoes, this intervention remains ignored in many communities (Lindsay *et al*., 2002).

Mosquitoes breed in pools of water (Markle *et al*., 2007; Carter *et al*., 2000) in close proximity to houses. One of the principal breeding habitats for *Anopheles funestus* and *Anopheles gambiae* species, which are mainly

responsible for transmitting malaria in sub-Saharan African, are temporary, sunlit pools (Gillies and DeMeillon, 1968; Githeko *et al*., 1996). Draining pools of water, leveling land, constructing drains, and providing proper waste water management facilities can be carried out to eliminate mosquito breeding sites (Markle *et al*., 2007).

Mosquitoes are also known to use vegetation as resting places (Forattini *et al*., 1993; Rubio-Palis *et al*., 1992; Peterson *et al*., 2009) and it is from vegetation adjacent to homes that mosquitoes enter homes – again, most commonly in the evenings and at night – and bite human subjects (CDC, 2008; Tadei *et al*., 1998). Failing to control vegetation near to houses serves to encourage the presence of mosquitoes that require resting places (Warell and Gilles, 2002), especially important when this is close to the house, so providing a reduced distance to travel to reach the house. Clearing vegetation can reduce mosquito populations near human habitation.

This study was aimed at quantifying the factors associated with prevention of malaria and other diseases transmitted by mosquito vectors at household level in malaria-endemic communities in Uganda. The study assessed presence of: screening in windows and ventilators to prevent mosquito entry, stagnant water around homes where mosquitoes can breed, vessels that can hold water for mosquito breeding, and unnecessary vegetation around homes which offers harbourage for mosquitoes.

METHODS

The study was conducted in Wakiso district which is located in the central region of Uganda with a projected population for 2010 of 1,260,900 (WDLG, 2011). A total of eight villages from two study areas within the district were included in the study. These were: Nkumba (Central, Bufulu, Bbendegere and Bukolwa) and Ssisa (Lukose, Bulwanyi, Bumpenje and Kaama). As in most parts of the country malaria is endemic in these areas, whereas dengue and yellow fever are considered of lesser public health significance in Uganda's health system because fewer cases are reported across the country.

The study areas were predominantly rural communities although they neighbour the Entebbe municipality which is largely an urban area where the country's only international airport is to be found. The population is engaged in various forms of employment and social activity including arable and livestock farming, fishing, quarrying stone and brick making, whilst those in the public and service sectors are employed in schools, hospitals, factories, and hotels.

Data were collected using 'observational checklists'. These 'checklists' were used by the researchers to record observations of the conditions found in and around homes and compounds. This was preferred to the interviewing of inhabitants and would be likely to produce more reliable data. Accordingly, the field work involved looking for mosquito proofing of windows and ventilators and assessing potential mosquito breeding sites for the presence of pools of water and vessels that could trap rain and other sources of water, and overgrown vegetation within five metres of houses that could provide resting sites.

Three 'rounds' of data collection were completed between 2007 and 2009. A minimum of 50 households per village of the eight study villages were visited in each round of data collection making a total of 1,208 households for the three rounds. Households included in each 'round' were not re-visited.

Approval to conduct the study was obtained for the malaria control project from the Uganda National Council for Science and Technology. Village chiefs were duly informed about the study. Household owners were clearly informed about the purpose of the study before data collection.

RESULTS

Mosquito proofing

Just 9% of the houses had fully-screened windows and ventilators, and only houses with all windows and ventilators properly screening were considered to have sufficient protection against the entry of mosquitoes.

Presence of water and vessels capable of containing water

Of the households involved in the study, 41% had visible standing water (whether rainwater or from other sources) in pools and containers, including stagnant water present in depressions in the ground and soak-pits. A total of 75% of the households had vessels that had the potential to hold water and so the potential to facilitate mosquito breeding. More than one type of vessel was found around houses, most notably: tins/cans (56%), discarded jerry-cans (53%), water drums (28%), bottles (24%) and car tyres (13%).

Overgrown vegetation around households

The majority of households (71%) had overgrown vegetation within five metres of the houses. This mainly consisted of grass and shrubs.

DISCUSSION

The large proportion (91%) of houses that lacked screening of their windows and ventilators suggested that mosquitoes have ready access to the majority of houses in the study areas. In addition, the presence of damaged and missing window glass increases access through windows even when 'closed', and such unhampered access of mosquitoes into houses may account for the high incidence of malaria among such communities (Ogoma *et al*., 2009; Tang *et al*., 1995).

Although less than half (41%) of the houses surveyed had evidence of water standing or lying in which mosquitoes could breed, the surveys were conducted primarily in the dry season when one might expect there to be less rainwater. Nevertheless, during the rainy season it is known that water ponds around houses and this indicates why the occurrence of malaria is higher in such periods (Cook and Zumla, 2008).

More significant was the discovery that three-quarters of the houses surveyed had vessels capable of holding rain-water around about them, so that irrespective of the season, water duly contained might be available for mosquito breeding. Nevertheless, these vessels might be expected to be in evidence throughout the year, so contributing to the high incidence of malaria and other mosquito-transmitted diseases such as dengue and yellow fever in the rainy season (Jaenisch *et al*., 2010; Yé *et al*., 2009; Li *et al*., 2009).

Whilst discarded tins/cans and cut jerry-cans might be removed or lidded, other vessels such as water drums have a degree of permanence and are not readily removed being used in these communities for rain-water harvesting. Self-evidently, these drums are a ready place in which mosquitoes can breed (Hemme *et al*., 2009).

Although it is customary for some communities to cover such water storage vessels in order to prevent mosquitoes breeding, this was not the case in these study areas. Mosquito vectors known to breed in such vessels include *Aedes aegypti* which transmits diseases such as dengue and yellow fever (Barrera *et al*., 2006; Orozco, 2007; Webber, 2009). Where the vessel or water cannot be removed or protected it is important to prevent mosquitoes breeding by interrupting their life-cycle and applying a larvicide.

In the case of the majority of households that had overgrown vegetation within five metres of their houses, clearing this is the only sensible option to reduce resting places and so the population of mosquitoes near to homes and their human occupants (Allan *et al*., 2009; Coimbra, 1988).

CONCLUSIONS

From the findings of this study, it is evident that several factors at household level in the study area might be serving to maintain the level of occurrence of malaria and other diseases transmitted by mosquito vectors.

More effort is therefore needed by environmental health practitioners and other health professionals involved in health promotion to raise and maintain the public's sensitivity towards the importance of implementing these basic house-keeping measures at household level, and in so doing implement a complementary strategy designed to prevent malaria and other diseases being transmitted by mosquitoes. Local leaders and community health workers can also be targeted to promote the use of the various methods to reduce the incidence of malaria in their communities.

This 'household' strategy might include:

- installing screens to windows, ventilators and any other openings in houses using insect-proof wire mesh;
- improving drainage around homes to avoid stagnation of water by leveling land and construction of drainage channels;
- eliminating vessels (disposed of as solid waste) that can hold water, thus removing a breeding site for mosquitoes;
- larviciding pools of water with a suitable larvicidal agent; and,
- clearing unnecessary vegetation from around houses to reduce mosquito resting places.

In addition, greater advocacy is required of governments, non-governmental organisations and other stakeholders involved in the control of mosquito vectors to promote the use of these measures particularly in malaria endemic communities to complement existing strategies such as use of ITNs.

Finally, further studies are suggested to explore the efficacy of these control measures in terms of environmental safeguards put in place, the extent of the mosquito population and the incidence of mosquito-borne disease over time.

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REFERENCES

Allan SA, Kline DL, Walker T (2009). Environmental factors affecting efficacy of bifenthrin-treated vegetation for mosquito control. *Journal of the American Mosquito Control Association*, 25, 338-46.

Barrera R, Amador M, Clark GG (2006). Ecological factors influencing *Aedes aegypti* (Diptera: Culicidae) productivity in artificial containers in Salinas, Puerto Rico. *Journal of Medical Entomology*, 43, 484-492.

Carter R, Mendis KN, Roberts D (2000). Spatial targeting of interventions against malaria. *Bulletin of the World Health Organization*, 78.

Centre for Disease Control (CDC) (2008). Anopheles mosquitoes. Division of parasitic diseases. Available at: *http://www.cdc.gov/malaria/biology/mosquito/* [Accessed 30 June 2008.]

Coimbra CEA (1988). Human factors in the epidemiology of malaria in the Brazilian Amazon. *Human Organization*, 47, 254-260.

Cook GC and Zumla AI (2008). Manson's tropical diseases (22nd Edition). Chapter 73. Malaria. Saunders Ltd.

Forattini OP, Kakitani I, Massad E, Marucci D (1993). Studies on mosquitoes (Diptera: *Culicidae*) and anthropic environment. 4 – Survey of resting adults an synanthropic behaviour in South-Eastern, Brazil. *Revista de Saúde Pública*, 27, 398 411.

Gillies MT and DeMeillon B (1968). The Anophelinae of Africa South of the Sahara (Ethiopian zoogeographical region). *Johannesburg: South African Institute for Medical Research*, 54.

Githeko AK, Service MW, Mbogo CM, Atieli FK (1996). Resting behavior, ecology and genetics of malaria vectors in a large scale agricultural area of western Kenya. *Parassitologia*, 58, 307-316.

Hemme RR, Tank JL, Chadee DD, Severson DW (2009). Environmental conditions in water storage drums and influences on *Aedes aegypti* in Trinidad, West Indies. *Acta Tropica*, 112, 59-66.

Jaenisch T, Sullivan DJ, Dutta A, Deb S, Ramsan M, Othman MK, Gaczkowski R, Tielsch J, Sazawal S (2010). Malaria incidence and prevalence on Pemba Island before the onset of the successful control intervention on the Zanzibar Archipelago. *Malaria Journal*, 9, 32.

Kirby MJ, Milligan PJ, Conway DJ, Lindsay SW (2008). Study protocol for a three-armed randomized controlled trial to assess whether house screening can reduce exposure to malaria vectors and reduce malaria transmission in The Gambia. *Trials*, 9, 33.

Kiwanuka GN (2003). Malaria morbidity and mortality in Uganda. *Journal of Vector Borne Diseases*, 40,16-19.

Lengeler C (2004). Insecticide-treated bed nets and curtains for preventing malaria. *Cochrane Database Systematic Review*, 2, CD000363.

Li L, Bian L, Yakob L, Zhou G, Yan G (2009). Temporal and spatial stability of *Anopheles gambiae* larval habitat distribution in Western Kenya highlands. *International Journal of Health Geographics*, 8, 70.

Lindsay SW, Emerson PM, Charlwood JD (2002). Reducing malaria transmission by mosquito-proofing homes. *Trends in Parasitology*, 18, 510-514.

Mabaso ML, Sharp B, Lengeler C (2004). Historical review of malarial control in southern African with emphasis on the use of indoor residual house-spraying. *Tropical Medicine & International Health*, 9, 846-856.

Markle WH, Fisher MA, Smego RA (2007). Understanding global health. McGraw Hill Professional (1st Edition).

Ministry of Health (MOH) – Uganda (2005a). The burden of malaria in Uganda – Why all should join hands in the fight against malaria. Available at: *http://www.health.go.ug/malaria.htm* [Accessed 29 June 2006.]

Ministry of Health (MOH) – Uganda (2005b). Uganda Malaria Control Strategic Plan 2005/06–2009/10.

Ng'ang'a PN, Shililu J, Jayasinghe G, Kimani V, Kabutha C, Kabuage L, Kabiru E, Githure J, Mutero C (2008). Malaria vector control practices in an irrigated rice agro-ecosystem in central Kenya and implications for malaria control. *Malaria Journal*, 7, 146.

Ogoma SB, Kannady K, Sikulu M, Chaki PP, Govella NJ, Mukabana WR, Killeen GF (2009). Window screening, ceilings and closed eaves as sustainable ways to control malaria in Dar es Salaam, Tanzania. *Malaria Journal*, 8, 221.

Orozco J (2007). Defeating dengue: a difficult task ahead. *Bulletin of the World Health Organization*, 85, 737-8.

Peterson I, Borrell LN, El-Sadr W, Teklehaimanot A (2009). Individual and household level factors associated with malaria incidence in a highland region of Ethiopia: a multilevel analysis. *American Journal of Tropical Medicine and Hygiene*, 80, 103-11.

Rubio-Palis Y and Curtis CF (1992). Biting and resting behaviour of anophelines in western Venezuela and implications for control of malaria transmission. *Medical and Vector Entomology*, 6, 325-34.

Schlagenhauf P (2007). Travelers' Malaria. PMPH, USA (2nd Edition).

Schofield CJ and White GB (1984). Engineering against insect-borne diseases in the domestic environment, house design and domestic vectors of diseases. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 78, 285-292.

Tadei WP, Thatcher BD, Santos JM, Scarpassa VM, Rodrigues IB, Rafael MS (1998). Ecologic observations on anopheline vectors of malaria in the Brazilian Amazon. *American Journal of Tropical Medicine and Hygiene*, 59, 325-335.

Tang L, Manderson L, Deng D, Wu K, Cai X, Lan C, Gu Z, Wang KA (1995). Social aspects of malaria in Heping, Hainan. *Acta Tropica*, 59, 41-53.

Warrell DA and Gilles HM (2002). Essential Malariology. Arnold (4th Edition).

Webber R (2009). Communicable Disease Epidemiology and Control. CABI (3rd Edition).

Wakiso District Local Government (WDLG), Uganda (2011). Available at: *http://www.wakiso.go.ug/* [Accessed 15 May 2011.]

WHO (2006). Malaria vector control and personal protection: WHO Technical Report. Geneva 1-72.

WHO (2009). Malaria. Key Facts. WHO. Geneva. Available at: *http://www.who.int/mediacentre/factsheets/fs094/en/* [Accessed 10 August 2010.]

Yé Y, Hoshen M, Kyobutungi C, Louis VR, Sauerborn R (2009). Local scale prediction of *Plasmodium falciparum* malaria transmission in an endemic region using temperature and rainfall. *Global Health Action*, 2.

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LITERATURE REVIEW

The health impacts of environmental nuisances and their contribution to health inequities – a review

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ABSTRACT

This study reviews the currently available evidence on the health impacts of environmental nuisances, and their impact on health inequities. Evidence describing links between common environmental hazard exposures, annoyance and health is limited but growing. The evidence-base is greatest in respect of exposure to environmental noise where it is implicated in terms of possible adverse effects through sleep disturbance; cardiovascular and physiological impacts, mental health, quality of life and wellbeing impacts.

However, annoyance caused by other types of environmental nuisance may result in similar public health outcomes to these, as there are biologically-plausible pathways for such exposures to adversely impact upon wider health outcomes including psychological health, general quality of life and wellbeing. Furthermore, a social gradient exists and this manifests itself in terms of the impacts of environmental nuisance affecting, disproportionately, deprived communities.

Environmental health practitioners can contribute to the development of the evidence base by improving the coordinated use and surveillance of complaint data to understand trends and causes and to suggest possible interventions.

Improved collaboration between professional and regulatory organisations and public health agencies across England and Wales is recommended to improve consistency and reliability of data collection and collation for surveillance purposes.

Interventions to address environmental nuisances should consider the potential for these to impact on health inequities and seek to disrupt the mechanisms generating inequities in health related to environmental nuisances.

Key words: Environmental exposures/health effects, environmental nuisances, environmental justice, health inequities, environmental health

INTRODUCTION

Societal drivers, policy and legislation, scientific and technological advances all continue to shape the environments where we live and work. Although, on the whole, these influences have resulted in greater levels of public health protection, professional and public concerns continue to grow around the potential for some exposures to environmental hazards to have an adverse impact on human health.

Primarily, these concerns relate to respiratory and cardiovascular diseases, cancers, congenital anomalies and injuries (Health Protection Agency, 2005; Prüss-Üstün and Corvalán, 2006; Smith *et al*., 1999). However, in line with the World Health Organization's (WHO) definition of health being 'a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity', impacts of environmental factors on psychological health, well-being and quality of life have assumed an elevated level of public health significance (Curtice *et al*., 2005).

Whilst it is recognised that environmental factors can affect health in its broadest sense, it is often difficult to isolate and quantify the risk that might arise from these exposures because of their close interactions with other health determinants. Indeed, the WHO has estimated that 24% of the global disease burden can be attributed to environmental factors, whilst at the UK level the estimate is in the region of 14% (Prüss-Üstün and Corvalán, 2006; World Health Organization, 2008). Unfortunately, our understanding of the complex and multi-faceted relationships that exist between exposures to environmental hazards and public health outcomes (and how these vary) at the local level is limited.

In contrast, it is relatively easy to measure physical public health impacts arising from occasional acute exposures to environmental hazards e.g. an accidental chemical release affecting a defined local population. It is much more difficult to quantify the physical and psychological impacts that might result from more common environmental hazard exposures. Yet it is these more frequent ('common') exposures that might represent a more significant, though less tangible, health burden. Scoping the magnitude of this problem is important to inform our understanding of their public health significance.

Our recent study attempted to better scope the problem in Wales by conducting a review of annoyance complaint data routinely collected by local authorities (Brunt and Tomlinson, 2013). This companion paper presents the findings from a literature review of evidence pertaining to the public health implications associated with environmental hazards that commonly cause annoyance. It indicates the need to further improve our understanding of this environmental public health problem.

Defining environmental nuisance

Individual or community complaints of 'annoyance' are often referred to as 'nuisance' complaints, though care should be taken to distinguish between the two given the legal implications associated with the term 'nuisance'.

Statutory nuisances in England and Wales are defined under section 79 of the Environmental Protection Act 1990, as amended. Any of the following situations can constitute a statutory nuisance if sufficient to be 'prejudicial to health' (meaning injurious or likely to cause injury to health) or a 'nuisance'. These may present in terms of:

- the state of premises;
- accumulations of materials or the keeping of animals at a premises;
- smoke, fumes, gases, dust, steam, insects, noise or artificial light emitted from premises;
- noise from vehicles, machinery or equipment in a street.

The term nuisance is not defined in the legislation but has been held to represent a nuisance at common law (law developed through legal precedent) whereby there is material interference with the use and enjoyment of one's property (Law and Martin, 2009). Whether or not an 'annoyance' is a 'nuisance' is thus a judgement call made by the local authority. In addition to

this legal definition, nuisances have been described as the cumulative effect on humans caused by repeated events of annoyance arising from exposures to ambient stressors over a period of time that leads to modified or altered behaviour (Fernandes *et al*., 2009).

Literature search strategy

The literature review was undertaken in May 2012 using the Medline (via PubMed), PsycInfo, GreenFile and Scopus databases, applying a wide range of search terms. These are detailed in the appendix below. The electronic search was limited to studies conducted on human subjects that were published in or translated into English, and published in 2002 or later. The reference lists of articles were searched manually to identify any additional eligible literature not found as a result of the electronic search.

LITERATURE REVIEW FINDINGS

Noise

Noise is commonly defined as unwanted sound in the wrong place, or at the wrong time. Noise, as an environmental nuisance, includes neighbourhood noise caused by individuals or small groups of people in or around the home, and environmental noise generated from transport, industrial and recreational activities (but excluding noise from the normal use of transportation). Neighbourhood noise is the most common source of complaint, five times more frequent than commercial/leisure noise complaints, and twenty times more common than complaints regarding industrial noise. Similar proportions were found by the Chartered Institute of Environmental Health (2011) when considering confirmed statutory noise nuisances.

However, most evidence on non-auditory health effects of noise relates to transport noise. Associations have been shown between community exposure to transport noise and elevated blood pressure, increased blood concentrations of stress hormones and a small increase in cardiovascular disease risk. Growing evidence supports a link between exposure to environmental noise and impaired cognitive performance in children (Ad Hoc Expert Group on Noise and Health, 2010). Noise is significantly associated with sleep disturbance, which is in turn is associated with cardiovascular disease, hormonal effects, and changes in cognition, mood and memory (Taskar and Hirshkowitz, 2003; Zaharna and Guilleminault, 2010).

A review of the effect of non-traffic related ambient sources on sleep (Omlin *et al*., 2011) identified a small number of studies, though these failed to arrive at

a general conclusion. However, in most cases 'meaningful' sounds such as leisure and neighbour noise were associated with sleep disturbance.

Odour

The primary adverse effect of exposure to odour is annoyance, which has been associated with: farming (Horton *et al*., 2009; Nimmermark, 2004; Radon *et al*., 2004); waste treatment facilities (Aatamila *et al*., 2010); and, waste-water treatment works (Lebrero *et al*., 2011). The (un)pleasantness (*hedonic tone*) of an odour is more important than intensity; a pleasant odour induces little or no annoyance regardless of intensity (Sucker *et al*., 2008). A potential direct link has been established with gastric symptoms in cases of severe odour intensity, in addition to the symptoms mediated by odour through more moderate intensity exposure (Steinheider *et al*., 1998).

Smoke, fumes and dust

Airborne pollutants from transportation sources (particularly nitrogen dioxide, sulphur dioxide and particulate matter emitted by road traffic) have been associated with cardiovascular disease (Bhaskaran *et al*., 2009; Franchini and Mannucci, 2011; Lenters *et al*., 2010; Mustafic *et al*., 2012; World Health Organization, 2005), and congenital abnormalities (Vrijheid *et al*., 2011). Other research has investigated specific exposures associated with waste management activities including: municipal landfill (Kloppenborg *et al*., 2005; Koshy *et al*., 2009); incineration (Kim *et al*., 2011; Ranzi *et al*., 2011); large-scale composting (Herr *et al*., 2004); and, industrialised farming (Schinasi *et al*., 2011). This type of activity generally falls within the compass of regulatory control through Environmental Permitting, so outside the statutory nuisance framework.

Situations typically complained of as 'nuisances' include smoke from bonfires and dust from construction/demolition activities (Brugge and Dhar, 2008), but there is little evidence of direct impacts on health from these types of activity, the most likely pathway leading towards complaints of annoyance.

Light

Artificial lighting is a newer addition to the panorama of nuisance, though with significant exemptions applying to such places as transport facilities. The inclusion is intended to deal with intrusive directed lighting e.g. from security lights or floodlights, rather than residual light pollution that interferes with the darkness of the night sky. There is debate about the potential link between exposure to artificial light at night and increased risk of breast cancer (Chepesiuk, 2009; Kantermann and Roenneberg, 2009; Kloog *et al*., 2008), but it is unclear to what extent this relates to 'nuisance' lighting.

The chief adverse effects of light nuisance complaints would appear to be annoyance and potential interference with sleep. It has been suggested that the introduction of artificial lighting may lead to an increased risk of vector-borne diseases by providing attraction points for vectors of disease, altering human behaviour and thus increasing exposure to such vectors (Barghini and de Medeiros, 2010). Depending on the extent of global climate change, this may become an issue in countries currently enjoying a temperate climate.

Waste/accumulations/pests

Accumulation nuisances generally arise because of the presence of putrescible waste or waste that attracts and provides harbourage to pests (insect, rodents or birds). The public health significance of pests has been well explored (Bonnefoy *et al*., 2008): they act as vectors of disease in both the developed and developing world. Mites, cockroaches and rodents have been associated with allergic asthma responses, and pests are also a cause of anxiety and annoyance. Other nuisance aspects of waste accumulations are dependent on the nature of the waste and whether it has any hazardous properties that might pose direct risks to health.

Contribution to health inequities

Environmental nuisances have a relationship with inequities in health. Carder *et al* (2009) identified that the impact of black smoke (i.e. particulate air pollution) on mortality appeared to be stronger among people living in more deprived areas, particularly in relation to respiratory mortality. A review of European studies on social inequalities related to ambient air quality found that some studies identified that poorer people found themselves more likely exposed to air pollution, whilst others found the reverse. However the general pattern, regardless of exposure, was that subjects in lower socio-economic groups experience more serious health impacts arising from air pollution (Deguen and Zmirou-Navier, 2010).

The review of routinely collected annoyance complaint data in Wales referred to previously (Brunt and Tomlinson, 2013) also identified a social gradient in incidence of annoyance complaints in general, and with strong associations for noise, pest, and waste complaint rates and deprivation status, where rates increased with rising levels of deprivation, echoing similar findings in Eastleigh, Hampshire (Fernandes *et al*., 2009).

A cross-sectional study into the potential psychosocial effects of 'environmental incivilities' in Scotland (Ellaway *et al*., 2009) sheds further light on the importance of localised environmental nuisances. This study evaluated associations between environmental incivilities and reported health and health behaviours. Three

domains of incivilities were considered: 'street level incivilities' (comprising litter, rubbish, fly-tipping, vandalism and graffiti, dog and cat mess, discarded needles, abandoned vehicles etc.); 'infrastructural incivilities' (sewage smells, factory noise and smells, vacant or derelict buildings, overhead power lines) and 'absence of environmental goods' (safe play spaces and pleasant places to walk or sit).

For all these domains, respondents in the most deprived areas were the most negatively disposed to their local environment. Those experiencing 'street-level incivilities' and 'absence of environmental goods' were more likely to report feelings of depression, anxiety and poor health, whilst 'absence of environmental goods' was linked with poor health behaviours. These associations were not identified for the larger-scale infrastructural hazards.

DISCUSSION

Whilst a systematic approach was taken to searching the literature, this was not a systematic review *per se*, so it lacks a full critical appraisal of methodological quality in terms of each of the studies identified. However, this literature review provides an initial 'scoping' of the current evidence on the health impacts of environmental hazards and annoyance, and whilst this does not represent a thorough evaluation of the evidence, many of the sources identified were themselves systematic reviews of published evidence.

Environmental factors that can cause annoyance are important since they are a useful indicator of the general wellbeing in, and satisfaction of, a community. The quality of the immediate environment is important to individuals and communities, often much more so than national or international environmental issues. It is the immediate environment that directly impacts people's lives on a daily basis. Annoyance complaints do not just provide an indication of individual or community dissatisfaction with the quality of local environments; in many cases, they may represent a direct and measurable exposure to common environmental hazards.

Annoyance is the most widespread adverse effect of exposure to environmental nuisance. In the context of the holistic definition of health and wellbeing (World Health Organization, 1948), it is a health impact in its own right. Whilst undesirable in itself, annoyance may also mediate an indirect stress response pathway leading to the physiological and mental health effects described above. This may be further modified by the specific features of the nuisance (e.g. acoustical characteristics of a noise), and personal factors influencing the vulnerability of the affected individual (Jones K, 2010).

Although not all annoyance complaints are substantiated, and still fewer fall into the category 'statutory nuisances', the majority might be expected to be genuine complaints and there is emerging evidence that *perceived* as well as *actual* annoyance from environmental hazards is linked to poor health outcomes (Curtice *et al*., 2005).

Caution should be exercised in interpreting reported associations between noise nuisance and cardiovascular effects, since air pollution is known to be associated with cardiovascular disease and is strongly patterned in urban and deprived areas; indeed, the same locations where increased noise nuisance exposure may occur. Air pollution should therefore be considered as an important confounding variable in such investigations (Schwela *et al*., 2005).

Another potential confounder are the characteristics of individual 'complainants'. Some complainants may be considered 'vulnerable' because of factors such as age, gender, ethnicity and pre-existing health conditions. A factor of particular relevance in the development of annoyance may be the personality characteristics of an individual. When a person makes a complaint regarding an environmental nuisance, is that a unique and specific psychological reaction to that exposure, or just part of the personality of the recipient? What causes stress, anxiety or annoyance in one person may not cause a reaction of any sort in another.

Persson *et al* (2007) investigated the relationship between trait anxiety, annoyance and noise and air emissions and found that trait anxiety scores closely reflected ratings of environmental annoyance. They go on to suggest a cautious approach to the use of annoyance complaints as a proxy measure of individual exposure in isolation because trait anxiety in individuals may act as a confounding factor.

Ecological approaches using aggregated annoyance ratings, grouped, for example, by geographical area, would overcome this concern, but introduce their own methodological complications – for example, the potential sensitivity of a population to a particular problem (perhaps due to previous incidents or concerns raised in the development control process), or, conversely, and for a variety of reasons, a reluctance within a particular community to complain.

The temporal association between exposure and annoyance in individuals should also be considered carefully. A cohort study in Sweden (Eek *et al*., 2010) investigated self-rated stress, subjective health, and working conditions and environmental annoyance in individuals at baseline, and subsequently any changes in environmental annoyance five years later. They found that people

who later would report annoyance with environmental factors were most likely to report subjective health complaints, higher levels of stress, work dissatisfaction and lower personal social support, than those who did not report environmental annoyance. In this cohort, the development of annoyance or intolerance to environmental factors was preceded by reduced subjective health and stress in daily life, which is later attributed by the individual to environmental factors. In this model of causation, exposure to the environmental factor may be considered a necessary but insufficient cause of annoyance.

Based on the literature reviewed in this paper, the evidence for fully-quantified public health impacts from common environmental annoyances is weak. Nonetheless, the stewardship model of public health ethics suggests that, where there is plausible evidence that people pose public health risks to one another, or environmental conditions that sustain good health are under threat, it is appropriate to adopt a 'precautionary approach' to intervention (Nuffield Council on Bioethics, 2007). Health impacts resulting from exposures to environmental hazards are plausible if there is a complete exposure pathway that links the source with receptor(s). Where this can be demonstrated, intervention is appropriate to break the source-pathway-receptor linkage.

Public health professionals who seek to mitigate and eliminate exposure to environmental nuisances, such as environmental health practitioners, can contribute to the research evidence in two ways. Firstly, by the coordinated use and surveillance of complaint data to understand causes and trends and with this suggest potential interventions. Secondly, by using appropriate research tools (such as randomised controlled trials and community trials) to properly evaluate the effectiveness of environmental health interventions to resolve problems and mitigate health risks.

What form might such interventions take? Traditional advice in dealing with environmental nuisances such as noise have recommended a combination of enforcement approaches with alternative methods of dispute resolution including mediation and the raising of public awareness (CIEH and DEFRA, 2006). In the context of local authority service delivery, there is usually a standard procedure followed for investigation of such complaints. Such 'universal' approaches to delivery of interventions and services undoubtedly have their place, but can have the unintended consequence that some groups benefit more than others, and hence these groups might be targeted indirectly.

Interventions targeted at disadvantaged and/or 'at-risk' groups can overcome this concern, but have their own problems. These include: difficulty determining

'eligibility'; the possibility of causing disadvantage to those who fall just short of the target 'threshold'; and, possible stigmatisation of individuals and communities who are repeatedly 'targeted'. Area-based services often combine the targeted and universal approaches – they target deprived areas, but all local residents are eligible regardless of individual status (Nuffield Council on Bioethics, 2007).

There is no 'magic bullet', and a 'mixed economy' of approaches is likely to be required. The Diderichsen model of the pathways from the social context to health outcomes identifies the main mechanisms by which health inequities are generated (Diderichsen *et al*., 2001). Evidence presented in this paper can be considered against this framework to identify how environmental nuisances contribute to social inequities in health:

- Social stratification: the population is sorted into different social positions, allocating different power and resources to different social positions. Groups that are better off typically have more power and opportunities to live a healthy life than groups that are less privileged – for example by living in areas where environmental nuisances are less likely to occur, and lobbying for action where they do occur;

- Differential exposure: disadvantaged groups are more likely to be exposed to environmental nuisances, and at higher intensity/frequency;

- Differential vulnerability: individuals in lower social positions are often exposed to many different risk factors (environmental and personal), which may interact, and as a result they are more vulnerable than those in higher social positions; and,

- Differential consequences: The social and economic consequences of illness are not only dependent on the health problem suffered by the person, but also on the effects on that person's ability to stay employed, live independently and participate in their community. In general, those in wealthier groups are better able to absorb the impacts and costs of these consequences.

The Diderichsen model therefore also provides a framework for successful intervention to reduce inequities, and interventions aiming to address environmental nuisance should consider how these mechanisms can be disrupted in order to have greatest impact on health inequities and environmental justice.

CONCLUSIONS AND RECOMMENDATIONS

This study has reviewed the currently available evidence on the health impacts of environmental nuisances, and their impact on health inequities. Evidence describing links between common environmental hazard exposures, annoyance and health is limited, but growing. The evidence-base is greatest in respect of exposure to environmental noise in respect of which possible adverse effects include sleep disturbance and impacts on quality of life and wellbeing. However, there are biologically-plausible pathways for exposures to other environmental hazards which may have wider health outcomes, and where this is accompanied by a 'social gradient' the effect may impact disproportionately upon deprived communities.

In support of Environmental Health Practitioners being better able to contribute to the development of the evidence base by making use of complaint data to indicate causes, trends and suggest possible interventions, we recommend improved collaboration between professional and regulatory organisations and public health agencies across England and Wales to improve consistency and reliability of data collection and collation for surveillance purposes.

Interventions to address environmental nuisances should consider the potential for impact on health inequities and to this end the Diderichsen model provides a useful framework for intervention development.

REFERENCES

Aatamila M, Verkasalo PK, Korhonen MJ, Viluksela MK, Pasanen K, Tiittanen P and Nevalainen A (2010). Odor annoyance near waste treatment centers: A population-based study in Finland. *Journal of the Air and Waste Management Association* 60(4), 412-418.

Ad Hoc Expert Group on Noise and Health (2010). Environmental noise and health in the UK. Didcot: Health Protection Agency. Available at: *http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1279888026747* [Accessed 15/5/12].

Barghini A and de Medeiros BA (2010). Artificial lighting as a vector attractant and cause of disease diffusion. *Environ Health Perspect*, 118, 1503-1506.

Bhaskaran K, Hajat S, Haines A, Herrett E, Wilkinson P and Smeeth L (2009). Effects of air pollution on the incidence of myocardial infarction. *Heart* (British Cardiac Society), 95(21),1746-1759.

Bonnefoy X, Kampen H and Sweeney K (2008). Public health significance of urban pests. WHO Europe. Available at: *http://www.euro.who.int/en/what-we-publish/abstracts/public-health-significance-of-urban-pests* [Accessed 24/5/12].

Brugge D and Dhar A (2008). Residential health near major construction projects: unexplored hazards. *Reviews on Environmental Health*, 23(1),75-81.

Brunt H and Tomlinson A (2013). Annoyance from common environmental hazards: a cause for public health concern? *Chemical Hazards and Poisons Report*, (23), 31-35.

Carder M, McNamee R, Beverland I, Elton R, Cohen GR, Boyd J, Van Tongeren M, *et al.* (2009). Does deprivation index modify the acute effect of black smoke on cardiorespiratory mortality? *Occupational and Environmental Medicine*, 67(2),104-110.

Chartered Institute of Environmental Health (2011). Annual survey of noise enforcement – results for 2010-11. London: CIEH. Available at: *http://www.cieh.org/WorkArea/showcontent.aspx?id=41034* [Accessed 17/5/12].

Chepesiuk R (2009). Missing the dark: health effects of light pollution. *Environmental Health Perspectives*, 117(1), A20.

CIEH and DEFRA (2006). Neighbourhood noise policies and practice for local authorities – a management guide. London: CIEH. Available at: *http://www.cieh.org/library/Knowledge/Environmental_protection/Noise/NoiseManagementGuideSeptember2006.pdf* [Accessed 29/11/13].

Curtice J, Ellaway A, Robertson C, Morris G, Allardice G and Robertson R (2005). Public attitudes and environmental justice in Scotland: a report for the Scottish Executive on research to inform the development and evaluation of environmental justice policy. Edinburgh: Scottish Executive. Available at: *http://www.scotland.gov.uk/Publications/2005/10/2791230/12310* [Accessed 2/11/10].

Deguen S and Zmirou-Navier D (2010). Social inequalities resulting from health risks related to ambient air quality – a European review. *The European Journal of Public Health*, 20(1), 27-35.

Diderichsen F, Evans T and Whitehead M (2001). The social basis of disparities in health. Challenging inequities in health. New York: Oxford University Press.

Eek F, Karlson B, Österberg K and Östergren P-O (2010). Factors associated with prospective development of environmental annoyance. *Journal of Psychosomatic Research*, 69(1), 9-15.

Ellaway A, Morris G, Curtice J, Robertson C, Allardice G and Robertson R (2009). Associations between health and different types of environmental incivility: A Scotland-wide study. *Public health*, 123(11), 708-713.

Fernandes A, Jones L, Isaac J, Saunders P and Harrison H (2009). The epidemiology of nuisance complaints in the area of Eastleigh Borough Council 2003–2008. *Chemical Hazards and Poisons Report*, 15, 40-44.

Franchini M and Mannucci PM (2011). Thrombogenicity and cardiovascular effects of ambient air pollution. *Blood*, 118(9), 2405-2412.

Health Protection Agency (2005). Health protection in the 21st century – understanding the burden of disease. London: Health Protection Agency. Available at: *http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1194947403055* [Accessed 13/9/12].

Herr CEW, Zur Nieden A, Stilianakis NI and Eikmann TF (2004). Health effects associated with exposure to residential organic dust. *American Journal of Industrial Medicine*, 46(4), 381-385.

Horton RA, Wing S, Marshall SW and Brownley KA (2009). Malodor as a Trigger of Stress and Negative Mood in Neighbors of Industrial Hog Operations. *American Journal of Public Health*, 99(Suppl 3), S610-S615.

Jones K (2010). ERCD REPORT 0907: Environmental noise and health: a review. London: HMSO. Available at: *http://www.caa.co.uk/docs/33/ERCD0907.pdf* [Accessed 14/5/12].

Kantermann T and Roenneberg T (2009). Is light-at-night a health risk factor or a health risk predictor? *Chronobiology International*, 26(6), 1069-1074.

Kim Y-M, Kim J-W and Lee H-J (2011). Burden of disease attributable to air pollutants from municipal solid waste incinerators in Seoul, Korea: a source-specific approach for environmental burden of disease. *The Science of the Total Environment*, 409(11), 2019-2028.

Kloog I, Haim A, Stevens RG, Barchana M and Portnov BA (2008). Light at night co-distributes with incident breast but not lung cancer in the female population of Israel. *Chronobiology International*, 25(1), 65-81.

Kloppenborg SC, Brandt UK, Gulis G and Ejstrud B (2005). Risk of congenital anomalies in the vicinity of waste landfills in Denmark; an epidemiological study using GIS. *Central European Journal of Public Health*, 13(3), 137-143.

Koshy L, Jones T and BéruBé K (2009). Characterization and bioreactivity of respirable airborne particles from a municipal landfill. *Biomarkers*, 14(Suppl 1), 49-53.

Law J and Martin E (Eds.) (2009). Oxford Dictionary of Law. Oxford: Oxford University Press 7th ed.

Lebrero R, Bouchy L, Stuetz R and Munoz R (2011). Odor assessment and management in wastewater treatment plants: A review. *Critical Reviews in Environmental Science and Technology*, 41(10), 915-950.

Lenters V, Uiterwaal CS, Beelen R, Bots ML, Fischer P, Brunekreef B and Hoek G (2010). Long-term exposure to air pollution and vascular damage in young adults. *Epidemiology*, 21(4), 512-520.

Mustafic H, Jabre P, Caussin C, Murad MH, Escolano S, Tafflet M, Périer M-C, *et al.* (2012). Main air pollutants and myocardial infarction: a systematic review and meta-analysis. *Journal of the American Medical Association*, 307(7), 713-721.

Nimmermark S (2004). Odour influence on well-being and health with specific focus on animal production emissions. *Annals of Agricultural and Environmental Medicine*, 11(2), 163-173.

Nuffield Council on Bioethics (2007). Public health: ethical issues. London: Nuffield Council on Bioethics. Available at: *http://www.nuffieldbioethics.org/sites/default/files/Public%20health%20-%20ethical%20issues.pdf* [Accessed 10/10/12].

Omlin S, Bauer GF and Brink M (2011). Effects of noise from non-traffic-related ambient sources on sleep: review of the literature of 1990–2010. *Noise & Health*, 13(53), 299-309.

Persson R, Björk J, Ardö J, Albin M and Jakobsson K (2007). Trait anxiety and modeled exposure as determinants of self-reported annoyance to sound, air pollution and other environmental factors in the home. *International Archives of Occupational and Environmental Health*, 81(2), 179-191.

Prüss-Üstün A and Corvalán CF (2006). Preventing disease through healthy environments: towards an estimate of the environmental burden of disease. Geneva: World Health Organization.

Radon K, Peters A, Praml G, Ehrenstein V, Schulze A, Hehl O and Nowak D (2004). Livestock odours and quality of life of neighbouring residents. *Annals of Agriculture and Environmental Medicine*, 11(1), 59-62.

Ranzi A, Fano V, Erspamer L, Lauriola P, Perucci CA and Forastiere F (2011). Mortality and morbidity among people living close to incinerators: a cohort study based on dispersion modeling for exposure assessment. *Environmental Health*, 10, 22.

Schinasi L, Horton RA, Guidry VT, Wing S, Marshall SW and Morland KB (2011). Air pollution, lung function, and physical symptoms in communities near concentrated swine feeding operations. *Epidemiology*, 22(2), 208-15.

Schwela D, Kephalopoulos S and Prasher D (2005). Confounding or aggravating factors in noise-induced health effects: air pollutants and other stressors. *Noise and Health*, 7(28), 41-50.

Smith KR, Corvalán CF and Kjellström T (1999). How much global ill health is attributable to environmental factors? *Epidemiology*, 10(5), 573-584.

Steinheider B, Both R and Winneke G (1998). Field studies on environmental odors inducing annoyance as well as gastric and general health-related symptoms. *Journal of Psychophysiology*, 12(SUPPL. 1), 64-79.

Sucker K, Both R, Bischoff M, Guski R, Krämer U and Winneke G (2008). Odor frequency and odor annoyance Part II: Dose – Response associations and their modification by hedonic tone. *International Archives of Occupational and Environmental Health*, 81(6), 683-694.

Taskar V and Hirshkowitz M (2003). Health effects of sleep deprivation. *Clinical Pulmonary Medicine*, 10(1), 47-52.

Vrijheid M, Martinez D, Manzanares S, Dadvand P, Schembari A, Rankin J and Nieuwenhuijsen M (2011). Ambient air pollution and risk of congenital anomalies: a systematic review and meta-analysis. *Environmental Health Perspectives*, 119(5), 598-606.

World Health Organization (1948). Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States and entered into force on 7 April 1948. Official Records of the World Health Organization, 2, 100.

World Health Organization (2005). Health effects of transport-related air pollution: World Health Organization. Available at: *http://www.euro.who.int/document/e86650.pdf* [Accessed 18/5/12].

World Health Organization (2008). The global burden of disease: 2004 update. Geneva: World Health Organization. Available at: *http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_full.pdf* [Accessed 13/9/12].

Zaharna M and Guilleminault C (2010). Sleep, noise and health: review. *Noise & health*, 12(47), 64-69.

APPENDIX

Data for this literature review were collected in May 2012 using the Medline (via PubMed), PsycInfo, GreenFile and Scopus databases, applying the search terms detailed below. The electronic search was limited to studies conducted on human subjects that were published in or translated into English, and published in 2002 or later. The reference lists of articles were searched manually to identify any additional eligible literature not found as a result of the electronic search.

{ ("air pollution/adverse effects"[MeSH Terms]) OR "particulate matter/adverse effects"[MeSH Terms]) OR "dust/adverse effects"[MeSH Terms]) OR "noise/adverse effects"[MeSH Terms]) OR "odors"[MeSH Terms]) OR "waste management"[MeSH Terms]) OR "environmental exposure/adverse effects"[MeSH Terms]) OR "environmental pollutants/adverse effects"[MeSH Terms]) OR "refuse disposal"[MeSH Terms]) OR "garbage"[MeSH Terms]) OR "insects"[MeSH Terms]) OR “murinae”[MeSH Terms]) OR "sewage/adverse effects"[MeSH Terms]) NOT "noise, transportation/adverse effects"[MeSH Terms]) } AND { (“stress, psychological"[MeSH Terms]) OR "anxiety"[MeSH Terms]) OR "sleep deprivation"[MeSH Terms]) OR "fatigue"[MeSH Terms]) OR "social isolation"[MeSH Terms] OR ("stress, physiological"[MeSH Terms]) OR "cardiovascular diseases"[MeSH Terms]) OR "hypertension"[MeSH Terms]) OR "prehypertension"[MeSH Terms]) }.

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ARTICLE

Chartered Institute of Environmental Health

Reflexivity – researching practice from within

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Key words: Reflexivity, environmental health, research recruitment, qualitative methods, practitioner researcher, professional network

RESEARCHING PRACTICE FROM WITHIN

As an environmental health practitioner (EHP) undertaking doctoral research into the role of fellow EHPs in the newly restructured public health system in England, my professional background has had an important part to play in my approach. Most notably (and the subject of this Article) has been the value of the professional networks that I have been able to access and use to good effect.

In the UK, EHPs in practice, and especially those who are members of the Chartered Institute of Environmental Health (CIEH), have opportunities of interacting with professional colleagues through special interest groups (SIGs), branch meetings, conferences and 'events', the trade journal ('Environmental Health News') and a number of opportunities of meeting colleagues and exchanging thoughts and ideas though 'social media'. This contributes to a profession where members have ample means of making and maintaining connections or links with colleagues and for those so 'connected' assume a level of familiarity with the activities of peers that would be denied otherwise. I refer to these connections as parts of a 'professional network' (PN).

I would argue that the ability to mobilise PNs can be very useful, but it comes with responsibilities. Reed and Procter (1995) describe the role of a practitioner researching other practitioners, as a 'hybrid' role, which sees the researcher occupying the continuum between 'outsider' and 'insider'. The potentially

negative impacts of this 'hybrid' role include: favouring people you know to be of like-mind when recruiting respondents, misrepresenting data in favour of their professional grouping, and deciding in favour of presenting the manuscript for publication in a professional rather than an academic journal.

In this article I will discuss these issues with examples drawn, where appropriate, from my doctoral research experience.

Most researchers will recognise recruitment of would-be respondents who will provide unbiased information and reactions as being a challenging element of empirical research (Mulhull 2002). So it was that my research project required me to recruit a number of such respondents (in the end I secured the services of 21) and they came to the research through: being part of my own PN (8), via a member of my PN (4); through an introduction secured through a contact at the CIEH (4); through contacts made following an article I wrote for 'Environmental Health News' (3); through meeting someone at a conference (1) and, second-hand, through a colleague of a colleague of a contact at the CIEH (1).

In order to gain access to the more senior, higher-profile and most influential 'actors' that would be impossible through my immediate PN I took the decision to use the CIEH for this purpose. It was not planned at the outset, but came about gradually upon the advice and support of one particular EHP. This served the purpose and overcame the view expressed by an EHP when they remarked: *'...you won't get in the door I don't think. I'll help you if I can...'* (EH practitioner in national post ID33).

The use of PNs as a means of recruitment has been little discussed in the health literature, but when it has it has mostly related to physicians. A German study found that physician, network-based, recruitment increased participation rates for a questionnaire study (Wetzel *et al*., 2005). A literature review of the recruitment of physicians in research also found that the use of 'personal' and 'friendship' networks increased recruitment rates (Asch *et al*., 2000). Although my research would employ a different method of data collection, and my interest lies in professional rather than personal networks, my experience supports these findings; that on balance, given the difficulty of recruitment for research, the overall benefits of using PNs outweigh the risks.

Since it was intended that my primary method of data collection was going to be semi-structured interviews, I had in mind that the dynamics of those interviews with respondents recruited through my PN would differ markedly from those from non-EH backgrounds interviewed in another strand of the project. However, this went further, since my professional background would

likely play a part in the scheduling and conduct of my interviews (Hand 2003). Thus, using my PN to recruit respondents for interview would have consequences, not least because they would know my background. In an attempt to counteract bias, a fixed interview schedule was developed so as to ensure, as far as possible, that the same matters of interest were discussed with all interviewees.

Beyond this, the most immediate consequence was a greater level of intimacy and trust, with interviewees being more candid in comparison with respondents from other backgrounds. On one occasion, I was introduced by an interviewee to a colleague with the comment, *'The good news is, she's one of us'* (EH manager ID43). When queried on this general sentiment, they explained that when interviewed by non-EH researchers they had sometimes struggled to communicate a detailed understanding of their work context.

Beyond this, having shared backgrounds resulted in an increased depth of response resulting in higher quality data, which might not have been otherwise possible to gather in the available time. Chew-Graham *et al.* (2002) found in a study of GPs, where interviewers and interviewees shared a professional background, responses were often more 'emotionally charged', generating 'rich and intuitive responses'. This is supported by the following excerpt from a interview transcript, with my emphases:

> *'...I think the profession at the moment is feeling quite,* ***you know****, quite downtrodden really,* ***it doesn't help that the government is going "regulation is*** [expletive deleted]***, we hate regulators"****... all the cuts...'*

Such emotionally candid comments were not forthcoming during interviewees with non-shared backgrounds. A further phenomenon described by Chew-Graham *et al.* (2002) is how this familiarity can trigger expressions of vulnerability, but these can be ambiguous and used by the interviewee as a strategy to avoid probing questions. Take, for instance this comment from a well-respected EH manager:

> [whispers] *'I was never very good at food – never very good at anything in Environmental Health actually, but food, I was terrible'* (EH manager ID40).

Another consequence of a shared professional background is that the interviewer may well have a deep understanding of the technical language used, and will know the environments in which the interviewees work, and whilst this is likely to enable a greater depth of enquiry, some have suggested that this can result in a reluctance or failure to challenge (Chew-Graham *et al*., 2002).

However, this has a distinct advantage when the researcher with the shared professional background comes to analyse the data, especially qualitative data. They will likely come into this with a sense that it may not be possible or even desirable to analyse the data from a position of neutrality, and that analysis will be influenced by the backgrounds and perspectives of those who have produced them (Mauthner and Doucet, 2003 :415). Thus, 'inside knowledge' may provide a useful additional data source. Needless to say, unless one remains self-conscious as to the potential to cause bias, background knowledge may carry with it assumptions that biases the outcome (Holloway and Biley, 2011) and may lead to a failure to probe areas that 'seem self-evident' (Hand, 2003 :22).

My experience investigating the lack of engagement of environmental health practitioners in the new English public health system supports Pellatt's (2003) observations of feeling the full gambit of emotions from 'joy, pain, hurt, excitement, anger, love, confusion, satisfaction, loss, happiness and sadness', and I can vouch for the need to analyse my data objectively, setting aside personal disappointment.

Conversely, as a consequence of researching a topical subject that involves my peers, the respondents can have higher expectations of what the researcher can deliver with the data acquired. As one respondent commented [my emphasis]: *'So... what conclusions do you think you're going to come up with, anything?* ***Is it helpful to us, and how are you going to feed it into the world...?***' (EH manager ID8).

It might be expected that researchers without a special affinity for the subject or its practitioners might not bear the same level of expectation on their shoulders nor the sense of obligation to publish results favourable or useful for their peers. Some researchers have even reported respondents having 'difficulty in accepting that our prime aim was not necessarily to produce practical recommendations for action' (Pollitt *et al*., 1990).

The dilemma of where to publish will be familiar to any practitioner-researcher who must balance publication in peer-reviewed journals (required in academic circles) against providing something of practical value to their peers who have made the research possible. Peer-reviewed journals are not easily accessible to most EH professionals and Holloway and Biley (2011) make the point, *'Being a qualitative researcher means being accountable – for the choice of data and for their interpretations- to the participants and readers of the story'*.

Beyond this, and speaking parochially, EHPs may be surprised to find they possess many of the research skills valuable in qualitative data collection

through their work. My ability to interview, take statements, record observations and critically analyse documents in order to build up a detailed picture of a situation has proved very useful. In addition, 'softer' skills such as communicating with people at various levels and managing a complex workload put one in good stead. The skills gap I have encountered has revolved around the development and application of theory and in understanding and communicating in the language of academia. As Holloway and Bailey (2011) observe:

> *'It isn't easy to write a good story and to present a scholarly account.'*

They go on to highlight difficulties the 'insider' researcher can have in looking beyond straightforward meanings to appreciate more abstract, theoretical ideas.

To conclude, PNs can be invaluable in recruiting participants for research and obtaining insightful data that would be denied others, providing the limitations are acknowledged.

The application of reflexivity to the impact that the researcher herself may have on a project is known to be difficult (Finlay, 2002), but it is considered as both good scientific practice and a valuable part of the qualitative research process (Mauthner and Doucet, 2003; Wren, 2004), provided it does not become merely 'a self-indulgent form of navel-gazing' (Carolan, 2003). My hope is that this reflexive article has not fallen into the latter category and will instead help inform and encourage the work of practitioner-researchers like myself.

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REFERENCES

Asch S, Connor SE, Hamilton EG *et al*. (2000). Problems in recruiting community-based physicians for health services research. *Journal of General Internal Medicine* 15(8), 591-599.

Carolan M (2003). Reflexivity: a personal journey during data collection. *Nurse Researcher,* 10(3), 7-14.

Chew-Graham CA, May CR and Perry MS (2002). Qualitative research and the problem of judgement: lessons from interviewing fellow professionals. *Family Practice,* 19(3), 285-289.

Finlay L (2002). 'Outing' the researcher: the provenance, process, and practice of reflexivity. *Qualitative Health Research,* 12(4), 531-545.

Hand H (2003). The mentor's tale: a reflexive account of semi-structered interviews. *Nurse Researcher,* 10(3), 15-27.

Holloway I and Biley FC (2011). Being a qualitative researcher. *Qual Health Res,* 21(7), 968-975.

Mauthner NS and Doucet A (2003). Reflexive accounts and accounts of reflexivity in qualitative data analysis. *Sociology,* 37(3), 413-431.

Mulhull A (2002). Methodological issues in nursing research, in the field: notes on observation in qualitative research. *Journal of Advanced Nursing,* 41(3), 306-313.

Pellatt G (2003). Ethnography and reflexivity: emotions and feelings in fieldwork. *Nurse Researcher,* 10(3), 28-37.

Pollitt C, Harrison S, Hunter DJ, *et al* (1990). No hiding place: on the discomforts of researching the contemporary policy process. *Journal of Social Policy,* 19(2), 169-190.

Reed J and Procter S Eds (1995). Practitioner research in health care. London, Chapman and Hall.

Wetzel D, Himmel W, Heidenreich R, *et al* (2005). Participation in a quality of care study and consequences for generalizability of general practice research. *Family Practice,* 22(4), 458-464.

Wren B (2004). Research reflexivity. Editorial. *Clinical Child Psychology and Psychiatry,* 9(4), 475-478.

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BOOK REVIEW

Evidence, research and publication: a guide for environmental health professionals

Rob Couch, Jill Stewart, Caroline Barratt, Surindar Dhesi and Alan Page
ISBN 978-1-291-09954-6
Published by www.lulu.com

Review by Dr Chris Day

Receiving a final draft of *'Evidence, research and publication: a guide for environmental health professionals'* in October 2012 I was immediately struck by its informal tone and the lack of pretention across its 94 pages. However, don't be fooled, this is a guide that insists upon the engagement of its reader for it has to be read, and read carefully.

Whilst the book as a whole provides a compelling argument for EH professionals to become research active (it is undoubtedly a 'call to arms') it seldom 'preaches' and uses the personal experience of the authors to great effect. It comes over as the 'antidote' to some of the research books one reads where the text is slick, reflection is over-rehearsed and any commentary laden with faux humility. If EHRNet's book lacks sophistication, and at times a certain discipline in the way ideas are developed, this only serves to make the book more personable and 'human'.

In Part 1, after some valuable discourse around the nature and purpose of an evidence base (Chapter 1) the book pauses to offer a 'health warning'; if research is not exclusively the province of extraordinarily gifted people it needs to be undertaken to an extraordinarily high standard. Chapter 2 continues in this vein as the authors systematically confront some of the difficult issues that researchers are obliged to consider before they can sensibly get underway. Where they feel it is essential to understand unfamiliar terms and concepts they discuss these briefly, provide a neat glossary and then suggest further reading.

However, for me the book comes into its own in Part II where it seeks to assist the novice researcher in getting started by considering some of the fundamental

skills and competencies that will need to be discovered and refined during these early stages. If the sub-headings 'Why read?', 'How to read' etc. come over as patronising and suggest that the content will be self-evident, they aren't; indeed I would say that if the authors can be encouraged to produce more material of this sort they may like to return and expand the text further.

It might come as a surprise to find the authors' listing those who they believe to be the big 'thinkers' in the field of environmental health, but for me it suggested an understanding of the needs of a new EH professional faced with the task of identifying who and what to read before embarking upon research. It certainly had me Googling' some of the names!

If Chapter 3 was about 'reading', Chapter 4 is dedicated to writing, and writing for publication, making a particularly persuasive argument for doing so. It goes on to differentiate between the content and style most suitable for journals, books, conferences and the print media and how one should go about submitting drafts and manuscripts for maximum impact.

Just a very short section is dedicated to 'macro-editing' but I would suggest the authors might want to revisit this and consider the collective experience of editors, university lecturers and employers as to the need for much greater attention to the quality of grammar and syntax in the initial drafting of text. One would not wish to build this out of proportion, but the standard of presentation is a vitally important feature of any submission and that poor written English is so often the reason for initial rejection.

Chapter 5 ('Why study for a research-related degree') challenges the reader to consider the skills-set required of a student entering into post-graduate study in which research plays a part, before offering a brief (over-brief?) summary of the different kinds of award on offer in the UK.

There follows a series of thumb-nail testimonials offered by the authors as to what motivated them to start out on their research careers, what they experienced along the way (for good or bad) and their reflections on it now that it was over, or nearly over. Their candour here, but also in the sensitivity of the narrative elsewhere, made this book stand out as being far more than a guide or reference book.

Finally, and I should declare an interest at this point in that the authors deemed to quote my past reference to Donald Schön's analogy of the hill (where problems are well understood and the solutions likewise) and the swamp (where the problems themselves aren't properly elucidated so the solutions

cannot possibly be), in their valedictory chapter. Rhetorically entitled *'How can I become more research active and make my work more evidence based'* the authors throw down the gauntlet and invite EHPs to start seeing their 'day job' as an opening for research and together help to make the evidence base supporting practice far more the outcome of this sort of research.

If EHRNet's vision, in time, of a research-focused profession, with its practitioners absorbed by the need to descend to the swamp, then, as it hopes, this e-Book will have served to encourage the reader *'to embrace your inner nerd and join us on our swampy journey towards a better environmental health for all'*.

Can I applaud the authors – Rob Couch, Jill Stewart, Caroline Barratt, Surindar Dhesi and Alan Page – for their determination to see EHRNet established and become a force for the promotion of research and publication, but above all for doing what their e-Book implores others to do...get published!

If one had to be critical, not all who might read and benefit from this guide will have paid to download it. If the authors feel the call to provide an updated version – and they certainly should – then perhaps they could be persuaded to expand some of these chapters and offer them as booklets in hard-copy. Beyond this, I would recommend it without reservation to anyone starting out (or even returning) to research in the EH field as I think it has something for everyone.

Review by Dr Chris Day

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NOTES FOR AUTHORS

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