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Aims and Scope

The Journal of Environmental Health Research is a peer reviewed journal published in three formats; Printed Full Journal, Printed Abstracts and Electronic Journal.

The Journal publishes original research papers, review articles, technical notes and professional evaluations covering the diverse range of topics which impinge on environmental health including; 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.

The Journal provides a communications link between the diverse research communities, practitioners and managers in the field of environmental health and aims to promote research and knowledge awareness of practice-based issues and to highlight the importance of continuing research in environmental health issues.

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Editors: Harold Harvey (left) and Paul Fleming

Editorial

In today's world, buzz words such as accountability, best value, effectiveness and evidence-based practice are the norm in many policy documents and business plans, not to mention their use in political and management rhetoric. Increasingly, professionals in all disciplines are being challenged to offer proof that their practice is effective, efficient and equitable. Traditional modes of working are being scrutinised to prove their worth.

In response to such demands for proof of best practice in environmental health, a growing body of research in the discipline is being generated globally, not least in the UK and Ireland. In the recent visioning document from the Health Development Agency 'Environmental Health 2012: A key partner in delivering the public health agenda', there is a call for an enhanced research effort facilitated through the establishment of a national environmental health research agency.

Until recently, while countries such as the USA have had well established routes for disseminating research findings, we on this side of the Atlantic have been less well provided for. To help remedy this situation, the Chartered Institute of Environmental Health, in a forward-looking move, has now created the Journal of Environmental Health Research.

The first, and in some senses the trial issue of the Journal, has met with widespread approval, with many in the environmental health field and beyond commenting favourably and looking forward to further issues. The working group and staff responsible for this achievement are to be congratulated. This widespread and positive acceptance has led to the continuation of the Journal resulting in our appointment, by the Institute, as editors. We each lead our respective academic disciplines in the University context – Harold Harvey as the Director of the Environmental Health Protection and Safety centre and Paul Fleming as Academic Co-ordinator of Public Health. We also retain firm links with research and practice development in the field which keeps us firmly grounded in the realities of day-to-day practice.

It is our intention to produce two high quality issues of the Journal each year. An Editorial Board is in the course of being appointed and papers will be research-based and rigorously peer-reviewed. It is our intention that the journal will claim its place on key electronic data-bases at the earliest possible opportunity.

Environmental health research in the UK and Ireland is coming of age. It is our hope that the Journal will make a significant contribution to the increasingly research-based work of Environmental Health professionals.

Each issue of the Journal will be published in three versions; full printed, abstracts and electronic journal. In keeping with the environmental ethos, submissions to the Journal and the peer review process will be managed electronically with no requirement for printed copies. Readers will be encouraged to adapt their literature access methods so that in course of time the electronic version will become the primary means of accessing the Journal.

Harold Harvey and Paul Fleming

Guest Comment

The Health Development Agency (HDA), in partnership with the Chartered Institute of Environmental Health (CIEH), has recently published the findings of a project which sets out a strategic vision for the contribution of the environmental health profession to the development of health and well-being.

A key finding of the report is that environmental health practitioners need to understand the impact of environmental health on health and inequalities and how to evaluate the effectiveness of their work.

The report makes it clear that, "a research programme is needed to gather, and make widely available, high quality and reliable evidence of public health interventions by environmental health". This is a clarion call which has already been answered by the publication of the first issue of the Journal of Environmental Health Research (JEHR) earlier this year.

An evidence based approach to the development and enhancement of environmental health services is essential and the outcome of such work must be widely disseminated to all those academics and practitioners who can benefit from it.

I am therefore delighted, as President of the CIEH, to be associated with the second issue of the JEHR which features research projects carried out by a number of environmental health academics and practitioners. This work covers a number of important environmental health specialist areas and will, I am sure, prompt changes in practices and procedures in the field.

It seems to me that the publication of the JEHR is an initiative which is both necessary and timely and I would encourage environmental health professionals and practitioners to get involved in research projects by using the opportunity which now presents itself to have their work published in the JEHR.

The first issue of the JEHR was greatly welcomed and filled a gap which has existed for far too long. This second edition builds on that success.

All professionals must display both competence and commitment. Achieving a satisfactory level of competence in the early stages of the professional environmental health officer's career is gained from assimilating information which is well known and by using practices which are tried and trusted. The development of such a professional, and the profession to which he or she belongs, demands an involvement in work which goes beyond what is known and applied.

It is absolutely essential for the CIEH and its members to embrace the challenge laid down by the HDA by establishing a strong environmental health research base. I am confident that our members will rise to it.

Brian Hanna
President of the CIEH

Urban rat infestations and the risk to public health

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Abstract

The control of commensal brown rat (Rattus norvegicus) infestations by local authorities has been largely seen as a matter of protecting public health. In recent years there has been a reported increase in domestic premises which have been the subject of complaint about rat infestations, but no assessment has been made of the potential risks to public health. This study examined the possible sources of rat infestations in England and Wales. At the same time there is evidence of substantial under-reporting of rat infestations. The parasitic burden of wild brown rats in urban environments was also examined, compared to that found among rural wild rats, and the public health implications considered. The range and prevalence of zoonotic infection was, in general, lower among urban rats than their rural counterparts. This may be attributable to domestic livestock driving zoonotic cycles of infection and differences in population densities. However it has been found that domestic premises with rat infestations are more likely in the older parts of urban areas with poorer environments and where, it is argued, it is also likely that there will be lower levels of complaint due to greater tolerance of rats even when they are known to be present. The study reported here has examined the administrative structures involved in the control of rats, including the attitudes of local authorities and Directors of Public Health and the relationship between local authorities and the water and sewerage undertakers, on the control of rats in sewers. It has been concluded that where the control of rats depends solely on complaint, and rat control strategies are not fully developed, there will be increased risks to public health. The result of ineffective strategies and lack of co-operation from other agencies, as may be occurring in some parts of England and Wales, will be that the rat population and colony densities could increase in urban areas. This is most likely in those areas where there are other social stresses, thereby enhancing the potential for increased parasitic loads within the rat population. This has implications for the health of those communities and could further contribute to inequalities in health.

Key Words: Brown rats (Rattus norvegicus), dwellings, inequalities, infestations, public health, risk, urban

Introduction

In recent years there have been reports of increased levels of infestation of domestic premises by commensal brown rats (Rattus norvegicus) (Meyer et al, 1995) and increased complaints to local authorities of rat infestations (NPTA, 2001). The level of complaints about rats to local authorities does not in itself mean an increased rate of infestation, nor an increase in the total rat population. It could reflect more frequent sightings of rats in daylight resulting from changes in rat behaviour or reduced tolerance by some members of the public. Whilst the rodent survey undertaken as part of the English House Condition Survey 1996 (MAFF, 1999; Langton et al, 2001) indicated a lower rate of infestation around domestic premises than Meyer et al (1995), it used a different methodology. It did however, point to a number of key factors influencing the risk of rat infestations in and around dwellings.

Several diseases likely to be transmitted by animals are emerging as serious threats to public health. However, the epidemiology of many zoonotic diseases is poorly understood, and even in the UK, baseline data on the prevalence of important zoonoses in wildlife are scarce.

Although fear of the wild rat as a carrier of disease is embedded in our culture, and immortalised in our literature, the scientific literature relating to rat-borne infection is scant. There is a question whether the assumption that rodent control is essential for public health in England and Wales remains valid as changes to the operation of local government and sewerage service in recent years have failed to take serious account of this.

A survey of a wide range of parasites of wild brown rats on UK farms to rectify the lack of baseline data on rat-borne infection (Webster & Macdonald, 1995), found them to be infected with 13 zoonotic species

with a range of 2-9 simultaneously per rat, and up to 10 non-zoonotic species. The results suggested rural wild rats could be a serious risk to the health of humans and domestic animals in the UK.

The situation in urban environments, in contrast, remains largely unknown. It is documented that certain parts of the sewerage system contain rats (Bentley, 1960; Twigg, 1975); even with a continuous baiting programme the population can be reduced but never completely eliminated (Channon et al., 2000). Furthermore, with reports of a deterioration in the integrity of the sewerage infrastructure (Battersby 1998, 1999) coupled with less sewer baiting (Battersby 1998, 1999) rats may have increased opportunity for direct and indirect contact with humans and their companion animals in an urban environment (Bradshaw, 1999). This present study as part of a larger consideration of the issues, aimed to make, we believe for the first time, a preliminary investigation of the parasites infecting urban rats and thereby help assess the public health risks.

Methods

This study has utilised a number of methods to assess the risk factors that influence the existence of rats in and around homes. A literature review, a postal survey of local authorities and three regional research seminars attended by representatives of local authorities, pest control companies and water and sewerage undertakers, were undertaken.

To make this initial assessment of the parasites carried by Rattus norvegicus in urban areas, forty wild brown rats were live-trapped using Bledderberry traps, and subsequently humanely killed with a rising concentration of CO_2. The rats were trapped at thirteen urban and suburban sites in and around London between May 1999 and May 2000. All sites were identified in liaison with local authority officers following complaints to environmental health departments. Consultation with the Home Office confirmed that no licence was required as all samples were taken immediately after death. The main criteria for site selection were: proximity to housing; obscuration from public view; agreement of the occupier where relevant; no treatment yet in progress; and if possible, association with drainage defects. Between one and six traps were used per site depending upon the scale of infestation and nature of the site. All rats were trapped in the open between May 1999 and June 2000, with a pause in the trapping between early December 1999 and March 2000. Only six rats were trapped on land that was not within the curtilage of a dwelling or part of a housing estate. These were at two sites adjacent to major railway lines, one of which was heavily fly-tipped, and on which four rats were trapped.

Methodological and diagnostic details were, wherever possible, matched to those of Webster & Macdonald's (1995) study. In brief, rats were categorised by weight as juveniles (< 100g), sub adult (100-200g) or adult (>200g) following Calhoun (1962), and an approximately matched distribution of rat age/weight ranges were sampled to that of Webster & Macdonald's (1995) study (here 20% juveniles: 32% sub-adults: 47% adults). Serum was collected by cardiac puncture post asphyxiation and used to test for antibodies against Toxoplasma gondii by the IgG indirect latex agglutination test (ILAT: Toxoreagent; Eiken Ltd.); Titres of >1:16 were considered positive (Webster, 1994). Individual fresh faecal samples were inoculated directly onto each of: MacConkey agar, XLD agar, Hektoen agar, Yersinia selective agar and Campylobatcer agar (Oxoid Ltd), and Selenite broth, Phosphate Buffered Saline (PBS) and Listeria selective broth (Biomerieux Ltd). The last six samples were also cultured onto CT SMAC agar for E.coli 0157 (Biomerieux Ltd). All were incubated at 37°C overnight except the PBS which was incubated at 4°C for two to three weeks. Suspect colonies were obtained in pure culture and identified using API identification strips (bio Merieux UK Ltd). The enrichment broths were then sub-cultured onto the following media: PBS onto Yersinia selective agar; Listeria broth onto Listeria selective agar; and Selinite F onto Rambach agar and XLD agar (Oxoid Ltd). These were then incubated at 37°C overnight and examined for suspect colonies.

The remaining faecal samples from each rat were processed for enteric parasites using faecal concentrator (Evergreen Scientific) and examined microscopically.

Results

Although it is difficult to assess the actual population, attempts have been made to assess the number of domestic properties infested by way of survey rather than by records of complaints, which is probably the least accurate method. Meyer et al. (1995) argued that the high media profile afforded to commensal rats reflected public concern at the potential damage and the continued risk of disease transmission, but a high public profile leads to misrepresentation of localised events. The 1993 commensal rodent survey (Meyer et al., 1995) specifically sought to determine whether levels of infestation of both the brown rat and the house mouse (Mus domesticus) had changed since the mid to late 1970s and work undertaken by Rennison and Drummond (1984). The 1993 survey found 4.6% of all domestic premises (excluding those associated with commercial activities) to be infested by rats compared with 3.3% in 1976-79 as found by Rennison and Drummond (1984). This represented an increase of over 39%. Although still proportionately small, it amounts to a substantial number of premises.

In 1991 there were 19.7 million dwellings in England (DoE, 1993). It is estimated there were approximately 1.25 million dwellings in 1997 in Wales with 10,000 new dwellings added each year (Welsh Office, 1998). It is assessed that the total number of dwellings in England and Wales in 1993 was approximately 20.95 million. At the rate of infestation reported by Meyer et al. (1995) over 963,000 dwellings in England and Wales would have been infested with rats in 1993. At the same rate of infestation in 1996 in England and Wales, 995,900 dwellings would have been infested from a total housing stock of 21.65 million (DETR, 1998; Welsh Office, 1998).

The assessment of rat infestations in dwellings undertaken as part of the English House Condition Survey (EHCS) 1996, (MAFF, 1999) used a different methodology from that of Meyer et al. (1995) and the results are not directly comparable. Apart from differences in surveyor expertise, greater reliance was placed on information provided by the occupants. Results from the EHCS 1996 indicate that 0.3% of occupied properties had rat infestations inside and 1.6% had infestations outside. Using the EHCS 1996 (DETR, 1998) estimate of 20.4 million dwellings, there would thus be approximately 61,000 domestic premises with internal infestations and 326,4000 dwellings with infestations outside in England. Using the figure of 21.65 million for dwelling stock for England and Wales and assuming the same rate of infestation for both countries as found in the EHCS 1996, 65,000 dwellings would have had internal infestations and 346,400 with infestations outside, a total of 411,400 infested premises. This is less than half the estimate based on the 1993 figures of Meyer et al. (1995) for the 1993 rodent survey.

Reliance in the EHCS 1996 on information from occupiers about the level of infestations, and the lack of information about vacant dwellings, means the 1996 figures are likely to be an underestimate (MAFF, 1999). Concern about over-reliance on occupiers' views and attitudes, and their sightings of rats, is supported by the findings of Meyer et al. (1995) and Bradshaw (1999). For example occupiers were found to be far less willing to take action on rats than for mice. This may partly be due to ignorance of, or an unwillingness to accept the existence of the infestation, and is a possible explanation for the lower figures in the 1996 survey. The 1993 survey found a quarter of rat infested domestic properties were not subject to any control. It was found that in about 10% of premises the occupier exercised control measures (Meyer et al., 1995).

A more detailed analysis of data from the EHCS 1996, (Langton et al., 2001) suggests slightly different figures for infested premises. Some 0.23% of domestic premises had brown rats living indoors and 1.6% had rats living outdoors. For England this would equate to about 47,000 dwellings with rats indoors and 326,400 outdoors, a total of 373,400 infested premise, and implies even fewer infested premises than originally estimated (MAFF, 1999). Using the mean number of rats per infestation of 2.2 as used by Harris et al. (1995), and the estimated figure of infestation rates of Langton et al (2001) produces a figure of 821,500 as the lowest estimate for the number of rats living in close proximity to humans in and around dwellings in England. Taking the infestation rates identified by Meyer, et al. (1995) there would be over two million rats living in and around the immediate vicinity of our houses. These figures take no account of rats living elsewhere in the urban environment.

Dwellings that were more susceptible to rodent infestations were identified in the EHCS 1996 (MAFF, 1999; Langton, et al., 2001). The prevalence of rats (and mice) was found to be significantly greater for dwellings where pets or livestock were kept in the garden. This may be of some public health significance given the affect of Toxoplasma gondii on the behaviour of rats, which act as an intermediate host, until passed to the cat as primary host (Webster, 1994). Rats with positive Toxoplasma titres exhibit reduced neophobia (Webster et al, 1994).

The relationship found in the EHCS 1996 between dwellings with pets and livestock and the presence of rat infestations might be explained partly by the higher proportion of rural properties with domesticated animals. There is also a greater population of rats in rural areas by comparison with urban areas (MAFF, 1999), with Harris et al (1995) suggesting a mean of 8.8% of rural domestic premises infested compared with 3.25% in urban areas. The association with indoor infestations may be a result of external infestations invading the dwelling. In urban environments, companion animals, particularly dogs, appear to be associated with rat infestations, and there is also a positive relationship between the presence of free-ranging cats and rats, perhaps because of a common benefit derived from access to waste food (Childs et al, 1991, cited by Langton et al, 2001).

Of further concern to environmental health professionals is that dwelling condition is also a factor. It was found in the EHCS 1996, that unfit properties were more likely to have an infestation than other properties (MAFF, 1999; Langton et al., 2001). A trend was identified of increasing infestation rate with increasing poor condition (MAFF, 1999). The standard of fitness in s.604 of the Housing Act 1985 (by which dwellings are currently judged) includes a number of requirements including satisfactory drainage. Properties unfit due to a failure to meet that requirement often failed other requirements

and so it was difficult to identify any particular aspects of a property's condition that led to an increased risk of rodent infestations. Nevertheless, Langton et al (2001) found a trend to link unfitness of housing with rat infestations. The only variable relating to general disrepair that Langton et al (2001) found linked to rat infestations was blocked drains.

Langton et al (2001) found the issue of housing density to be more important in urban than rural areas. It seems likely that the higher the density of dwellings, the more likely it is that a nearby dwelling can be a source of infestation, especially as the home range of rats may well encompass more than one dwelling at a time and dispersal by both rats and mice is more likely to be successful over short distances. Rat infestations were found to be significantly more common in older properties, even after adjustment for the presence of pets. It was concluded by Langton et al (2001) that infestations by commensal rodents have two general forms. Firstly, those in properties that are less than satisfactory in respect of fitness for human habitation, situated in areas with multiple problems including neglected or derelict buildings, commonly in urban areas with high densities of dwellings. The second form is infestation of older properties, on large plots in rural areas with low-density housing, reflecting reservoir populations of commensal rodents present in agricultural habitats.

The presence of rats in urban areas is a common indicator of a degraded environment (Colvin, 2001). In the EHCS 1996 (DETR, 1998; MAFF, 1999), surveyors were also asked to score problems in the vicinity of the dwelling under survey. A high correlation was found between problem areas, with widespread litter, vandalism, scruffy gardens and neglected and vacant buildings, and rat infestations. Langton et al (2001) confirm that dwellings in areas with substantial prob-lems such as dereliction and litter had a significantly higher prevalence of rats. The DETR (1998) constructed an indicator of poor living conditions from a range of housing and environmental information obtained in the survey. This found 552,000 disadvantaged households out of a total of 1.3 million living in such areas. The disadvantaged groups most likely to be present are certain ethnic minority groups (30% of Pakistani and Bangladeshi households are housed in poor living conditions), unemployed households (19%) and the long-term sick or disabled (under 60 years old) who are also more likely than average to be housed in poor living conditions.

The postal survey of local authorities in England and Wales as part of the present study indicated that defects associated with under-ground drainage were an important factor in above-ground infestations, with almost three-quarters of respondents considering that up to 40% of surface infestations were attributable to defects in the sewerage infrastructure (public and private drainage and sewerage) (Battersby, 1998). Table I indicates the assessment by local authority officers of the importance of certain factors that contribute to surface rat infestations. It shows that local authority officers considered broken private sewerage to be the second most common contributory factor to an infestation, with open watercourse and ditches being the most common factor. Concern was expressed in the research seminars and postal surveys in the present study about the termination of agency agreements with the sewerage undertakers and the inadequacy of sewer baiting. Of the 167 respondents to the postal survey, 70 (42%) said that there was an agency agreement with the sewerage undertaker and 96 (57%) said there was not. The picture is slightly complicated by those authorities with more than one sewerage undertaker operating in the district, and three respondents were unable to answer this question. Of those authorities without an agency agreement, 52% said there had been such an agreement within the previous five years. There were clear regional variations on agency agreements but over 10% of responding authorities to this study also said there was no sewer baiting in their areas. It was found that liaison with the water and sewerage companies was often minimal even where an agency agreement existed or the local authority was undertaking sewer baiting. There was no coherent or consistent approach to the control of rats in sewers with almost three-quarters of respondents indicating they met with the sewerage undertaker to discuss rodent control only "as necessary" or "never".

The significance of the presence of rats in and around homes depends upon the range and prevalence of parasitic species among urban rats. This study found that the range and prevalence of parasitic species detected tended to be lower than that previously obtained from rural rats (see Table II). The prevalence of certain species were significantly lower in urban rats, for Capillaria spp., Toxocara cati, Hymenolepis nana, H. diminuta, Taenia taeniaeformis and Toxoplasma gondii. The prevalence of Listeria spp., and Yersinia enterocolitica was also lower in urban rats. Pasteurella spp., and Pseudomonas spp. were not detected at all amongst urban rats even though present in rural rats. The only species that showed significantly higher prevalence levels amongst urban rats was Trichuris spp. (see Table II).

There may be at least two potential explanations for the discrepancy between the high parasite loads previously identified amongst rural rats compared to the low rats in urban rats reported here. The first relates to the competitive impact of wildlife and

domestic livestock on driving cycles of zoonotic infection, and the second relates to the different population densities between the two habitat types.

The survey of Directors of Public Health (DPHs) in this study indicated that there is little liaison with local authorities on rat control and public health. Out of 61 responses 21 (34%) said there was no liaison with the local authority with regard to rat infestations and their control. Forty (66%) said that there was some liaison but 20 of these typified this as "rare" with 19 typifying it only "as necessary". Only one described the liaison as "regular" and in no instances was it thought of as "frequent". Local authority officers in the regional seminars rarely raised the issue of liaison with other public health professionals, such as the DPH, yet most also suggested that protection of public health was the primary reason for rodent control. It was also found that DPHs are often not fully aware of the range of zoonotic agents that can be carried by rats.

Discussion

Whilst concern has often been expressed about the total number of rats in the country, it may be that not only are there fluctuations in the total rat population, but there will be local 'hotspots'. There are indications that in urban areas these will be linked to areas of general deprivation (Mortimer, 1989; DETR 1998a, MAFF 1999; Langton et al, 2001) and areas of older housing with similarly aging drains and sewers. Residents of rundown areas are likely have a lower health status and could be more

Table I: Contributory factors to rat infestations as assessed by the responding local authority officers in England and Wales

Factor/source	Total score from responses	Number of respondents scoring item	Mean score	Mode	Number of scores <3	Number of scores 3 or more (%)
Open ditches/watercourses	481	156	3.08	5	56	100 (64)
Broken private drain/ sewer below ground	443	156	2.84	3	69	87 (56)
Poor workmanship in previous repairs or alterations to drainage systems	337	156	2.16	1	97	59 (38)
Open drains on building/ demolition sites	334	156	2.14	1	107	49 (31)
Displaced/missing caps to interceptors	310	154	2.01	1	103	51 (33)
Poor workmanship in original installation of drainage system	301	154	1.95	1	105	49 (32)
Poor connection between underground and above-ground drainage	297	152	1.94	1	109	43 (28)
Broken or damaged above-ground drainage	290	153	1.90	1	112	41 (27)
Missing rodding eye or cover to inspection chamber or ventilation pipe	285	153	1.86	1	107	46 (30)
Less durable materials used in previous repairs or alterations to drainage systems	221	152	1.45	1	123	29 (19)
Less durable materials in original installation of drainage systems	216	153	1.41	1	126	27 (18)
Damage to drainage from inappropriate cleaning	127	154	0.82	0	145	9 (6)

The mean score gives some indication as to the overall perceived importance of the different factors. The number of times when a factor was scored less than 3 and 3 or more is also given. The mode is the score most frequently given for a particular factor.

susceptible to the risks the close proximity of rats may pose. It has been acknowledged in the Black Report (DHSS, 1980) that health inequalities exist in this country and this is likely also to be a reflection of economic status. At the end of the 1990s these inequalities still existed, whether measured in terms of mortality, life expectancy or health status, whether categorised by socio-economic measures or by ethnic group or gender (Acheson, 1998). The welfare state was established following the Beveridge Report of 1942, which set out a national programme of policies and services to combat the "five giants of Want, Disease, Ignorance, Squalor and Idleness" (Beveridge, 1942). If under-reporting of rat infestations is a major problem, then it is most likely in those areas where there is already social exclusion, disengagement and lower health status.

There is also a higher rat infestation rate for houses in multiple occupation (HMOs) compared with singly occupied dwellings, and the number of HMOs will affect the level at which an area is infested (Meyer et al., 1995). Again with a high turnover of residents, and the transitory nature of occupation there is likely to be a lower level of complaint.

Table II: Parasite prevalence among wild brown rats (Rattus norvegicus)

Parasite	Disease	Rural rats *			Urban rats			_ =
		N	N +ve	% +ve	N	N +ve	% +ve	
Helminths								
Nematode ova†	-	112	44	39	40	19	47	n.s.
Nematode larvae‡	-	44	6	14	40	9	22	n.s.
Capillaria spp.	Capillariasis	44	10	23	40	1	2	0.006
Toxocara spp.	Toxocariasis	112	17	15	40	3	1	n.s.
Heterakis spp	-	44	6	14	40	0	0	0.01
Trichuris spp	Diarrhoeal disease etc	243	0	0	40	5	12	0.0001
Hymenolepis spp.	Diarrhoeal disease etc	243	80	33	40	7	17	0.04
Taenia spp.	Diarrhoeal disease etc	147	16	11	40	0	0	0.02
Bacteria								
Listeria spp.	Listeriosis	44	5	11	40	1	2	'0.09'
Yersinia enterocolitica	Yersiniosis	44	5	11	40	1	2	'0.09'
Yersinia pseudotuberculosis	Pseudotuberculosis	44	0	0	40	0	0	n.a.
Pasteurella spp	Pasteurellosis	35	2	6	40	0	0	n.s.
Pseudomonas spp.	Melioidosis	44	2	4	40	0	0	n.s.
Salmonella spp.	Salmonellosis	44	0	0	40	0	0	n.s.
Vibrio spp.	Diarrhoeal disease etc	44	0	0	40	2	5	n.s.
E-coli 0157	Diarrhoeal disease etc	n.i.	n.i.	n.i.	12	0	0	n.a.
Protozoa								
Toxoplasma gondii	Toxoplasmosis	235	84	35	18	2	11	0.03
Coccidia & Eimeria spp.	Coccidiosis etc	112	12	11	40	4	10	n.s.
Entamoeba spp.	Amoebic dysentery	44	0	0	40	1	2	n.s.

*** Prevalence levels in urban wild rats are compared to those previously recorded by the same methods for rural wild rats (Webster & Macdonald, 1995).**
_ values refer to the c2 statistics (Fisher's exact test where n<5).
n.s. refers to a non-significant difference;
n.a. refers to not applicable (where e.g. matched 0% prevalences reported); and
n.i. refers to not investigated (where current diagnostic materials where not available).
† 'Nematode ova' – approximately 75% were identified as Nippostronglyus brasiliensis; 20% as Strongyloides spp., and the remainder were not identified.
‡ 'Nematode larvae' – the majority identified were Strongyloides spp.

When a pest control service has been contracted out this may be to provide a service for dealing with complaints or requests for treatment, and the level and location of complaints may be a reflection of the level of concern or tolerance by members of the public. Local authorities may wish to assess how the terms of the contract contribute to the development or implementation of a rat control strategy. For example, will contractors feed back information on particular environmental factors that are contributing to infestations such as drainage defects, litter or harbourage, and the proportion of complaints that are confirmed infestations? Or can the contractors provide information to indicate whether the risk areas as identified in national surveys are similar locally, and what level of treatment is being undertaken there? Complaints alone are not an adequate basis for assessing the problem. Results from a random sample of premises in London in 1972 indicated that rat-infested premises might be three times more prevalent than that which notification indicated (Rennison & Shenker, 1976) and the absence of sightings on which complaints are based should not be taken to mean an absence of rats (Bradshaw, 1999). Local authorities and any rat control strategy should recognise that infestations are less likely to be professionally treated where pest control is contracted out (Meyer et al., 1995).

At first sight this study indicates that overall the risks to public health in urban areas may not be as great as often feared, as the prevalence of parasites in urban areas is lower than in the rural environment. However that is no ground for complacency. Examination of the possible reasons for this difference demonstrates the need for greater vigilance. In a rural environment, soil and water contamination by infected excreta from domestic livestock may potentially spread infection to the sympatric rat population, and thereby maintain or even initiate rodent reservoirs of infection. Indeed, a previous study on another zoonose, Coxiella burnettii, found consistently higher infection rats among rodent population on livestock farms, but low or zero for rats on arable farms where commercial livestock were absent (Webster et al, 1995). Although urban areas do contain numbers of companion animals, zoonotic rates tend to be low amongst such species. For instance Nichol and Snow (1981) studying domestic cats in an urban environment found only 14.9% to be infected with any parasitic species with Toxocara cati the most common (at 11.5%). Thus cats at least may play a lesser role than domestic livestock in driving zoonotic cycles. Similarly even though it is known that rats inhabit the sewerage infrastructure, in direct contact with human waste and a substantial proportion of above-ground defects are attributable to defects in the sewerage infrastructure, the prevalence and range of parasites carried or excreted by humans in the UK urban environment is currently likely to be low whilst standards of hygiene are properly maintained. This would mean a low transfer to the wild rodent population. If the proportion of the human population carrying parasites increased then this could be reflected in the parasites carried by rats.

However, the role of domestic pets in the risks is still of relevance however. Cats may not drive the zoonotic cycles generally but are the definitive host of Toxoplasma gondii. Infection of rats has been found to lead to behavioural changes in the rat that would benefit the parasite by making the infected rats more susceptible to predation by domestic cats. T. gondii appears to alter the rat's perception of the risk from cats (rats have evolved anti-predator avoidance of areas which show signs of cats' presence), and in some cases the innate aversion changes to 'imprudent attraction' (Berdoy et al, 2000). This benefits the parasite as the life cycle can only be completed in cats. T gondii causes toxoplasmosis in humans, and infection across the placenta also occurs where a pregnant mother acquires the primary infection.

The second explanation for the lower parasitic prevalence in urban rats, and relevant where control is inadequate, relates to differences in rodent population densities between the two habitats. There is evidence that rat population densities are often very high within rural environments, but generally very low, with restricted inter-group social interaction within the modern developed urban environment (Twigg, 1975). The latter has been achieved primarily through pest control programmes and enhanced sanitation (Twigg, 1975). Such low population densities as well as trap shyness (neophobia) in response to control pressure imposed may be reflected in the extended time taken to trap the urban rats in this present study. High rat population densities and overcrowding, on the other hand, favour the transmission of parasites, particularly those spread by direct contact or short distance aerolization (Anderson, 1993). Webster and Macdonald's (1995) study demonstrated that the zoonotic prevalence range and intensity was highest amongst the most densely rat-populated farms. Other studies of Leptospira spp. have reported a similar pattern with moderately high infection rates in rural brown rates but low or zero rats from urban and suburban sites (Hathaway, 1981; Blakelock and Allen, 1956 in New Zealand; Gordon-Smith et al, 1961 in Malaya).

However urban rats do carry parasites that can cause ill-health and must pose a risk to the health of communities where standards of environmental and personal hygiene are not maintained. It seems that there is a lack of awareness amongst medical professionals, which could also lead to misdiagnosis, and a failure to recognise the need for intervention. It is unlikely that the situation will improve whilst there is such a low level of liaison between environmental

health professionals in local authorities and the DPHs, a lack of liaison that is often reflected in the relationship with the sewerage undertakers, other local authority services and servicing companies.

Conclusion

This study included an initial assessment of the range of parasites carried by commensal brown rats. At this time the prevalence of parasites generally seems greater in rural rats than in those found in urban areas, perhaps because of predation from pest control activities in the past leading to lower population densities. The sampling of urban rats was undertaken as part of a wide-ranging study and further work in this area is required.

The presence of rats in urban areas is linked to poor areas of housing, often older, but not exclusively areas of older housing, where there is generally a degraded environment. These are areas of multiple deprivation and social exclusion, areas suffering from a combination of linked problems such as unemployment, poor housing, bad health and poor quality environments (Social Exclusion Unit, 2001). Thus where people whose health status is already likely to be compromised are living, the presence of rats in numbers could pose an additional pressure on their health and well-being. At the same time, social inertia, a result of social exclusion, may lead to under-reporting of infestations.

Effective rat control strategies should be seen in the context of the development of comprehensive community strategies, and should address those environmental factors that encourage rat infestations, which in themselves are a reflection of poorer environmental quality. This community strategy as required by Local Government Act 2002 provides the over-arching framework for the activities of the council and its partners to address local needs and to utilise the powers provide by the Act to promote or improve the economic, social or environmental well-being of their area. Where rat control is contracted out then the contractor is another of the partners, along with the sewerage undertaker in all cases.

The number of domestic premises infested by rats may be increasing (Meyer et al, 1995). There has been an increase in complaints to local authorities (Battersby, 1998; NPTA, 2001) possibly due to a greater awareness by some members of the public, but a substantial proportion of infestations actually go unreported and untreated (Meyer et al, 1995, MAFF, 2000). More local authorities now charge for what has previously been a free rodent control service (NPTA, 2001), which may hinder reporting and proper treatment, especially in those older parts of inner cities where income levels are low.

Furthermore, many local authorities lack any strategic approach, often contracting out the rodent control service, which responds only to complaints. Increasingly fewer local authorities act as agents for the privatised sewerage undertakers on sewer baiting (Battersby, 1998 and 1999). Liaison between local authorities and the sewerage undertakers is variable across the country and non-existent in some areas. As the rat population in the sewers increases containment within the sewerage infrastructure will be prejudiced by inadequate maintenance, both public and private. There is often inadequate repair of defects in private drainage and poor control over the quality of work. Coupled with litter and poor environmental quality above-ground, the potential exists for the rat population densities in urban areas, at least on a localised basis, to approach those found on farms with an increased risk to public health.

The situation for the last fifty years when there has been a decline in the rat population should not therefore be assumed to be that which will apply generally in the future. Furthermore, medical practitioners need to be made aware of the range of parasites carried by rats, as there is every chance that ill-health currently caused by rat infestations may be misdiagnosed, and the public health evidence to justify investment in more effective control of rats may be being lost.

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Investigating the Acceptability of Computer Based Training for Local Authority Health and Safety Enforcement Officer Training

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Abstract

In 1996 the Health and Safety Commission issued guidance to Local Authorities which included a requirement that they had a trained and competent inspectorate. Considerable interpretative skills are required in the implementation and enforcement of health and safety legislation and the recent report by the Better Regulation Task Force on Enforcement (Cabinet Office, 1999) emphasises the importance of a trained and competent inspectorate, particularly with regard to consistency of approach. This paper reports on research commissioned by the Local Authority Unit of the Health and Safety Executive to investigate the role emerging technologies can play in assisting Local Authorities to achieve a trained and competent inspectorate, and to assess the acceptability of computer based training as a delivery medium for Local Authority health and safety enforcement officers. Three computer based training packages were developed and piloted within LAs. The packages were delivered through different forms of computer technology, namely floppy disk, CD-ROM and the Internet. Fifty nine enforcement officers tested the packages and were asked detailed questions regarding the ability of the media to deliver effective training in terms of its reliability, usability and flexibility. In addition, line managers from twelve of the LAs which had participated in the pilot were questioned regarding the acceptability and economic viability of delivering health and safety enforcement training in this way. All three packages were enthusiastically received by both trainees and managers. The findings demonstrate that computer based training (CBT) can provide an effective means of delivery of health and safety training to enforcement staff in the workplace and has the facility (assuming the content remains current) to enable several groups to be trained over a period of time. However it is also important to recognise the demands which CBT introduces, both to the trainees and their managers. Shifting to workplace training requires systems to organise and oversee the achievement of learning objectives as trainees progress through the programme(s) offered. Failure to recognise the resources and support required in managing workplace training may result in alienation and a failure to achieve the learning objectives set.

Key Words: Computer based training; CD rom: environmental health, health and safety enforcement officers; Internet; professional development; work based training; web based training.

Introduction

The training of health and safety inspectors, particularly those employed in LAs, has received considerable scrutiny. The Department of Trade and Industry's 'Review of the Implementation and Enforcement of European Law' (1993) (the DTI Review) suggested that inadequate training of enforcement staff was one of the reasons underlying inappropriate enforcement decisions and the review made recommendations regarding the need to improve training for enforcement staff.

Resource limitations and the inappropriate content of many of the available courses were identified as factors influencing the quality of training provision for LA based health and safety enforcement officers (Prince et al., 1994) Moreover, it was suggested that proper management of training might offer scope for savings on the cost of piecemeal and unintegrated training which could be redirected to more focused training activity. Prince et al. (1994) also drew attention to the difficulty that independent LAs experience in co-ordinating their responses to identified training needs.

The Local Authority Unit (LAU) within HSE commissioned research to examine the problems faced by LAs in addressing these training issues. A fundamental element of the research was to investigate the acceptability to LA based health and safety enforcing officers of training delivered via emerging and novel technologies.

This paper reports on the development of three computer based health and safety training packages, evaluates the pedagogical, ergonomic and economic aspects of delivering training to Local Authority

health and safety enforcement officers and explores the opportunities and barriers faced by those wishing to implement computer-based training.

To consider the different types of CBT each training package was delivered by floppy disk, CD-ROM and the Internet. It was not the intention of this research to compare the three media, but to investigate the acceptability of computer based training in its different modes and to explore its potential to ameliorate some of the difficulties faced by LAs in providing professional training for its health and safety enforcement staff. As Kearsley (1991) has pointed out, if different media are used to their full potential, they would not teach the same material and therefore could not be meaningfully compared. The significant determinant of a successful outcome to training is that the power of a particular medium is fully exploited when used.

Three subjects for which there was a recognised training need at the time of the research were selected as the basis of the training content for the packages, namely: The Health and Safety (Enforcing Authority) Regulations 1998, Hotel Safety and Accident Investigation.

The aims and objectives for each training package were defined and matched against the suitability and strengths of the selected media (see Table I). Thus:

1) the Health and Safety (Enforcing Authority) Regulations 1998 training which was entirely text-based and sought to develop a systematic approach to the interpretation of the regulations and was delivered on floppy disk;
2) the hotel safety training which included a large amount of information, both textual and visual, sought to enable trainees to recognise hazards and assess compliance with legislation was delivered on CD-ROM;
3) the accident investigation training which incorporated a non linear approach (e.g. the ability to move between the different witness statements and factual details), reference to other on-line information sources, the facility to discuss professional judgments with fellow trainees and sought to develop accident investigation techniques was delivered via the internet.

All three packages were developed and produced in-house at Salford University. The rationale for in-house production was to ensure the training content was tailored to the needs of LA based enforcement officers and to enable the researchers to realise

Table I: The suitability and strengths of the selected training media

	Floppy Disk Health and Safety (Enforcing Authority) Regulations 1998	**CD-ROM** Health and Safety Enforcement at Hotels	**Internet** Practical Accident Investigation
Features	Text-Based. Aim to increase knowledge.	Text and visual content. Large volumes of information can be accommodated. Aim to increase knowledge and skills.	Text and visual content. Reference to other information sources. On-line discussion facility. Aim to increase knowledge, skills and improve consistency of approach.
Suitability	Content that is not visual. Subject matter which can be broken down into logical steps. LAs with older or less elaborate computer systems are able to participate in the study.	Subject matter that contains large quantities of information. Content which is enhanced by visually stimulating graphics, including video.	Learning material which benefits for example case studies; material subject matter which has related technical information on world wide web.
Strengths	Simple to use.	Photographs and computer-generated graphics enhance learning experience. Possible to reproduce or simulate work-place safety documentation.	Trainees able to communicate with each other via email and discussion groups. Access can be gained to numerous relevant databases and organisations. Built in 'peer review' process encourages trainees to discuss the case simulation with each other and enhance consistent approach to enforcement.
Weaknesses	Suitable computer hardware and technical support required. Limited functionality and computer-generated effects Little opportunity for interaction.	Suitable computer hardware and technical support required. Expensive to produce and particularly to update. Library system to organise CDROM required. No facility to communicate with other geographically remote trainees.	Suitable computer hardware and technical support required. Users may not be familiar with WWW. Internet links may take trainees out of controlled training site.

accurate data on the resources involved in developing training of this sort. Whilst the material covered by the floppy disk package could have been produced as a paper based exercise, the material presented via the CD-ROM and the Internet was highly visual and exploited the elements of these media (e.g. use of computer generated effects, hyperlinking to other useful information sources and the ability to communicate electronically with other trainees) and the information was therefore not easily transferable to a paper based exercise.

The aims and learning objectives of each package were defined and are presented in Table II.

Although acquisition of knowledge and skills is an important element of a training programme, the primary focus of this research was to examine the suitability of the differing media. Consequently, there was no attempt to report on any knowledge and/or skill gain following completion of the package. However, health and safety managers could introduce this aspect into future training experiences.

Methods

A sampling frame for selecting trainees was constructed to ensure that the three packages were tested by a range of individuals representing different employee status and different types of local authorities. Whilst every effort was made to ensure broad representation, allocation of particular packages was in some cases, limited by the availability of technology within individual LAs. The research tool randomly allocated trainees to particular packages without consideration of their preparedness to undertake the training package. Previous computing experience was not taken into account when trainees were allocated to packages because it was important to learn about their broad acceptability of these different media to a wide ability range amongst trainees.

Initially 95 trainees were recruited (32 to the disk; 33 to the CD-ROM; 30 to the Internet). The training packages were designed for delivery via computers located in the workplace. The managers of all the trainees were advised that the training should be completed at work and all agreed to this aspect. Each trainee was supplied with detailed user instructions and for the floppy disk and CD-ROM, the training disks; those using the Internet site were sent details of the web site address. In addition to completing the training package, each trainee was also asked to complete a pre and post training questionnaire and a user log. Trainees who did not complete all three items were excluded from the final analysis. Thus, a final sample of 59 trainees was obtained (14 disk, 25 CD-ROM and 20 Internet).

The pre-training questionnaire gathered personal details about the trainee, including their previous experience of computer-based technologies. The post-training questionnaire explored six aspects of the training (design and layout; training content, achievement of learning objectives; flexibility, usability and acceptability). In the user log, trainees were asked to give details of the frequency and length of time they spent using the package. No guidance as to the length of time each package should take to complete was given as this would, to some extent, be determined by a trainee's professional experience, previous use of the technology and the different reasons (e.g. refresher training for experienced officers, introduction or review for newly qualified officers) for undertaking the training.

Table II: Aims and objectives of training packages

Medium	Aims	Objectives *On completion, trainees would:*
Floppy Disk	To enable health and safety enforcement officers to apply the Health and Safety (Enforcing Authority) Regulations 1998	● be familiar with the main principles underlying the determination of the appropriate enforcement agency; ● be able to apply a systematic approach to establish the appropriate enforcement agency;
CDROM	To develop the knowledge and skills necessary to conduct a health and safety inspection of a hotel in order to monitor and evaluate compliance with relevant statutory provisions.	● recognise health and safety hazards in hotels and be able to suggest appropriate control measures to reduce associated risks; ● be able to conduct a health and safety inspection of a hotel, assess the degree of compliance with statutory requirements; ● review safety documentation and comment on its adequacy.
Internet	To develop a knowledge base about accident investigation procedures and the trainees' ability to investigate an accident.	● have developed their practical accident investigation skills; ● increased their knowledge of accident investigation procedures and practices; ● be familiar with good practice and encouraged to adopt a consistent approach to accident investigation.

The use of a control group was inappropriate since it was not possible to construct a broadly similar work based learning package in the case of accident investigation and hotel safety. A paper based training package would not adequately handle the volume of information and the extent of the visual content in the case of hotel safety and there is no direct equivalent in a local authority workplace of access to on-line information sources or the facility to discuss with other geographically remote trainees as available for the web-based accident investigation training package.

The views of managers from twelve of the LAs who had participated in the pilots were also sought about the potential of the media to provide professional development training in the future.

The evaluation considered three key areas:
Pedagogical aspects; the capability of the media to deliver training which developed the desired learning objectives:
Ergonomic aspects; the reliability, usability and flexibility of the media. These factors may determine the acceptability of the media to trainees and managers and often tend to be the overriding factor in the selection of a particular medium:
Economic aspects; what can be afforded and/or justified in terms of cost.

Results

The modest numbers involved in the trialling of each package, made significance testing inappropriate and in any case it was not the aim of the research to compare the relative acceptability of each of the three media. The results are therefore presented as percentages.

Pedagogical Aspects

Pedagogy is the science of teaching and investigates the process of learning. Many factors influence the outcomes of training programmes (Patrick, 1992) and may include; the personnel involved; the nature of the skills to be acquired; the time that can be devoted to training; the media to be employed in facilitating learning; and the opportunities available to apply the knowledge and/or skills acquired. To evaluate the pedagogical impact, trainees were asked to consider three aspects of the training package they had tested and to attach a score (on a 1-10 scale) to each. The mean scores are presented in Table III.

Those trainees who had used the CD-ROM were the most positive overall about the pedagogical aspects of the medium, although the Internet group was also enthusiastic about its potential. The floppy disk package scored lowest on all pedagogical issues, possibly as a consequence of its limited functionality and visual attractiveness.

Trainees and managers were asked more detailed questions on pedagogical issues and the results are presented below.

Design and Layout

The majority of the trainees (61%) reported that they found navigation through their package straight-forward (Disk 57%; CD-ROM 60%; Internet 65%). Overall, 64% of trainees reported that the design and layout of the package maintained their interest, although there were large differences between the groups (Disk 29%; CD-ROM 84%; Internet 65%). The poor response of the disk users may be related to the limitations inherent in delivering training on floppy disk, in that only simple graphics can be incorporated. However it may also be linked to the different subject matter covered in the packages. The content of the floppy disk was likely to be less stimulating than that contained within the CD ROM and the web based training packages.

The majority of the trainees (76%) reported that they felt in control of their learning (Disk 71%; CD-ROM 92%; Internet 60%) and 66% reported that they were satisfied that they had completed their training, although differences did arise between the groups (Disk 71%; CD-ROM 88%; Internet 35%). The floppy disk and CD-ROM users were likely to have been more familiar with these forms of technology compared to the Internet users and this may have affected the learning experience of the Internet cohort as they reported little previous experience and understanding of web based technology. The lower scores reported by the Internet group for these two aspects may reflect the importance of providing greater guidance and/or training in moving around the site and in the tasks trainees are expected to complete within the Internet packages.

Table III: Impact scores for pedagogical aspects

Factor	Score		
	Disk	CD-ROM	Internet
Design and Layout	4.8	6.8	6.2
Training content	5.5	7.9	6.9
Achievement of learning objectives	4.6	7.2	5.7
Overall average	5.0	7.3	6.3

Training content

Eighty three percent of the trainees reported that they found the training material interesting, although the disk trainees returned the lowest scores on this aspect (Disk 50%; CD-ROM 96%; Internet 90%). Overall, 27% of the trainees reported that the training was too simple for them, although this overall score was attributed mostly to the disk group (Disk 57%; CD-ROM 16%; Internet 20%).

Achievement of learning objectives

In order for trainees to have the potential to achieve the learning objectives set within the packages, two pre-requisites are necessary. Firstly, they must have the underpinning knowledge and skills pertinent to the subject matter covered by the training. Secondly they must have the technical know-how to operate the delivery medium. Both of these elements were considered in the research. Overall, the trainees reported high levels of appropriate subject knowledge and skills (81%) (Disk 86%; CD-ROM 88%; Internet 70%). However, whilst all of the disk cohort (100%) and 84% of the CD-ROM trainees felt that they had sufficient technical know-how to operate their training package, only 50% of the Internet cohort felt suitably prepared. The inexperience of the Internet cohort was also highlighted in that only three trainees reported exploring the hyperlinks within the site and only two reported visiting other web-sites whilst undertaking the training. The lack of experience in using the Internet may have important implications for the introduction of this medium for training. LAs wishing to exploit its potential will need to establish the previous Internet experience of their officers and may need to provide appropriate introductory courses to enhance their confidence in using this medium for training delivery. Nevertheless, managers must also be aware that once trainees become more skilled in the use of the web there may be a tendency for them to leave the controlled training environment to surf irrelevant sites. This aspect will need monitoring to prevent misuse.

Sixty-nine percent of the trainees reported that the learning objectives were clear, with the disk group returning the lowest scores on this aspect (Disk 57%; CD-ROM 80%; Internet 65%). Seventy-one percent of trainees reported that as a consequence of completing the training they felt more confident in undertaking the tasks covered by the package, although again, large differences arose between the groups, with the Internet trainees reporting the lowest levels of confidence (Disk 93%; CD-ROM 88%; Internet 35%).

Managers' views on pedagogical aspects

Eleven of the twelve managers interviewed thought CBT was capable of developing technical knowledge and legal and procedural application, but half of those questioned did express some reservations about its ability to develop practical skills. In particular managers were sceptical about the ability of training provided on floppy disk to enhance practical skills and two commented that this form of delivery had few, if any advantages over paper based training. In contrast, CD-ROM and web-based training was thought to be capable of contributing to the development of practical skills if packages were designed to maximise interaction and were supplemented by other forms of skills training such as peer review and coaching.

The potential of CBT to promote consistency of enforcement because each trainee received the same information was noted as a clear advantage of CBT. However it was recognised that the information provided needed to be clear and comprehensive if the opportunities for misinterpretation are to be limited.

Ergonomic Aspects

If training is to be delivered by computer, aspects such as the reliability, usability and flexibility of the hardware and software will be paramount (Ravet & Layte, 1997) and may determine whether such packages are widely adopted by LAs. With this in mind, trainees were asked to rate (on a 1-10 scale) the flexibility, usability and acceptability of the media they had tested. The mean scores are presented in Table IV.

As with the pedagogical aspects, the trainees commented favourably about the CD-ROM and were

Table IV: Impact scores for ergonomic aspects

Factor	Score		
	Disk	CD-ROM	Internet
Flexibility	5.2	6.8	6.7
Usability	6.3	6.7	5.7
Acceptability	5.9	7.7	5.9
Overall average	5.8	7.1	6.1

positive towards the Internet but less so towards a floppy disk program. Trainees and managers were asked more detailed questions relating to ergonomic aspects and these results are presented below.

Flexibility

New technologies have provided the opportunity to explore novel approaches to learning and to offer potential solutions to the challenges presented by the demands for more flexibility in the delivery of training in terms of time, location, content and form (Furst-Bowe, 1996). The vast majority (85%) of the trainees enjoyed being able to work at their own pace and this was particularly noticeable in the disk group where all trainees responded positively, compared with 84% of the CD-ROM trainees and 75% of the Internet trainees.

The complexity of the learning objectives varied between the packages and it was estimated that trainees would need approximately two hours to complete the disk package and six hours for the CD-ROM and Internet packages. Trainees were not directed about the expected completion times in order to learn more about the way in which trainees approached these packages. Fifty eight percent of the cohort did report that their normal work activities had prevented them from spending as much time as they would have liked on the package (Disk 36%; CD-ROM 72%; Internet 55%). Overall 56% of the trainees reported that they were able to work through the package without disturbance, but differences were apparent between the groups (Disk 71%; CD-ROM 64%; Internet 35%) and may be related to the amount of time required to complete the package as well as the individual experiences of the trainees. These findings raise important issues regarding the management of training. If employers move towards workbased learning they must ensure sufficient time is set aside for its completion and to facilitate reflection and the transfer of learning.

Usability

The overwhelming majority of the participants (86%) found the training medium they piloted easy to use, but differences did arise in the need for in-house support to run the programs with 14% of the disk group, 36% of the CD-ROM group and 75% of the Internet group requiring assistance. In general the programs operated without significant problems, but 44% of the CD-ROM group experienced some problems running their program, these were generally caused by local computer virus protection measures.

Acceptability

A prospective user's overall attitude toward using a computer is a major determining factor in their eventual decision as to whether to use CBT. Reluctance to use CBT cannot be overcome merely by increasing a trainee's exposure to this type of training. The user must gain in confidence, see the computer as beneficial to them, feel in control when using the computer and see the computer as an integral part of their work activities (Selwyn, 1997). The vast majority of trainees enjoyed using CBT (83%) (Disk 79%; CD-ROM 88%; Internet 80%) and 86% of the trainees expressed the wish to use the medium that they had piloted in future training programmes. Only 20% of the trainees reported that technical difficulties had discouraged them from using CBT with the Internet group reporting the highest rates (Disk 14%; CD-ROM 12%; Internet 35%).

Managers' view on ergonomic aspects

The flexibility of CBT was seen as a distinct advantage by the majority of the managers (10 out of 12). Staff were able to access CBT at any time which afforded managers flexibility in terms of staff deployment. Training sessions could therefore be rescheduled without incurring cost should an emergency arise. The majority of managers also appreciated the advantages of staff being trained on site, as this reduced training and travelling costs and avoided the need for staff to be absent from the workplace.

Two managers who did not comment favourably about this aspect were employed in LAs in which the provision of information technology equipment was limited, thus negating the flexibility CBT can offer. Several of the managers also commented on the flexibility CBT provided in terms of how the training was used. For example, the training needs of different groups of inspectors can be addressed as elements of the training can be used by newly qualified officers whilst experienced officers can use the same package for refresher training.

There were some minor technical difficulties in the use of the packages and half of the managers reported that their staff had experienced problems with the computer hardware - in some cases this was attributed to computers not being of a sufficiently high specification and in others there were insufficient machines available for use in the workplace. Such obstacles may hinder LAs wishing to the use of embrace CBT as a training medium.

All but one manager thought their staff lacked the necessary computing skills to undertake the web based training and four believed their staff did not have sufficient computing skills to make the best use of the CD-ROM and the disk based training packages. There was a general view that staff needed to become more familiar with navigation of the web before they were able to use the Internet training to its full potential.

All twelve managers were prepared to use other CD-ROM and web-based packages if they were available. Two of the eight managers whose staff piloted the disk based training did not see any future for training delivered in this way because of its limitations compared to the other media piloted. Only one of the managers commented upon the relative advantage accruing because web based training is sourced from a single point i.e. the host server. Other forms of CBT such as the floppy disk and CD ROMs require some form of library system if maximum benefits are to be obtained for the purchasing organisation. The absence of comments from other managers about this aspect may reflect their inexperience in managing CBT.

Economic Aspects

Whilst training is important and necessary, it can also be costly and organisations must maximise the return on the investments they make in training their workforce (Read & Kleiner, 1995). Several research studies have concluded that, under the right circumstances, computer based delivery systems are considerably more cost effective than classroom teaching and produce learning that is at least equal, if not superior, to that which can be achieved in a lecture (Goldstein, 1993). Economic considerations may ultimately determine whether CBT is widely used within a training framework. The costs of each package (assuming technology and equipment to support it was already available in the workplace) was estimated, based upon the time taken to develop the training content and to write the supporting software divided by an estimated number of potential purchasers. It was also assumed that 40% of LAs would purchase the packages, resulting in a predicted cost of £100 for floppy disk, £400 for CD-ROM and £100 for the Internet site. The higher cost of the CD-ROM was due to the substantially greater software development time. The Managers were then asked to comment on whether they felt that, at these prices, the training packages represented an economically viable prospect. Five of the eight managers whose staff had used the floppy disk package did not believe that this type of technology had any long-term future. Managers may however have under-estimated the potential of disk-based training in providing an alternative to paper based training materials.

Opinions as to the economic viability of the CD-ROM package varied. Two believed it to be cost effective; a further four felt it would be in areas of recurring need for training, whilst three felt that the purchase cost would be too high. Thus, whilst the CD-ROM package was enthusiastically received by both managers and trainees, financial constraints within LAs may prevent its widespread adoption as a training medium.

All of the managers agreed that the Internet training package provided at this price would be cost effective, although one manager did raise concerns about the recurrent costs of working on-line. However, with recent developments in on-line pricing this is unlikely to be a future concern.

Discussion and Conclusions

Following evaluation of the packages developed within the research project it is clear that the use of CBT within LAs does provide an acceptable delivery mode for health and safety enforcement officer training. CBT provides an innovative and flexible medium through which theory and worked examples can be combined into workbased training packages which are trainee centred. The indications are that CBT has the potential to extend and augment the range of training methods presently employed

Although the group piloting the Internet package did experience some difficulties in its use, both trainees and managers acknowledged the pedagogical and ergonomic potential of this medium to deliver training. Managers clearly viewed the Internet as the most economically viable means of addressing professional development of their health and safety enforcement staff in the future. Evaluation of the Internet package did however highlight the critical importance of managing the introduction and implementation of web-based training within LAs. Only 30% of the Internet trainees believed they had the necessary technical expertise and pre-requisite knowledge to undertake the training. Lack of familiarity with the medium was evidenced by their inability to exploit features such as hyperlinks and on-line discussion groups which were incorporated to facilitate learning. Inexperience with the Internet must therefore be addressed if its potential as a delivery method is to be realised. Its use may require more careful management compared to more familiar CBT media. Time may need to be ring-fenced to ensure trainees have an effective training experience and further consideration may need to be given to the design of the package to incorporate tasks that necessitate the use of features such as on-line searching and discussion groups. In addition to clarifying the tasks and milestones within the training, these activities will facilitate the development of navigation skills around the site.

Previous research has suggested that resource limitations and inappropriate content of courses are two of the key problems facing LAs (Prince et al., 1994). CBT offers a solution to these difficulties if LAs work collectively to commission and finance the development and production of web based training. The training content can be designed to address specific training requirements at a reasonable cost. Other advantages are that the input of experts can be harnessed; expert input is only required in the development stage and once captured it can be made available on a wide geographical scale and over a

prolonged period of time. Financial savings are also realised because staff complete the training within the workplace at a time which is tailored to accommodate the demands of the employer, rather than a training provider. Managers commented that the provision of CBT enabling all enforcement officers throughout England, Wales and Scotland to receive the same training irrespective of location and time would make a major contribution to the achievement of consistency in enforcement. Assuming that the training content is up to date, CBT can be used repeatedly over a number of years ensuring all officers receive the same information. This is very different from the traditional forms of training in which the content varies depending upon the individual trainer's delivery. Trainees may interpret the messages they receive in different ways and some of the managers pointed out that there was a need within CBT to include self assessment exercises that monitor the understanding and progress of trainees. The real issue is the way in which the training is transferred into the work setting and one of the key aims is to seek consistency in enforcement. It was not possible within the limitations of the project to examine the effects of the training on consistency of enforcement. However it is unlikely that there will be consistency in enforcement if officers are not provided with the same information in the first instance.

There are a number of pedagogical advantages in using CBT. It provides an opportunity for learners to adopt differing learning styles or strategies - an aspect which is not normally addressed in traditional lecture-based programmes (Patrick, 1992). Repeated access to the material provides an instant refresher course to those working in a particular area, or a general introduction to those who may be moving into a new area of work. The layering of material accommodates a range of abilities and prior knowledge and enables trainees to work through the material at their own pace. Engaging trainees through interaction with the medium can also support deep learning and encourage the trainee to validate knowledge through experimentation (Kolb, 1984).

Computer based training (CBT) is increasingly an integral element of professional development in the workplace and has the potential to improve the effectiveness of LA health and safety inspector training in a number of important ways. However, it is important to recognise that CBT introduces new demands on both the trainees and their employers (Robinson, et al., 1998). CBT moves control of the material covered to the trainee and therefore requires a more pro-active approach to learning. Managers must recognise a fundamental change in the way in which they organise training provision (Reeve et al., 1998). A shift towards training in the workplace requires them to organise and oversee the achievement of learning objectives as trainees progress through the training packages. If trainees and organisations are unclear about the management of this process, motivation to complete the training may diminish (Keeling et al., 1998). Failure to acknowledge the time and support needed to acquire new study skills may result in alienation (Lund & Volet, 1998). In order to promote successful implementation of CBT, empirical research that explores not only knowledge acquisition but also the impact of various contextual factors and personal characteristics on the effectiveness, productivity and success of CBT is essential to implementing health and safety enforcement officer training within Local Authorities.

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Quality and Health and Safety may not always be two sides of the same coin – a lesson from the service sector for managers and enforcers

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Abstract

This paper examines the common assumption that quality objectives in an organisation are consistent with good health and safety practice. It begins by discussing the idea itself and its theoretical limitations before examining its genesis. It then looks at the history of quality and the language of quality within a wider management context. This is followed by a discussion of the viability of a current commentary on quality and health and safety. Having anchored the paper in the context of the service industry, the paper goes on to describe an aspect of an empirical study based in catering. The study consisted of a series of observations, a programme of physical environmental monitoring, interviews of 11 lecturer chefs, second interviews, and finally a feedback session. This helped to throw light on how quality and health and safety fit into the less predictable environment of service industries. The main finding is that as service time approaches, the importance of quality ascends while health and safety issues are relegated. Using this finding, a potential contradiction between quality management and risk management is identified. The findings are discussed in the context of possible solutions which derive from both pragmatic and theoretical perspectives. These are based on ideas generated in the coal industry regarding the separation of production and safety duties and the ideas suggested from the application of contingency theory. The paper advocates, among other things, the acceptance of the implications of working in an organic as opposed to a mechanistic industry and its implications for training, especially of kitchen workers. Such training should be sufficient to help them to know not only what to do, but also to help them to make independent (and safe) decisions in the kitchen environment.

Key Words: Catering, environmental health, health and safety, management, quality, service industries

Introduction

In managing health and safety, especially over the last fifteen years, there has been a desire to sell safety to organisations by attaching it to other outcomes desirable to the organisation. Health and Safety, like other issues, has been active, not only in reinventing itself in current language and trends, but also in seeking to subsume itself within a category which, in consequence, attaches itself to those desirable outcomes.

The most obvious example of the above, over the years, has been the trend to demonstrate the contribution that health and safety initiatives can make to the 'bottom line' (to the profitability) of the organisation by reducing costs (HSE 1997, Willson 1985). The language has paralleled that of management theory with 'efficiency' giving way to 'effectiveness' giving way to 'loss management' giving way to 'risk management'. Lately the desire to be 'green' and environmentally friendly has made its mark on health and safety, as has the jargon of 'quality' and of 'integrated management systems'. While no one could argue with the view that health and safety is a management issue, it tends to sell itself by attachment to 'management' within the status aspect of the post 'manager'. This approach relies on a concept of management which is related by Braverman (1974) in his description of Taylor's concept of scientific management, i.e. it is not part of the worker's job, but rather it is the province of a separate stratum of 'managers'. This is as opposed to management being an abstract process that runs through every operation and is contributed to by all levels of worker in an organisation.

Seeing other management objectives as being compatible with Health and Safety is most neatly encapsulated by the Health and Safety Executive (HSE) when they wrote "Quality and Health and Safety are two sides of the same coin" (Health and Safety Executive 1992:12). This paper argues that there are limits to the usefulness of such language and that it can become self-defeating and even straightforwardly wrong.

Cost Effectiveness and Health and Safety

It has been argued that good health and safety can save money for an organisation (HSE, 1997). The message that an organisation should promote safe and healthy behaviour among its workers because it saves money carries the implicit corollary, however, that as soon as it ceases to show a return (or even a reasonable return) the effort should stop. Willson's (1985) discussion of Magneti Marelli in Inter-war Italy gives an example of a company actually admitting this when their health and safety policy was said, at first, to operate "simply as a question of benevolence of the employers" (page 252 Willson 1985). The emphasis soon changed and the policy was said to be self-financing, the factory doctor suggesting that the occupational health effort was kept "in proportion to the increased profit yielded, otherwise it would be uneconomic" (Corregiaria in Willson 1985:253).

Quality and Health and Safety

While quality may be a stepping-stone on the journey to profitability in the current orthodoxy, it is worth considering separately because of the emphasis that is currently placed on it and also because the 'quality process' has become a template for much management activity.

The suggestion of a link between quality and health and safety has been around for some time, but one of the earliest promoters was Cooper (1992) who suggested that good quality emerges from good health and safety practice. Since then a series of British Standards has been embraced by many UK companies as the way to manage and to achieve, among other things, good standards of health and safety. They tend to advocate a prescriptive route. Thus BS8800:1996 (British Standards Institute 1996a), for example, tells us that a safety management system should follow the route of HS(G)65 (HSE1997) or else that of BS EN ISO 140001:1996 (British Standards Institute 1996b). Both describe pathways to be taken in order to manage safety which involve analysis of flow, identification of problem areas and the development and implementation of strategies to address them.

Behind the idea of linking quality and health and safety is a history of application of systems' theory to the workplace, an early example being the work of the Tavistock Institute's model of socio-technical systems and used at least as early as 1951 (see Trist et al 1963). A development of the system as an analytical tool was the management control system which, in turn, is a form of feedback system usually compared to a refrigerator thermostat: the target (desired temperature) is set, the outcome (actual temperature) is monitored and compared constantly, and feedback results in an adjustment (the motor is operated accordingly).

Ever since its application, a system's approach has been a very powerful analytical tool used by organisations on many facets of their operation, including protecting the health and safety of employees (see for example Ragan and Carder 1994). Its characteristics and its universality of application can explain the attraction of wishing to integrate the analyses into one great system with the hope of optimising outcomes on all fronts.

The quality process as described by various bodies including the European Centre for Total Quality Management (Osborne and Zairi 1997) is a variant of the Management Control System (MCS) model; thus standards are set, systems are put in place, and outcomes are monitored and compared to the standards, etc. with adjustments being made where there are differences between outputs and standards. Their examination of the HSE model (HSE 1992) brought out the similarities between it and their own model of Total Quality Management (TQM); they saw the HSE model as "a model for TQM" (Osborne and Zairi 1997:5). In this way we can see two types of link that can be made between systems intended to promote health and safety and TQMs. The first is to redefine the MCS model as a TQM model. Thus might one say that any systematic approach (which goes through the process of defining standards, monitoring, comparing, etc.) to health and safety is the application of a TQM approach. To be concerned about this is merely to argue about which is the correct label and definition of a process: the principles, however, are clear and laudable. The second link is to see the systems as compatible and mutual, i.e. that they can form part of the same system where quality and health and safety neither compete nor sub-optimise each other. This latter view is the "ideal" for Osborne and Zairi (1997) and is one promoted by many writers including Lischeid who saw a "natural fit between safety and quality" with safety being "just one of the many facets that must be addressed when a company embraces total quality management" (Lischeid 1994). Again no one could argue with such an aspiration if the outcome is a safe and healthy workforce.

The belief that the quality approach will also promote health and safety rests on the assumption that an organisation can plan its production i.e. that from the outset the stages and steps are all totally predictable and that there is full control over each of them. Lord Robens (Great Britain, 1972) wrote with such planned production in mind (and with the factory as its archetype). The assumption that all

work in the UK followed this mode of production with a linear advance to completion enabled the systems analysts of the day to map out the production flow. Efficiency, quality, and health and safety (and environment, etc.) could then be considered along the flow-line permitting interventions to be made with the intention of improving the situation.

The simplest example would be that of the factory line where each input and its amount is known relative to the production process and the output. Thus for a desired final output, the actual amounts of each input can be fixed and the rate at which they feed into the process can be derived. This can then be used as the basis for a number of 'risk assessment' techniques such as HAZOP (Knieff et al, 1991).

Howard and Maguire (2001) have already questioned the application of the above assumption regarding plannability, linearity etc., to the service industries. In particular, the nature of production in the service industries is far from planned or plannable. Production activity is geared by the time of customer service which takes place in an unpredictable environment: they must meet, and even exceed (Maguire and Howard, 2001), customer expectation without knowing those customers (i.e. their preferences or sometimes even their numbers) until they turn up. The expectations of the customer in this sector of commerce include, however, service of the meal on the plate to the customer at the time agreed and not five minutes later.

A small part of a larger research programme is now reported for the first time which is used to further discussion on how quality management impinges on health and safety management in one particular part of the service sector.

Method

While a fuller description of the methods used in the earlier phases of the study are described in Maguire and Howard (2001), in summary they were as follows:

- an examination of national data regarding reported incidents for the catering industry;
- three extended periods of observation in teaching kitchens in a hotel school;
- an examination of the 'accident book' records for the same hotel school;
- continuous measurements made of temperature and noise between 08.00 hrs and 15.00 hrs for one day in one of the teaching kitchens;
- unstructured interviews of eleven chef-lecturers;
- a second follow-up of semi-structured interviews with two of the more senior chefs

For this part of the study, a meeting was held consisting of ten of the eleven chef-lecturer participants in the interviews plus the author and his fellow researcher. The meeting was run on the lines of Melucci's feedback sessions used in his studies of collective action in the 1980s (Melucci 1989, 1996). In summary, Melucci collected a variety of information, including individual discussions with members of the movement under study, and fed them back to the assembled group in order to encourage reflection.

Prior to the meeting, analysis had been made of the observations, interview transcriptions, and the physical measurements which resulted in a series of topics and issues being identified. At the meeting the following procedure was used:
The topics/issues were fed back to the group by:

- identifying the topic/issue abstracted from the above analysis;
- substantiating the topic/issue by quotations given during the interviews, personal observations made by the researchers, or actual readings of the physical environment measures;
- the comments of the chef-lecturers were sought as to the reasonableness of the interpretations;
- further comments were sought to develop the themes identified.

Results

For a discussion of the results from the earlier phases of the study see Maguire and Howard (2001). In summary, however, the main themes that emerged from the these phases were:

- the unique management status of the chef (degree of autonomy and autocracy);
- the social environment in which catering operates; and
- the "kitchen crescendo" (i.e. the increasing activity towards service time which was accompanied with increased heat and noise and resulted in a change in health and safety expectations and actions).

The crescendo was evidenced in the interviews and also the physical measures, especially of temperature (see Table I). Noise levels revealed a general increase from a visual average of 75dB(A) to a visual average of 80 dB(A) but, as is to be expected with the intermittent nature of kitchen sounds (voices and metallic equipment in a highly reverberent environment), these were far from constant with peaks up to 95 dB(A).

The participants in the group discussion agreed that the above themes described the environment in which they worked and they agreed with the existence of the "kitchen crescendo". They were particularly supportive of the existence of a threshold shift in acceptable 'safe' behaviour during the crescendo, i.e. that as things 'hotted up' chefs in commercial kitchens expected and tolerated lower standards of safety.

Table I: Spot temperatures over time found in a catering kitchen

(for full details see Maguire and Howard 2001)

Time	Temperature (°C)
08.30	21
09.30	23
10.30	23.5
11.30	27
12.00 (service time)	30
12.30	31
13.30	29.5
13.30	30

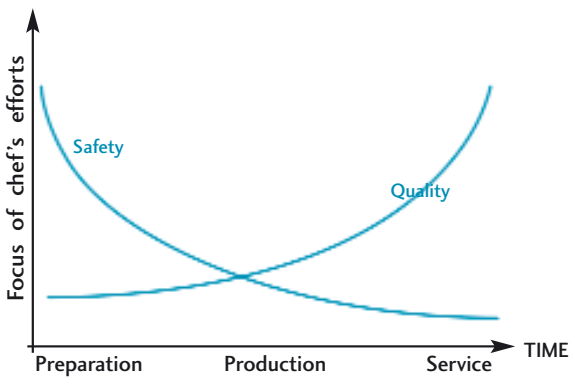
When asked to develop and comment on the 'kitchen crescendo', one chef-lecturer insightfully commented that towards the arrival of service time, chefs become focused on quality, i.e. their attention becomes less concerned with the process of food production (and health and safety) and more with its presentation: "95% is just focusing on the quality of the food" (field notes 6th July 2000).

In this study quality's ascendancy is at the expense of health and safety.

Elaborating the above theme, another chef lecturer stated that
"In preparation time, chef manages the operation. It is true management" but that "at service time, chef takes on the quality role" (field notes 6th. July 2000). This was developed by another chef-lecturer who pointed out that when the chef concentrates on the quality, it "allows others in the kitchen to take on the autonomy" (field notes 6th. July 2000).

These points are shown a descriptive 'graph' charting the shift in focus of the chef during activity in the kitchen (see Figure 1).

Figure 1. Shift in chef's focus of management in a catering kitchen over time.



Discussion

This potential for lack of proper safety management does not fit with Robens model of health and safety which includes self regulation as one of its three pillars (Dawson et al, 1988). Dawson et al. (1988) discuss at length the dilemma for first line managers with the emphasis, either tacitly or explicitly, being on production.

While health and safety incidents do occur throughout the preparation, production, and service (Maguire and Howard 2001), they tend to be less severe in the earlier part. It is suggested that the pressure which leads to the threshold shift in safety behaviour (the 'kitchen crescendo' – see above) is driven by:

- the nature of the service industry;
- the need to maintain customers and therefore;
- the paramount emphasis on quality at the expense of other matters including the health and safety of the workers.

It is also the case that the early stages of food preparation and production are more standardised, more controllable, and therefore the attention to quality is less demanding.

The shift in emphasis from health and safety to quality is in direct contrast with the implicit model used by Robens (Great Britain, 1972) and the HSE (1997) which, at its simplest, may be considered as two lines running in parallel with each other (preferably with equally high effort) (see Figure 2a), or, if plotted against each other, would approach perfect correlation (see Figure 2b).

Such an ideal model is not only a practical impossibility, it actually goes against the theory of risk management which sees different tasks taking on different degrees of significance (risk) at different times during the production.

A model of quality militating against safety challenges a current principle for both management and enforcement of health and safety. It certainly suggests that Osborne and Zairi's (1997) ideal is not so easily achieved. While one may hope for some aspects to mesh together, this study supports other work (see discussion of Dawson et al 1988 above) suggesting that quality targets may compete with, and win out, over health and safety targets.

Figure 2a. Ideal management focus during production

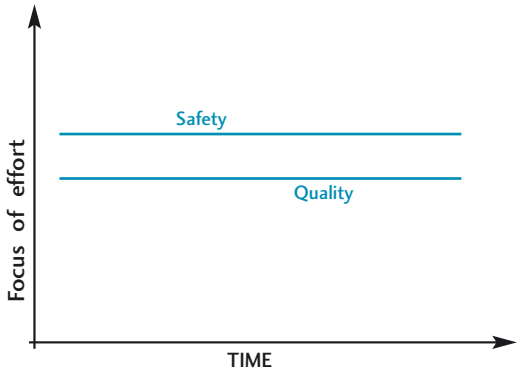
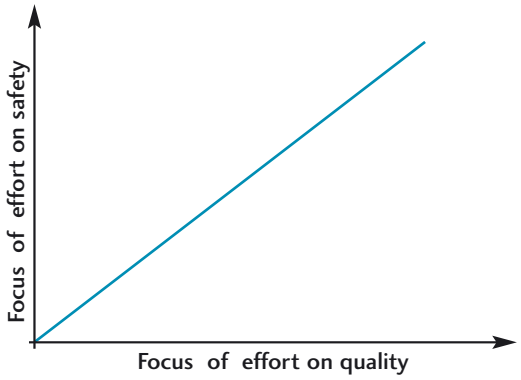


Figure 2b. Equal focus by chef on safety and quality throughout production



If the manager (here the chef) is responsible for managing health and safety and yet her or his traditional role in quality management works against this, then an alternative strategy for ensuring the health and safety of the kitchen workers must be found.

Responses

Two possible responses to this situation are discussed: one more theoretical (arising from contingency theory), one more pragmatic (an example from the mining industry). Both teach the same lesson.

Contingency theory

In essence this says that there is no 'one best way' of running an organisation, rather that the form and organisation of an organisation is contingent upon the nature of the business (see Perrow 1970). Thus management structures depend not on the personal style of the individual who is 'in charge' but rather on the type of work carried out and the nature of the environment in which the work operates.

The originators of contingency theory, Burns and Stalker, concluded from their study that "there is no set of single principles for 'good organisation'" (Burns and Stalker 1966: viii) and they made a simple but very useful distinction between mechanistic and organismic (often abbreviated to "organic") systems of management. Mechanistic systems exist under relatively stable conditions, enabling more explicit and predictable ways of working where "methods, duties and powers attached to each functional role are precisely defined (ibid:5). Organic systems exist in unstable conditions where change occurs and problems and needs for action cannot be so easily predicted and broken down. Here "individuals have to perform their special roles in the light of their knowledge of the tasks" (ibid:6).

It would appear that the HSE considers the mechanistic model to be the only model of management. It can also be argued that the HSE's view cannot work with the service industry because of its organic nature.

An example from mining

Catering is not the only business where there are competing interests of safety and production and where production is far from a smooth predictable pathway. A pragmatic management answer to the chef having irreconcilable duties may rest with separation of duties and of the personnel responsible, a model of management with which Robens must have been familiar since it exists in the coalfields from where he drew much of his inspiration. In the coal fields, despite mechanisation etc. production is far from the factory archetype discussed above; rather each member of the team has an important role in responding to the unpredictability that may be met. In Burns and Stalker's (1966) terminology, it is more towards the 'organic' end of a mechanistic-organic continuum.

In view of the unpredictability and consequent danger in mining, there is a post of pit deputy who must, by law, be appointed for each district within the field; their main duty is of safety rather than production (this is the concern of the colliery manager). Such an approach can be viewed as a 'commissar' for safety. While there may be little surface (sic) difference between the coal face and the kitchen, the common structural feature of a more organic organisation suggests that the coal field model for managing health and safety (with a separate person who has not only responsibility, but also power, for health and safety) may have lessons for the catering industry.

It is accepted, however, that numbers in the majority of catering kitchens are insufficient for the suggested separation of management duties. This takes us back to the lesson for organic systems of operation.

The Lesson

Where there cannot be a separation of duties, the alternative might be acceptance of an organic approach and its implications. Wilson (1989), in his analysis of the construction industry, argues that, in organic systems, the greatest positive influences on safety are self-regulation and learning through the setting of good example and gaining experience. Implicit in this is that the worker (here the catering worker) must gain sufficient understanding to make good decisions about health and safety in this less predictable work environment.

While the kitchen is more predicable than the construction site and there is probably more formal training of kitchen workers, the inculcation of safety awareness and the skill to assess the safety of a situation are equally necessary. Fortunately, the training of kitchen workers has a long tradition of being in 'real working environments' (an expression in the catering colleges referring to use of kitchen-based training sessions that result in a meal being served to customers). Such a training environment can include the consideration of safety and would allow the other kitchen member(s) to exercise the autonomy suggested by the chef above in relation to safety (see results section).

Conclusions

This paper suggests that the idea of managing quality and health and safety is only a straightforward concurrent process within a mechanistic style of production. While there is always a potential conflict between the two, they are not easily reconcilable in the service industry which approaches an organic style of operation. It is accepted that the principles of MCS/TQM models are excellent and praiseworthy and that they can be used in order to manage health and safety. When the targets clash, however, alternative strategies have to be adopted which ensure the primacy of health and safety. For this part of the economy possible alternatives involve dedicated powerful personnel or relying on individual training and competence in assessing safety.

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The perceived importance of cockroach [Blatta orientalis (L.) and Blattella germanica (L.)] infestation to social housing residents

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Abstract

This paper reviews published work on injury levels, particularly aesthetic injury levels, in respect of cockroach infestations in housing. The term "injury level" is used here to mean the pest population level (measured in terms of insect numbers or activity) at which the victim (in this case the tenant), suffers injury. The injury itself may be physical, psychological or economic. That is, the insects may spread disease, cause distress or damage property e.g. food. This paper discusses the importance of victims' perceptions of injury in cockroach control programmes. It is argued that these perceptions of injury are important, especially in terms of psychological injury actually suffered. They also influence the likelihood of the tenant taking action themselves to control the infestation and also determine the level of satisfaction with pest control services. The paper then reports the findings of an initial study which examined the relative perceptions of residents regarding cockroach infestations as compared to other common housing problems, e.g. dampness, poor security, poor repair. The results of this study showed that residents who had experience of infestation in their dwellings were more tolerant of cockroach infestation than those who had not. This finding is consistent with that of an earlier study which suggested that as pest numbers increase, victims' tolerance increases. In the case reported here, however, the perceived importance of cockroach infestation was considered relative to other housing defects rather than cockroach abundance. The relevance of the above to cockroach control programmes and customer satisfaction is discussed.

Key Words: Blatta orientalis, Blattella germanica , cockroach, environmental health, infestation.

Introduction

Cockroach infestation in the UK, although less widespread and less common than in, for example, the USA, remains a serious problem in some areas. This is important in terms of public health not only through the long established capacity of cockroaches to carry pathogenic organisms but also because of the risk of cockroach infestations causing asthma and other allergic disease, evidence for which is now accumulating.

The ultimate success of cockroach control programmes is dependent upon the degree of satisfaction and therefore the perceptions of those who have to live in cockroach infested environments. This point is particularly important, as cockroach infestations are often impossible to eliminate, so the preference expressed by many people for zero infestation is sometimes not achievable.

This paper will report the findings of an initial exploratory study into the perceptions of social housing tenants in a south London borough regarding the importance of cockroach infestation. The published literature on the health effects of cockroach infestation will be reviewed and the importance of setting injury levels and tolerance thresholds in cockroach management programmes will be explained. The indicative findings of this study will then be used to secure an indication of tenants' perceptions of the importance of cockroach infestation as compared to other common housing defects.

The risks to human health from cockroach infestations

It has been established for some time that cockroaches are able to carry pathogenic bacteria onto food (Morrell 1911, Antonelli 1930, Bitter & Williams 1949, Alcamo & Frishman 1980, Brenner, Koehler & Patterson 1987). This clearly demonstrates the potential for cockroach infestations to be responsible for food poisoning outbreaks. Causative links between infestations and outbreaks have been more difficult to demonstrate. Another risk to human health arises from the ability of cockroach tissue and fras to cause allergic reactions that can be very serious for some sufferers. Kang & Chang 1985 and Kang et al 1987 found evidence that exposure to german cockroach Blattella germanica (L) populations appeared to be responsible for atopic and allergic reactions in people living in cockroach infested environments.

More recently Arlian, (2002) has pointed out that large numbers of people are affected by arthropod allergy in the U.S. and that cockroach allergy is a major factor in this. Asthma has been found to be associated with reported cockroach infestation (Lwebuga-Mukasa et al 2002), and exposure (Kane et al 1999). More specifically, Rosenstreich et al (1997) found associations between environmental cockroach allergen concentration and sensitivity among 476 children with asthma. 36.8% were allergic to cockroach allergens.

Evans and Kantrowitz, (2002) concluded that exposure to cockroach allergen was a factor in the socio-economic status-health gradient in the U.S. This is supported by the findings of Rauh, Chew and Garfinkel, (2002) who found higher cockroach allergen levels in houses that were in poorer states of repair. Alp et al, (2001) concluded from their field research that cockroach allergen sensitivity starts early in life and may be the only sensitising allergen in many young inner-city children. Arruda et al, (2001) also pointed out that cockroach allergen exposure was associated with asthma and allergy especially in lower socio-economic groups and exposure in the first three months of life was associated with asthma. They also make the interesting observation that Cockroach asthma is an important public health problem that affects patients who are likely to be the least compliant with treatment with asthma medications or environmental control.

Cockroach infestation can, of course, also produce additional health risks as a product of the control measures employed. Wyatt et al, (2002) expressed concern over levels of pesticide use and consequent indoor pesticide residual concentrations in a study of pregnant women from minority groups in the U.S. Davis and Ahmed, (1998) similarly expressed concern over indoor exposure to chlorpyrifos used to control cockroaches.

Finally it is not unreasonable to suggest that the intense disgust felt by many people towards cockroaches, especially when they are in contact with human food, is likely to produce psychological effects and consequent risks to mental health.

The control and management of cockroach infestations

Cockroach infestations have often proved particularly difficult to control, (Bennett and Owen 1986, Beasley, Oldbury & Owens 1988, Rivault and Cloarec 1996). This difficulty arises from a range of factors, some of which are unique to cockroaches, others of which apply to insect pests generally.

Firstly cockroaches are nocturnal crevice living species that are difficult to reach with pesticides. They are not seen during the daytime so their exact location and activity may not be noticed. Their bodies are dorso-ventrally compressed and they can therefore find harbourage in very small crevices, as small as a few millimetres in width in the case of the nymphs. This makes them difficult to spot, for example behind loose wallpaper and architraves, and difficult to reach with insecticidal sprays.

Years of difficulty in controlling cockroach infestations have led to the application of large quantities of various pesticides over long periods. This has resulted in significant resistance to insecticides in many pest cockroach populations (Batth 1977, Cochran 1989, Rust & Reirson 1991). More specifically resistance to organophosphate, carbamate and especially pyrethroid insecticides were found in three strains of Blattella germanica collected in London by Chapman, Learmount and Pinniger, (1993).

To reduce pesticide application and target the pest species more accurately, thus reducing the potential for inducing resistance, a range of pesticides applied as bait have been developed (Milo, Koehler and Patterson 1986, Lucas, Invest and Dodd 1992). Many of these baits have been based upon hydramethylnon, which has a different mode of action to products commonly used in the past such as organochlorines organophosphates, carbamates and pyrethroids (Lucas & Invest 1993) thus reducing the risk of cross resistance. Resistance to a pesticide also tends to lead to the application of more pesticide in an attempt to increase the number of insects killed. This itself will provide pressure for further resistance and can endanger non-target species. Control using insect growth regulators which reduce the risk to non-target, at least non-target insect, species has also been used (Reid, Bennett & Yonker 1990, Evans 1993).

The abundance of cockroaches has also been linked to various environmental factors such as cleanliness and human density (Rivault and Cloarec 1996). Similarly Shah, Learmount and Pinniger, (1996) found cockroach infestation levels to be related to hygiene levels in individual flats and, in larger blocks, to district heating.

Integrated Pest Management

Because of the problems encountered in controlling pest populations, and in some cases the impossibility of eliminating the pest species completely, the concept of integrated pest management (IPM) has been developed. This concept was originally introduced in agricultural pest situations as integrated pest control (Stern et al 1959) where natural biological control mechanisms were optimised. This was later developed into integrated pest

management, defined then as "the reduction of pest problems by actions selected after the life systems of the pests are understood and the ecological as well as economic consequences of these actions have been predicted, as accurately as possible, to be in the best interests of mankind" (Rabb 1970). In many respects this definition remains valid today. Another definition was offered by Smith and Reynolds (1966): "a pest population management system that utilises all suitable techniques in a compatible manner to reduce pest populations and maintain them at levels below those causing economic injury".

Integrated pest management applies a thorough understanding of the ecology of the pest species to optimise control strategies. More importantly it accepts that elimination, even temporarily, of the pests is sometimes impossible. This requires the establishment of some sort of injury level up to which pest populations will be tolerated. In agriculture this level is described as the "economic injury level" and can be calculated from economic damage to crops and the costs of avoiding that damage. In environmental health pest control where risks to human health are complex, establishing an "injury" level is much more difficult. This task was undertaken by Zungoli and Robinson (1984) who discussed the concept of an "aesthetic injury level". One author of the work reported here has, however, experienced hostility to the term "aesthetic injury level" from public housing tenants who rightly pointed that their main objections to insect pests were based upon concern about health risks rather than aesthetic considerations.

Perceptions of the seriousness of cockroach infestations

The perceptions and attitudes of those who suffer cockroach infestation are important in designing effective cockroach control strategies. This is because it is these perceptions and attitudes that will be used to determine tolerance and injury levels for integrated pest management programmes. This process is complicated by the fact that it is very difficult to quantify, even approximately, the risks to human health of cockroach infestation. Furthermore, the victim's perception of the importance of cockroach infestation contributes to the actual psychological harm suffered by that person.

Another reason that the perception of the importance of cockroach infestation is important is that this will influence the actions that victims take to prevent or reduce cockroach infestation. For example, those who view cockroach infestation as very harmful are likely to pay more attention to good hygiene and other preventive measures. They are also more likely to instigate or apply immediate control measures.

The fact that cockroach infestations sometimes cannot be permanently, or sometimes even temporarily, removed from buildings is also important. People in the UK are generally unaccustomed to cockroaches and therefore expect their homes to be cockroach free. It is difficult, therefore, to persuade them to accept any, even temporary, level of cockroach infestation. This leads to the suggestion of an aesthetic injury level of nil, which, it has previously been pointed out, is sometimes impossible to achieve.

The London Borough of Southwark and the survey site

The London Borough of Southwark is located on the south bank of the river Thames, facing the City of London. The borough has the largest public housing stock of the London authorities with 50,843 dwellings and 11,870 under the control of housing associations. Southwark has in the past suffered severe deprivation in parts of the borough but, more recently, has undergone a period of dramatic regeneration and improvement of its housing stock and the general environment. Around £250m has been budgeted for this goal (Southwark Housing Report 1999).

In 1988 the Council set up an in-house team to deal with complaints of pest infestations. The Council routinely monitors housing for pest infestations on a sample basis and monitors recently infested houses for a period after treatment has been completed. This policy has resulted in a reducing budget for pest control as overall numbers of pests reduce. There remain, however, a number of 'hot spots' where severe infestations of cockroaches, pharaoh ants and mice occur despite intensive pest control activities.

The Cossall Estate

The study reported here was conducted on the Cossall Estate. This consists of 421 apartments contained in eight three-storey blocks. The buildings were built within the last 20 years, have cavity walls and central (district) heating. The estate has a history of cockroach infestation, Blatta orientalis (L.) and Blattella germanica (L.). At the time of the study 15.7% of the apartments were infested with cockroaches.

Methods

A quantitative questionnaire was used for the study. This was delivered face-to-face in all cases. Because of the nature of the data collected it was considered essential that all efforts be made to obtain access to as many dwellings as possible of those chosen to survey. This would also reduce the extent to which the samples were self-selecting. The final response rate was 80%.

The quality of the data collected in terms of their validity depended, to a large extent, upon the degree to which respondents trusted the interviewer and supported the study. To this end approval was obtained from the senior management of Southwark housing department. Also, letters were sent to households chosen for the samples in advance of the questionnaire visit. In this letter the tenants were told of the Council's support for the project as well as its overall objectives and were invited to contact the researchers to discuss any concerns they might have or to ask not to be visited. A number of people took up this offer. The interviewer was himself a resident of Southwark.

The questionnaire itself was also piloted to ensure that the questions asked and the method of delivery were appropriate.

The Cossall estate was chosen for the study because it had a relatively high level of recent cockroach infestation. Thirty dwellings with records of current cockroach infestation were chosen and thirty with no record of cockroach infestation. Of these sixty dwellings appropriate access was obtained to forty-eight (80%). This level of access was obtained by repeatedly calling back to flats where no one was found at home at the first visit, in the evenings and at weekends if necessary, until it was established that all had been done to obtain access. Some residents were never found at home despite repeated visits. Very few residents refused completely to take part. It is suggested that the high level of access obtained in this study improved the validity and reliability of the findings.

The questionnaire consisted of closed and open questions. It was refined by five pilot interviews. These included a number of sets of similar questions intended both to test the effectiveness of various forms of wording and to enable the validity of the questionnaire to be assessed by looking at the consistency of the responses. The responses were highly associated demonstrating a high degree of validity in the pilot. Even in the case of closed questions, considerable explanation was often given and emphasis was always placed upon a clear understanding of the question by the respondent rather than precise replication of the question itself to each respondent. The overall purpose of the questionnaire was to explore respondents' experience of, and attitudes to, pest infestations. Although the study consisted initially of thirty 'infested' and thirty 'non-infested' dwellings, these were provisional classifications. The perceived infestation status of each dwelling was established during the interview itself by asking the respondents if they had recently seen cockroaches in their homes.

Tenants were asked how long they had lived at their current address. This was to remove from the study those who had moved in over the last few weeks and whose recent experience of pest infestation did not relate to their current home. Tenants were then asked if they had seen any pest species in their dwelling recently as described above. Responses to this question included descriptions of, among others, cockroaches, mice (Mus domesticus), pharaoh ants (Monomorium pharaonis L.) and ghost ants (Tapinoma melanocephalum. Fab.). Tenants were then asked to describe the pest species that they had seen and, by careful questioning and non-specific prompting, it was ascertained whether or not the tenants were describing cockroaches and, where possible, if these were Blatta orientalis or Blattella germanica.

In the manner described above, dwellings were classified as 'infested' or 'non-infested'. In several cases those provisionally classified by Southwark Council as infested were found, upon questioning the tenants, to be non-infested and vice versa. It is accepted that there is likely to have been a number of dwellings that were infested but where the tenant was not aware of the infestation. This will not have adversely affected the study reported here as the questions related to tenants experience and perceptions of pest infestations rather than the actual infestation level of their houses.

The tenants were then asked a series of questions relating to their perceptions of cockroach infestation. These questions included their overall view of the seriousness of cockroach infestation, their views of the harmful effects of cockroach infestation, and the seriousness of cockroach infestation as compared to other common housing problems such as 'dampness', 'poor security', 'poor repair' and 'poor heating'. Respondents were also asked to make a comparison of cockroach infestation and infestation with other pest species. In all comparisons the parameters were explained in terms of a 'word picture'. The "word picture" consisted of an explanation of the parameters being compared. In the case of cockroach infestation, for example, the frequency and location of cockroach sightings, debris and contamination of food envisaged was described. Respondents were also invited to ask questions to clarify their interpretations of the descriptions given. Thus the "word picture" technique was used so that tenants were able, as far as possible, to compare similar situations in each case. The process was repeated for each parameter for example; the nature and degree of, e.g. 'dampness', was described with examples and confirmation was sought that the respondents understood the conditions that were being compared. Respondents were also given the opportunity in all cases to say that the two choices in the question were of equal importance to them. It is considered unlikely that people really did have precisely the same attitude to the various parameters of poor housing conditions that were compared. The opportunity to rate choices as equal, however, meant that those who did not have a definite or strong

opinion were excluded from the data. Finally tenants were asked questions on whom, if anyone, they considered responsible for cockroach infestations and what they thought of the Local Authority pest control service.

In the results, differences between responses were tested for significance using the Chi-squared test. Significance is expressed as probability, (p).

Results

The data presented here form part of a wider study that was undertaken by the first author of this paper. That study examined tenants perceptions of a range of factors and, indeed, included a number of pest species. The data, therefore, are drawn from what are often quite small samples. This has made conventional statistical analysis difficult. Having said this, the method employed is considered to be particularly valid as participants were always offered a 'don't know' or 'equal ranking' choice box. Furthermore, participants from dwellings described as 'non-infested' were always from the same estates and, therefore, the same types of houses, as tenants from dwellings described as 'infested'. This ensures that the differences detected do not arise from variations between the estates. This, although improving validity, contributed further to reducing sample sizes for analysis. All statistical analysis and statistical interpretation has been conducted, therefore, using the advice of a consultant statistician (see acknowledgement). Statistical probabilities are given where appropriate. The main results are summarised in Table I.

Tenants perceptions of the importance of cockroach infestations when compared with other adverse housing conditions

In all cases participants were asked to say which they considered worse and to choose between cockroach infestation with another adverse housing condition. 'Cockroach infestation' and each of the other adverse housing conditions were described to participants as explained in the methods section earlier.

Poor security

48% of respondents in infested dwellings reported considering cockroach infestation to be worse than poor security. In non-infested dwellings 80% of respondents considered cockroach infestation to be worse than poor security. Therefore, a significantly higher proportion of respondents from non-infested dwellings ($p=0.042$) considered cockroach infestation to be worse than poor security compared to those from infested dwellings.

Dampness

79% of respondents living in infested dwellings reported considering cockroach infestation worse than dampness. 84% of respondents living in non-infested dwellings reported considering cockroach infestation worse than dampness. Therefore a higher proportion of tenants in dwellings, which were not infested with cockroaches reported considering cockroaches worse than dampness, compared to those respondents living in infested dwellings. In this case the responses were not significantly different.

Poor heating

68% percent of respondents living in cockroach infested dwellings reported considering cockroach infestation worse than poor heating. 83% of respondents living in non-infested dwellings reported considering cockroach infestation worse than poor heating. Therefore a higher proportion of respondents in non-infested dwellings reported considering cockroach infestation worse than poor heating compared to those in cockroach-infested dwellings. In this case the responses were not significantly different.

Repair

61% of respondents living in cockroach infested dwellings considered cockroach infestation worse than poor repair. 89% of respondents living in non-infested dwellings considered cockroach infestation to be worse than poor repair. Therefore a higher proportion of respondents living in non-infested dwellings reported cockroach infestation to be

Table 1. Comparisons of perceived importance of factors in tenants of infested and non-infested houses

Comparison factor	Infested (percent)	Non-infested (percent)
Cockroach infestation worse than poor security	48	80
Cockroach infestation worse than dampness	79	84
Cockroach infestation worse than poor heating	68	83
Cockroach infestation worse than poor repair	61	89
More concerned about physical health risks of Cockroach infestation than nuisance	19	56
Cockroach infestation worse than mice infestation	25	39

worse than poor repair compared to those living in cockroach infested dwellings. In this case the difference in responses approached significance, p = 0.084.

The above results indicate that those tenants living in cockroach infested dwellings consistently report less aversion to cockroach infestation than other common housing defects compared to those living in dwellings that are not infested. The results also indicated that tenants in both infested and non-infested dwellings consistently rated cockroach infestation as more serious than other common housing defects.

The health effects of cockroach infestation

56% of respondents in non-infested dwellings reported their main concern over cockroach infestation as being related to physical health risks rather than nuisance. Of those in cockroach infested dwellings, however, only 19% were concerned more about physical health risks than about nuisance. The difference in responses was statistically significantly different (p = 0.019).

The above findings demonstrate that those tenants who suffered cockroach infestation reported less concern about physical health risks from cockroach infestation as compared with nuisance than those who lived in uninfested dwellings. It is interesting that when asked specifically about health issues that concerned them about cockroach infestation only 2% mentioned asthma or allergy. This question is returned to in the discussion section.

Cockroach infestation as compared with mice infestation

25% of respondents who lived in cockroach infested dwellings said that they believed cockroach infestation to be worse than mice infestation. 39% of respondents who lived in non-infested dwellings said that they considered cockroach infestation to be worse than mice infestation. In this case the responses were not significantly different.

These findings indicate that those tenants who live in cockroach infested dwellings consider cockroach infestation to be less serious when compared with mouse infestation than those who lived in non-infested dwellings.

The causes of and responsibility for cockroach infestation

Tenants opinions on the causes of and responsibility for cockroach infestation did not differ significantly between infested and non-infested dwellings. 40% of participants blamed unhygienic tenants for cockroach infestations, only 6% blamed the council and the remaining 54% thought that no one in particular could be blamed. Of those tenants who lived in cockroach infested dwellings, 83% rated the pest control service offered by the council as excellent or good.

Discussion

The data presented in this study indicated that when tenants were asked to choose between cockroach infestation and other housing defects; those who lived in cockroach infested dwellings consistently reported a lower perceived importance of cockroach infestation as compared to those tenants who lived in non-infested houses. These findings are consistent with those of Zungoli and Robinson (1984) who found that tenants' tolerance of cockroach infestation increased with the level of infestation that they suffered. Whereas Zungoli and Robinson were concerned with the variation in cockroach tolerance reported by tenants over time with varying levels of infestation, the study reported here examined cockroach tolerance against other common housing defects in infested and non-infested dwellings. In common with Zungoli and Robinson's findings, experience of cockroach infestation appeared to increase cockroach tolerance.

It was explained earlier in this paper that in integrated pest management (IPM) programmes for cockroach control, the degree to which people will tolerate cockroach infestations is of paramount importance. This is because it is often not possible in urban situations to completely eradicate the cockroaches. "Injury levels" at which cockroach control measures are implemented must therefore be determined based upon "customers" or "victims" tolerance levels.

Cockroach tolerance may well be influenced by people's experience of other housing defects. For example, those suffering from severe dampness or very poor perceived security may feel less strongly about cockroach infestations than those living in otherwise good housing conditions. It seems, however, that experience of cockroach infestation itself influences cockroach tolerance by a process of habituation.

It is interesting to note that experience of infestation does not always result in habituation. Smithers and Ramsey (2001) found that people living close to a large poultry unit appeared to become sensitised to fly nuisance and became increasingly concerned about fly species that occur naturally in rural environments.

It was pointed out earlier that the data reported here are the findings of an initial exploratory study into the perceptions of tenants regarding cockroach infestations. Despite the limitations of the study in terms of, for example, sample size, it is believed that the findings are important as they demonstrate the fluid nature of pest tolerance and its dependence upon people's previous exposure to infestation. These findings will be important in developing and sustaining pest management programmes in the future.

It is also interesting to note that tenants, whether in cockroach infested or in non-infested dwellings, almost always rated cockroach infestation as more serious than other common housing defects. This demonstrates the continued importance of cockroach control. It should also be noted that only 2% of tenants mentioned asthma or allergy when asked specifically about health issues that concerned them about cockroach infestation. Although cockroach asthma and allergy has not been demonstrated in the UK, cockroach allergens have been shown to be the most important contributors to indoor air quality induced asthma in children in the US, (Rosenstreich et al 1997).

Finally it is surprising that, given the difficulty of permanently removing cockroach infestations from housing developments, that so many tenants were satisfied with the pest control service offered by the Council. This is likely to be due to the highly proactive approach to pest control that Southwark Council has taken over recent years. The inclusive and open attitude of the pest control team themselves is also likely to have assisted in this, giving the tenants a sense of ownership in pest control strategies. This finding appears to indicate that customers' perceptions of the efforts of those attempting control can affect customer satisfaction and, therefore, injury levels.

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PROFESSIONAL EVALUATION

The Housing Health and Safety Rating System – a new method of assessing housing standards reviewed

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Abstract

The statutory standard of fitness was first introduced as a concept around 1919 and remains the key legal (Housing Act 1985, as amended) standard in assessing housing conditions and determining action to take, notably in the private sector. It has been criticised for failing to address many known hazards likely to give rise to harm in dwelling-houses, such as poor fire safety, domestic energy efficiency and ergonomics. There has also been criticism that the current standard is not dynamic and forward looking, and as such is not able to respond to changing needs and aspirations, and there have been calls for a 'system' of assessing conditions, rather than a fixed standard. Concern has also been expressed about how tenure-neutral the standard is and questions raised about how comparisons are made between public and private housing. There have therefore been moves in recent years to completely review the way in which housing conditions are assessed and a new approach has been under development for several years. This new approach is set to take into account known domestic accident-related data as well as to accord with current building regulation requirements and relevant research data concerning the effect of housing conditions on health and accidents. The proposed system – the Housing Health and Safety Rating System (HHSRS)– incorporates known hazards and is able to relate these to the likelihood of harm in all dwellings. Primary legislation will be required to introduce the system. Such a 'risk based' approach is set to bring determining housing conditions into line with wider environmental health approaches and activity relating to food and health and safety. This paper reviews the current statutory standard of fitness, its strengths and weaknesses, before turning to consider the development and likely implementation of the HHSRS. Whilst many welcome the new standard, others have concerns as to its practical application and its relationship to wider housing and renewal programmes within the new public health agenda.

Key words: Accident statistics, home safety, housing fitness, housing health and safety rating, statutory fitness.

Introduction

The debate about how housing conditions across tenures are assessed, monitored and regulated by local authority strategies and whether what is achieved really makes in roads into improving the nation's health has been evolving for many years within a climate of rapidly shifting tenure patterns. The current statutory standard of fitness has tended to be seen as a regulatory tool for the private sector, whilst social housing has been subject to its own protocol. Recent years have seen the rapid development of local housing strategies that more rigorously assess and respond to 'community need' with a renewed public health focus. Such changes have led to calls to review whether a new, comprehensive approach is necessary as part of a wider social agenda in assessing and responding to poor housing conditions (DETR, 2000a).

This paper reviews the current statutory standard of fitness, why it sometimes fails to provide a sufficient resolution for poor housing conditions in relation to maintaining and promoting health and how a new hazard based approach – the Housing Health and Safety Rating System (HHSRS) seeks to remedy this. It considers how the HHSRS may fit into wider housing and area renewal strategies in a climate of rapidly evolving policy.

The HHSRS and steps toward its future implementation are still evolving and local authorities are developing appropriate strategies to implement the proposed system. The author is aware of continually being overtaken by events and this paper therefore seeks to provide a review of the standard at this stage. It is hoped that research will be carried out to assess the impact of the HHSRS in relation to the current fitness standard at a later date.

The current statutory standards of fitness and nuisance

The concept of housing fitness was first introduced by the Ministry of Health in 1919, and some eighty years on, the standard remains broadly similar.

Statutory fitness is the key legal standard by which housing conditions are measured and appropriate action is taken. It represents a bricks and mortar type approach which does not take occupancy into account. Local authorities have an annual duty to survey their district for unfitness and determine a strategy to address it, with a further duty to take action to deal with every unfit dwelling-house identified. The standard is therefore crucial to local authority activity across housing tenures.

The current statutory standard of fitness (the fitness standard) is found under the Housing Act 1985 (as amended) section 604. A dwelling-house is deemed fit for habitation unless it fails to meet one or more specified criteria, and for that reason is not suitable for occupation. The criteria include structural stability, serious disrepair, dampness prejudicial to health, adequate provision for lighting, heating and ventilation, a wholesome water supply, facilities for preparation of food – including a sink with hot and cold water, provision of a WC (internal), bath or shower with hot and cold water, foul and surface water drainage. The fitness standard also applies to houses in multiple occupation (HMO), where an extended standard includes means of escape from fire and amenities for the number of occupants, responding to the increased likelihood of fire and accident by overcrowding and discomfort caused by an inadequate numbers of amenities.

The fitness standard was most recently amended by the Local Government and Housing Act 1989, when it was also made an integral part of the private sector housing grant regime. It added items that previously formed part of the Compulsory Improvement criteria (internal amenities) and aimed to provide a more objective basis for intervention into housing conditions, based on health and safety and reduced State intervention, with a change in emphasis from 'unfitness' to 'fitness'. Interpretation and application of the fitness standard was initially supported by Department of the Environment Circular (DoE) 6/90, and more recently upgraded to DoE Circular 17/96 (DoE, 1996) that provides ministerial advice to encourage uniformity in application. The Circular also delivers protocol on action to take in respect of individual and area based unfit dwelling-houses in the private sector.

However, almost as soon as the new standard was introduced, it was criticised and a Private Members Bill called for amendments. Some saw it to be subjective and limited in scope, excluding many domestic health and safety issues likely to cause harm, such as poor or even absent requirements for fire safety, internal arrangement, energy efficiency and indoor air quality. The standard is static, finite and non-progressive, being enforcement-based rather than progressive. It is not able to distinguish between degrees of unfitness, for example, lack of a wash hand basin is currently considered equal to major condensation dampness. Meanwhile, many other public and environmental health standards have moved on to forms of risk assessment, which can help provide a more dynamic approach. This said however, the current fitness standard is one that is national, has impact, is well recognised and interpreted and fits neatly into existing enforcement and grant-assisted regimes.

Statutory Nuisance provisions under the Environmental Protection Act 1990 also provide legal resolution for poor housing conditions, where the effect of the defect on health, rather than just the presence of the defect is important. Statutory Nuisance legislation may be a better course of action in some instances where the fitness standard is not sufficiently extensive. An advantage of this legislation is that it is enforceable across tenures and enables social housing tenants to take action against their landlords in seeking necessary repairs and improvements with increasing success, but such actions have caused resource problems to many local authorities. Any new approach assessing and responding to housing conditions across tenures would need to consolidate the advantages of both statutory fitness and nuisance to help provide an increasingly 'tenure-neutral' approach.

Relevant research

Concern with the fitness standard focused largely on the extent to which it was really able to help improve (recorded) health and safety housing data. By 1993, academics at Warwick University published a report on monitoring the new housing fitness standard and identified areas of concern. By 1995, the Building Regulations increasingly focused on safety and health issues, incorporating risk assessment techniques. The 1996 English House Condition Survey (DETR, 1998) reported that fitness standards remained similar to the previous survey, suggesting a general lack of progress in improving housing conditions nationally. In addition, the Home Accident Surveillance System (HASS) (DTI, 1995 and 2000) published evidence that suggested existing housing legislation was failing to tackle many domestic conditions likely to give rise to harm.

In view of some of the issues identified above, a review of the current statutory standard of housing fitness has been underway for some time. Initial consultation focused on whether expanding the standard to incorporate items such as internal arrangement and energy efficiency, both with important implications for home safety, or whether a more fundamental review of evaluating housing conditions, based on empirical evidence, was in fact required (see Battersby and Ormandy, 1999; Battersby et al, 2000; DETR, 1999).

Table I: Accidental deaths in the home for 1998 (England and Wales)

Age	Male	Female	Total
0-4	47	29	76
5-9	9	7	16
10-14	18	5	23
15-19	78	34	112
20-24	138	35	173
25-29	192	42	234
30-34	220	65	285
35-39	167	68	235
40-44	143	80	223
45-49	153	78	231
50-54	141	83	224
55-59	96	51	147
60-64	115	58	173
65-69	124	85	209
70-74	140	102	242
75-79	157	156	313
80-84	163	204	367
85+	212	451	663
Total	2,313	1,633	3,946

Note: Accidental deaths caused by drug poisoning, other poisoning, falls, fire/burns, natural factors, drowning/suffocations/choking, other accidents, or undetermined.
Source: based on ONS statistics cited in DTI (2000)

The government issued a Consultation Paper in February 1998 (DETR, 1998) seeking comments on how the standard might develop in the future. It fundamentally sought comment on whether to retain the current fitness standard, or to introduce an alternate approach, then called 'Fitness Rating'. This new rating approach would be a substantial move from the existing standard in that it would; target resources to the worst properties, include hazards known to present the most serious health and safety risks, allow more items to be considered without increasing the number of 'unfit' properties, and provide a more flexible approach for local authorities.

More recently, the DTI (2000) reported that there were almost 4,000 deaths at home in 1988, resulting from falls, poisonings, fire, suffocating/choking, and miscellaneous events (see Table I), these figures being higher than equivalents for road or workplace accidents. Many of these cannot be addressed by existing legislation. The government has increasingly favoured a risk assessment approach (DETR, 2001) so that the most serious health and safety hazards in housing stock could be addressed – notably cold, slip, trip, fall, fire and radon gas hazards (related to the accident data shown in Table II). Additionally, the need to relate health outcome of accident or harm occurrence to severity was identified to help allocate a risk rating based on the likelihood of, for example, death, pneumonia, serious injury, chronic stress, accident or infection. Any new approach would need to comprehensively address 20,000 excess winter deaths due to cold homes; 230,000 injuries and 500 deaths annually on stair falls; 15,000 non-fatal injuries and 600 fire deaths. Many of these could be barely (if at all) tackled by the existing standard, but could be by a new risk based system – a completely new approach to assessing housing conditions.

The Housing Health and Safety Rating System – a new approach

Current proposals are to introduce a comprehensive health and safety based system – the Housing Health and Safety Rating System (HHSRS) – applicable to all types of 'dwelling'. This would measure and rank the severity of risk by considering the effect of a defect, not just the presence of a defect. It would be medically and scientifically valid, practical and modern in application and legislatively based. It would protect the most vulnerable occupant (by age banding) to a particular defect. Fundamentally the new system would be based on 24 health and safety hazards in housing known to give rise to injury, with each being individually assessed – these are listed in Table III.

The proposed definition of 'dwelling' would be enlarged from the existing 'dwelling-house' definition to include the structure, the means of access, and associated outbuildings and garden, yard and /or other amenity space should provide a safe and healthy environment for the occupants and any visitors, enabling a wider domestic area to be addressed, again incorporating known areas of risk.

Table II: Summary of (non-fatal) home accidents by type from UK A&E statistics 1998

Category	Numbers of people
Fall	1.08m
Striking	650,000
Burn	102,000
Poisoning	41,000
Choking	14,000

(Source: DTI, 2000)

Table III: HHSRS hazards in the home

1.	**Excessive temperatures**
2.	Falls
3.	**Fire**
4.	Hot surfaces of materials
5.	**Damp, mould etc.**
6.	Air pollutants
7.	**Radiation**
8.	Electrical hazards
9.	**Noise**
10.	Lead
11.	**Asbestos**
12.	Entry by intruders
13.	**Crowding and space**
14.	Explosions
15.	**Infections from other sources**
16.	Poor provision for food safety
17.	**Inadequate facilities for personal hygiene**
18.	Inadequate sanitation or drainage
19.	**Contaminated water supply**
20.	Structural failure
21.	**Inadequate lighting**
22.	Uncombusted fuel gas
23.	**Entrapment and collision**
24.	Poor ergonomics

(Source: DETR, 2000)

The HHSRS considers the effect of the defect and provides a rating for this, which is a substantial move away from the existing standard, which comprises a pass or fail type checklist. The 'ideal standard' is established and the actual condition compared with this ideal; conditions falling short of this (faults) are assessed for their potential to cause harm. The assessment is based on the likelihood of occurrence (an event or period of exposure) multiplied by the range of harms or outcomes, which provides a hazard weighting score. The person most vulnerable to the hazard is taken into the equation. The numerical score calculated represents risk, which may be deemed acceptable or unacceptable, and would then trigger appropriate action. Risk assessment is to be based on the likelihood of occurrence multiplied by the range of harms resulting, to equal a hazard score ranging from 0 (safe) to 5,000 or more (unsafe) (see Table IV). The Office of the Deputy Prime Minister (ODPM) (previously DETR, then DTLR) is currently developing further guidance in administering the proposed standard (DETR, 2000a and b) which is now set to apply to HMO's, where each unit or 'dwelling' would be assessed separately, although there is some concern as to whether the HMO as a whole can be assessed holistically under the proposals, and this is considered later (CIEH, 2001; CIH, 2001).

The HHSRS is capable of comparing different types of hazard, taking into account the likelihood of occurrence and severity of occurrence and providing a numerical score for each hazard. This allows for improvements on architectural features that can give rise to an accident, such as design of stairs, windows, kitchen and so on. Fundamentally the HHSRS is a system, or an approach – not a standard, which enables it to be progressive in terms of housing conditions.

Application of the HHSRS

In practice, applying the standard involves identification of the 24 hazard categories (see Table III), to be assessed and recorded individually. This involves a two-stage assessment, considering the likelihood of occurrence and the range of probable harm outcomes that may result. The combination

Table IV: Ranges of possible hazard scores

Band	Score	Equivalent annual risk of death	Local Authority action
A	**5,000 or more**	**1 in 200 or more**	**Mandatory**
B	2,000 - 4,000	1 in 200 - 1 in 500	Mandatory
C	**1,000 - 1,999**	**1 in 500 - 1 in 1,000**	**Mandatory**
D	500 - 999	1 in 1,000 - 1 in 2,000	Discretionary
E	**200 - 400**	**1 in 2,000 - 1 in 5,000**	**Discretionary**
F	100 - 199	1 in 5,000 - 1 in 10,000	Discretionary
G	**50 - 99**	**1 in 10,000 - 1 in 20,000**	**Discretionary**
H	20 - 49	1 in 20,000 - 1 in 50,000	Discretionary
I	**10 - 19**	**1 in 50,000 - 1 in 100,000**	**Discretionary**
J	Less than 10	Less than 1 in 100,000	Ideal

(Source: DETR, 2001)

gives hazard score, directly related to equivalent annual risk of death. The assessment is based on the occupant most vulnerable to risk (by age banding), or it can be interpreted for the current occupant. The most appropriate action can then be determined from ranges of possible hazard scores (DETR, 2001).

The issue of enforcement is still the subject of consultation, but a local authority is likely to have a duty to take the 'Most Appropriate Action' based on the HHSRS hazards score and the local authority judgement as to acceptability. The most appropriate action options include Hazard Awareness Advice, an Improvement Notice, a Prohibition Notice or suspended action. The regulatory situation for local authority housing stock is less clear at this stage, but it is difficult to see how an entirely tenure neutral approach is possible here.

Although primary legislation is required before the system can be implemented, local authorities and other interested organisations have been making preparations to introduce the HHSRS. Officers are already familiar with the statutory standard of fitness, its scope and limitations, but are now getting to grips with application of the new HHSRS. In practice, this normally involves using a hand held computer which lists the 24 hazards enshrined in the system and an sub-menu for each hazard identified, to extend it further and offer a more accurate risk assessment. Once each hazard in each part of the dwelling has been identified, the computer generates a hazard rating for the dwelling that enables a decision to be made of acceptability at a given threshold (see Table IV). The new system will also require new computer software, compatible with existing data collation regimes.

The government continue to produce guidance as the system is tested and refined, including worked examples, which show how the standard applies to all dwellings. These examples range from system built tower blocks, to addressing major condensation and mould growth, to individual hazards arising from steps to an owner occupied 1930's dwelling (see DTLR, 2001). This is particularly important so that all tenures of housing stock within a local authority area can be considered and compared, with resources increasingly allocated according to risk.

Criticisms of the HHSRS proposal

Whilst many see the proposed system as dynamic and forward thinking, it has not received support from all quarters. Some have disputed the fundamental concept of the system – although it initially received support in principle – and believe that an updated and revised version of the current fitness standard would be more appropriate, arguing that the new system could be unnecessarily cumbersome to apply (see Parkinson and Fairman, 2000). Such an approach is understandable as the current standard is widely understood, easy to apply and fits well with existing enforcement and grant protocol. It also allows for professional judgement and some flexibility.

Ironically, the HHSRS may be seen to be too 'scientific' in its approach and as such may make it difficult to tackle some of the wider holistic health issues inherent in the current public health agenda. As with any approach based on reliance on data and statistics, there is a risk that other health-related issues many be missed or excluded in a risk assessment because they cannot be clearly rated. The home and its environment may cause, or contribute to ill-health in the form of stress and depression in some instances, but it is unclear whether, and how, the HHSRS might cater for this. Stress and depression are notoriously difficult to rate directly by empirical evidence, but may cause extreme harm outcomes in some cases. This is of increasing importance to the new public health agenda that seeks to reduce inequality and so promote health, seeing health in its wider context of building sustainable communities where housing, health and safety also need to be seen and responded to in it socio-economic context.

Now that the HHSRS is being tested, there is some concern with the practicalities of applying it. In their response to the DETR Consultation Paper (DETR, 2001), the CIEH (2001) and CIH (2001) raise concerns about its workability and how 'tenure-neutral' it really is. For example, they question the number of hazards currently listed, suggesting a simplified hazard grouping; how hazard ratings might be aggregated and compared and how resulting activity should be delivered; how consistent the standard can be; and the suitability of IT systems in its application. The CIEH (2001) also comments on the HHSRS's relationship to wider government policies, such as Best Value Performance Indicators and the Better Regulation and Modernising Local Government.

There are concerns, too, as to how the HHSRS could fit into wider housing renewal regimes and the impact it could have on renewal strategies. In this respect, it remains largely untested at this stage. It is unclear as to whether all hazards should be addressed, or just the more serious above threshold level, and if so, what should happen about lesser hazards. Existing case law suggests that repair is dealt with at the early stages so that dwellings do not fall into unfitness, but the guidance for HHSRS does not provide answers as to lower rated hazards, or about the general incentive under HHRSR to carry out general maintenance to dwellings. There is also a need for enforcement to be

able to address urgent hazards identified requiring immediate remedy, that is not able to be unreasonably delayed by appeal processes.

It is difficult to assess how the HHSRS relates to HMO's. There are currently additional legal controls governing HMO's, notably in respect of fire safety and amenity provision, but also for management and overcrowding. It is unclear whether the HHSRS will be able to address HMO's holistically, as the current approach seems to concentrate on individual dwellings rather than the HMO in its entirety.

Fitness, HHSRS and wider strategy

The Office of the Deputy Prime Minister – the new Office for regional and local government, housing, planning, regeneration, social inclusion and neighbourhood renewal – recently issued further housing renewal guidance, confirming its commitment to replacing the fitness standard with the HHSRS but not offering a timetable for reform (ODPM, 2002a). They seek to ensure that everyone has the opportunity of a 'decent home' and to help promote social cohesion, well-being and self-dependence. A decent home is defined as one that is statutorily fit, is in reasonable repair, has reasonably modern facilities and services, and provides a reasonable degree of thermal comfort (ODPM, 2002b). The government has announced increased resources for social housing to meet the decency standard by 2010 (ODPM, 2002c) but reiterated personal responsibility for the necessary works in the private sector (ODPM, 2002a). At this stage, it is unclear how and why the HHSRS might dovetail into these new arrangements.

As local authorities continue to acquire discretion in developing and delivering local strategy that sits within the wider government agenda of area regeneration, social inclusion and so on, they are simultaneously having to incorporate the fitness standard allied to HHSRS proposals as well as forging new partnerships that address the new public health's emphasis on inequality. There is a risk that local authorities will be pulled in different directions of new discretion and duties, and this needs to be carefully considered at the early stages. With local authority housing functions under increasing pressure it is important that they are able to retain flexibility in their approach. It is important for example that implementation of the HHSRS will not skew local authority housing activity wholly toward evidence based data and statistical returns at a time when community empowerment and social inclusion are also seen as crucial to promoting housing and health, and has a fundamental role to play in more non-quantifiable health improvements inherent in area regeneration.

As part of the wider public health movement, partnerships are seen as key to address health inequalities in service provision. The government's current approach to fuel poverty (DEFRA and DTI, 2001) is one example of where local authorities – largely due to earlier inadequate legislation and resources – have failed to make adequate in-roads, particularly in the private housing sector and partnerships are now seen as key in delivering change. Whilst the HHSRS system may be able to tackle the whole issue of domestic energy efficiency more comprehensively, there seems no reason why energy efficiency could not be inherent to an expanded standard of fitness. However, it remains too early to comment on this in respect of both the new Fuel Poverty Strategy and the HHSRS. Again, it is difficult at this stage to see how partnership based strategy and an enforcement led HHSRS may co-exist without duplication or unnecessary bureaucracy.

Summary

Many organisations, notably the CIEH and CIH, urge more government guidance which will take their concerns about the HHSRS into account. However, regardless of arguments for and against the proposed HHSRS, few would argue that there is a need to ensure that any new standard addresses domestic safety more comprehensively.

The HHSRS is likely to replace the fitness standard in the near future, but will require primary legislation. Once in place, local authorities will have a duty to apply the standard across tenures. It remains too early to assess how successful such a new approach to assessing and regulating housing conditions might be, and this will become clearer in the fullness of time. There is much benchmarking evidence available already to measure progress increases in the health and safety of the nation's housing stock for its residents, but improvements in reported statistics are only part of the story – particularly if reporting becomes skewed and fails to recognise wider health improvements in housing and communities. The new public health agenda, with its focus on tackling health inequalities through a range of local community partnerships, are also crucial in improving the nation's housing stock.

The HHSRS has many potential benefits in enabling local authorities to tackle many of the issues that are fundamental in the housing, health and safety interrelationship and the fact that a new approach is imminent is to be welcomed. It should help provide an evidence based response to addressing housing conditions, but any concerns need to be fully addressed now – including how and why it fits within emerging local housing strategies – before the new system is implemented.

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Book Review – Health Promotion for Environmental Health

Ann McCarthy and Catherine Pritchard

Chadwick House Publishing (2002)
Price: £25.95 + £2.00 p&p

Health Promotion for Environmental Health is that rarity, a health promotion text which is specifically designed for the environmental health sector. The authors, both of whom are academics with an Environmental Health Officer background, have sought to produce a short book (pp96) which can serve as a ready-reckoner for environmental health practitioners who wish to reflect on their health promotion role as well as those undertaking health promotion as a new venture. It can also be used as an introduction to health promotion for undergraduate students.

Chapters on key concepts and policy development in health promotion provide a context for the remainder of the book which focuses on a range of health promotion practice topics. These include a review of information sources, health promotion interventions, community health promotion through public health and partnership working and local authorities as settings for health promotion.

Like most publications, there are strengths and weaknesses. The book is not designed to engage in in-depth conceptual debates and therefore focuses on giving descriptive overviews of issues and helpful 'how-to' tips which will be of help to time-limited practitioners. Consideration of health impact assessment and health promotion planning models and strategies make practical contributions to real-life working. Several useful case studies on local authorities as key players in health promotion and a particularly useful consideration of 'bottom-up' strategies when considering community health promotion add to the effectiveness of the book. Reflective exercises in each chapter are also, with several exceptions, a helpful inclusion in the book.

On the debit side, the references in the key concepts chapter are to some extent, dated. In the chapter on reviewing information sources the omission of Web of Science and Proquest as 'health promotion friendly' bibliographical data-bases is surprising. There is also a tendency for the writing to be somewhat England and Wales oriented.

Overall, this book will make a useful contribution to the personal library of environmental health practitioners involved in health promotion and should be a standard acquisition by environmental health departments.

Reviewed by Paul Fleming

Book Review – Waste Minimisation A Practical Guide

Dr Karen Cheeseman

Chadwick House Publishing (2002)
Price: £25.95 + £2.00 p&p

Waste Minimisation – A Practical Guide is just that, an easy to read practical guide specifically targeting companies of all sizes, encouraging them to implement waste management schemes. The book is intended for management and middle management levels of companies. This particular publication is a revision of the original edition by Karen Pike (now Dr Karen Cheeseman) and Paul Phillips and has been completely updated for 2002.

The practical guide explains the concept of waste minimisation as part of a waste management policy and indicates some of the driving forces and incentives for adopting an environmental management system. It goes on to develop the waste minimisation concept for manufacturing and service industries and provides a simple step-by-step guide for implementing a waste minimisation programme on site.

Well that is what the Preface to the book says. Does it achieve its objectives? The author is a Chartered Chemist and her PhD research activities are concentrated on industrial waste minimisation. The book reflects that level of theoretical and practical expertise and experience.

The book poses a challenge to companies in its first short paragraph. 'Can you imagine throwing 1% of your annual turnover straight into a refuse skip every year? A ridiculous concept, but unless your company has reviewed its waste and energy management systems recently, that is probably what is happening at your company this very minute. Concerned by this? Then read on…..'

The book sets the legislative scene, covering the Landfill Directive, Waste Strategy 2000, and other waste regulating legislation dealing with packaging, integrated pollution prevention and control, climate change levy, ozone depleting substances, end of life vehicles, and waste electronic and electrical equipment. It goes on to define waste and waste minimisation and to helpfully expand on the definitions.

The focus of the book then moves to encouraging companies to establish waste minimisation schemes. The practical examples quoted are good, but the interest of the reader will be dependent on him identifying with the examples given.

The chapters on where to start, project champions and teams, identifying opportunities, monitoring and

targeting, and maintaining momentum offer good practical advice.

The potential weakness in preparing a practical guide to waste minimisation is that the same cliched theories are faithfully expounded while what the reader is looking for is practical guidance on how to make the theory happen. This short book – 60 pages of actual guidance – deals well with the theory and the driving forces and then moves into practical application of the theory. The examples quoted are fine, but some readers may not be able to, or take the time to, identify with those examples. That would be a pity.

This is a useful, easy to read, reference for companies and their waste management advisors as they look seriously at waste minimisation.

Reviewed by Dr Kenneth M Stewart

Have you found a new book which you think would be worth reviewing by JEHR? Have you produced a book which you would like to be considered for review by JEHR?
If so, please contact the Editor at JEHR@lycos.co.uk (or hd.harvey@ulster.ac.uk) for details of the review process.

Profiles of the Editors

Harold D Harvey

Harold Harvey is Senior Lecturer and Director of the Environmental Health Protection and Safety centre (EHPaS) at the University of Ulster. He has been in academia for the past 23 years and has managed several undergraduate and post graduate courses and convened the quality and curriculum development activity within the School of the Built Environment. He is a university senator and has served on several university and faculty committees including Senate, Academic Policy and Access Courses. He is a consultant to several public and private organisations and external examiner for several university courses and research degrees.

He is a fellow of the Chartered Institute of Environmental Health and has held several positions within the professional body including chairman and treasurer of the NI Centre and membership of the national Education and Professional Standards Board and Education and Professional Development Committee. He is a member of the local executive committee of the Institution of Occupational Safety and Health and campus convenor of the lecturers' professional body and trade union, the Association of University Teachers. He is member of the academic board of Loughry College of Food, the educational services committee of the Ulster Cancer Foundation and a trustee of a local radio production organisation.

For the past few years, through journal and conference contributions and the origination of the (now) annual Graduate/Post Graduate Research Conference on Environmental Health Protection and Safety, he has been heavily involved in the promotion of research as an essential element in the development of the environmental health profession.

Paul Fleming

Paul Fleming is Senior Lecturer in Health Promotion and Academic Co-ordinator of Public Health in the Multi-disciplinary Public Health Division of the School of Nursing, University of Ulster. His professional background as a post-primary school teacher and health promotion specialist led to his becoming the founder Course Director for the Postgraduate Diploma/MSc in Health Promotion at the University of Ulster in 1992. He has led a number of curriculum development initiatives including the establishing of a primary degree in health sciences and the creation of a named health promotion pathway in the masters programme for environmental health and safety. At present he chairs a Faculty

Student Support Committee and participates in the senior management of the School of Nursing.

In recent years his research profile has resulted in publications on health promotion needs assessment and evaluation with a specific emphasis on health promoting settings including particularly the work-place. Externally funded projects have contributed to this profile.

He is a member of the Institute of Teaching and Learning and the Society of Health Education and Promotion Specialists. Professional memberships include the Institute of Health Promotion and Education, the Royal Institute of Public Health and the United Kingdom Public Health Alliance. He also serves on a number of external committees including the educational services committee of the Ulster Cancer Foundation and the Training Sub-Committee of the Northern Ireland Physical activity Strategy Group. He is also active in professional developments for health promotion specialists.

Dr Kenneth M Stewart

Ken Stewart is Managing Consultant of Stewart Consulting (Environment and Health) and a Director of Waste Reduction Europe Ltd. His initial environmental health training was with the City of Dundee and after posts in Darlaston and Hemsworth he returned to Scotland as Deputy with Dumfries Town Council. He was Nithsdale District Council's first Director of Environmental Health, a position he held for 16 years. He moved from there to the newly formed Environmental Health (Scotland) Unit, later to become part of the Scottish Centre for Infection and Environmental Health (SCIEH). Latterly he was Assistant Director at SCIEH. He retired early in 1997 and established his own consultancy business.

Ken Stewart gained a Master of Public Health degree from the University of Dundee with his research into lead in the environment. In 1992 he gained a PhD from Dundee with research into house conditions and health. He has held lecturing positions with the Universities of Dundee, Edinburgh, Glasgow and Strathclyde and undergraduate, post graduate and PhD external examiner appointments at the University of Ulster. For 10 years he was the environmental health adviser to the Housing Committee of the Convention of Scottish Local Authorities. He is a frequent conference speaker and has published papers on a wide range of environmental health topics. He was for a number of years the International Federation of Environmental Health editor of the International Journal of Environmental Health Research.

Ken Stewart is a fellow and past President of the Royal Environmental Health Institute of Scotland and is a member of the Chartered Institute of Environmental Health.

Martin Fitzpatrick

Martin Fitzpatrick is a Principal Environmental Health Officer with Dublin City Council Air Pollution and Noise Control Unit. Since graduating in Environmental Health in 1984, he has worked in a variety of positions in environmental health services in Ireland. He also worked for two years as Senior Programme Manager with Project Concern International on child survival interventions in Indonesia and for several years with the World Health Organisation Regional Office for Europe in Copenhagen on the development of career profiles and training for environmental health professionals. He has more recently worked as Environmental Health Adviser to the Irish Department of Health and Children.

He has carried out extensive environmental health consultancy roles on behalf of the World Health Organisation, particularly in Eastern Europe and the Central Asian Republics and environmental health research on behalf of the Ministry of Public Health of Thailand. He has co-authored a number of publications on behalf of the World Health Organisation and regularly contributes articles to a variety of publications. He is a member of the Environmental Health Officers Association (Ireland).

J Oliver Hetherington

Oliver Hetherington is Lecturer in Environmental Health and a member of the Environmental Health Protection and Safety centre (EHPaS) at the University of Ulster. He is course director for BSc (Hons) degree in Environmental Health and the post graduate Diploma in Acoustics of the Institute of Acoustics. He has been an university external examiner for a number of years and is a consultant to several local authorities and industrial organisations. He has supervised postgraduate students at Masters and Doctorate level.

Before entering academia in 1985, he practised for seventeen years as an environmental health officer working in a range of areas before specialising in pollution control. He was a Principal Environmental Health Officer in Belfast City Council, with responsibility for environmental protection and pioneered the work of the council in noise control.

He is a member of the Chartered Institute of Environmental Health and has been a member of Council of the Northern Ireland Centre and a member of the Institute of Acoustics and honorary secretary of the Irish Branch.

Notes for Authors

Aims and scope of the Journal

The Journal of Environmental Health Research is published by the Chartered Institute of Environmental Health (CIEH). The Journal publishes original research papers, technical notes, professional evaluations and review articles covering the diverse range of topics which impact on environmental health.

Particular emphasis is placed on applied research and reviews which facilitate the improved understanding of a particular aspect of environmental health. It is intended that the Journal will help to promote improvements in the professional practice of environmental health as well as contribute to the research knowledge base.

Invitation to contributors

Contributions are invited on any of the diverse aspects of environmental health including occupational health and safety, environmental protection, health promotion, housing and health, noise 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.

Contributions should have the potential to improve practice through the dissemination of the results of research projects, reviews based on scholarly reflection and technical notes and professional evaluations which provide critical insights into practice issues. It is likely that most papers published will be based on work carried out as part of a research project or programme associated with an academic or other research institution.

Contributions are expected to be of a high standard, not only in respect of subject matter and its treatment, but also in the quality of the writing. Particular attention should be paid to clarity and conciseness of expression.

Originality

Only original articles are considered for publication. Submission of a manuscript represents certification on the part of the author(s) that the article submitted has not been published nor is being considered for publication in another journal. Contributions may, however, be based on a prior conference presentation.

Peer review

All contributions which are considered by the Editors to be within the aims and scope of the Journal are subjected to peer review by at least two reviewers. It is likely that one reviewer will have an academic research background and the other a practitioner or management background. Decisions on publication are made by the editors who are informed by the comments of the reviewers and the responses from the author(s) to the peer reviews.

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These notes are intended to guide authors in some details of presentation so that papers conform to a consistent Journal style. More details on style and paper preparation can be accessed at www.jehr-online.org.

Authors must comply with the style requirements in every respect. For example, manuscripts which are too long, have too many headings or tables or references which do not fully conform to the Harvard protocol will be returned to the author(s). Thus authors are encouraged to study these notes and those on-line carefully whilst preparing their manuscript.

Length

Research papers; 3,500 to 6,000 words.
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Technical notes and professional evaluations: not normally more than 2000 words.

Tables, Charts and Photographs

These should be kept to a minimum consistent with

the concise nature of the papers published in this Journal.

Language

Manuscripts are accepted in English only.

Layout/Sequencing

The manuscript should normally be sequenced as follows: Title; Author(s); Abstract (300 words +/- 10%); Key words (up to 8); Introduction; main exposition (typically this section consists of the Methods and Results); Discussion; Conclusions; Acknowledgements; References.

Further essential details on each on these is available at **www.jehr-online.org**

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The submission of manuscripts will normally be by Email and word processed file attachment only, with no requirement for the submission of printed copies. The word processed document should conform to the following specification to facilitate the peer review process and editing;

- MsWord (.doc) is the preferred word processor format but WordPerfect (.wpd) and Rich Text Format (.rtf) are acceptable.
- Times New Roman, 12 point, Single spacing.
- Do not indent paragraphs, do not number the pages nor insert headers or footers.
- The Cover Page should give the title of the paper, the name(s) and affiliations of the authors plus an Email address, telephone number and postal address for the corresponding author. Add a page break at this point and go on to the First Page.
- The First Page should repeat the Title only (not the authors details) plus the Abstract, Key Words and continue into the Introduction and the remainder of the manuscript.
- All tables and charts should be included as part of the manuscript in a single file, unless there is pressing technical reason for having separate files.
- The file should be named with the name of the first author e.g. Wilson.doc.
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The editors invite comments on any aspect of the Journal including your overall impression of JEHR, particular strengths, weaknesses and areas for improvement, letters on specific papers and topic suggestions for professional evaluations and book reviews. Correspondence on these issues should be sent to Harold Harvey at JEHR@lycos.co.uk (or hd.harvey@ulster.ac.uk).

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