The Journal of Environmental Health Research
ISSN 14760932 Volume 06 Issue 01

Editorial


One of the key aims of JEHR is to make available good quality scientific and professional information on environmental health issues to as many scientists, academics and professionals as possible. Of course this cannot be achieved without the contributions of the authors. While we want to encourage more authors to submit to JEHR, we have to admit that writing for a peer reviewed journal is challenging. It is rewarding to see your work in print and used by others, but it can be a time–consuming process. We have therefore included an enhanced guide for authors with the intention of giving additional assistance to our potential contributors.

Authors will be pleased to know that JEHR is now listed in the Directory of On-line Journals (DOAJ). This means that their papers will be available to a much larger readership. Papers published in JEHR will be searchable on the DOAJ database by journal, subject, key word and author. DOAJ currently covers more than 2,500 quality-controlled scientific and scholarly journals with almost 130,000 papers listed to date. Listing in DOAJ is an important step in development of the Journal.

In this issue we start with a topic close to the hearts of all environmental health practitioners – recruitment to the profession. Using the recruitment crisis of 2001 as a baseline, Cooper and Parkinson examine the current trends in applications and enrolments to CIEH accredited university courses to determine the extent to which the action taken at that time has been successful. While the numbers are increased, the authors believe that this does not necessarily mean that the crisis is over. This is particularly so when the students' responses to the question on what influenced them most to apply to environmental health are analysed.

Many lay people are surprised that one of the greatest risks to employees in workplaces is that of slipping, tripping or falling. Nothing high-tech or complex, just a simple slip or trip on a floor. We know, however, that it is the source of a very large number of accidents in workplaces. Any action that could be taken to reduce this risk would be welcomed by employers, employees and enforcers. Just as the hazard creating the risk is 'low-tech', so is the solution according to Dr François Quirion, Patrice Poirier and Paul Lehane. In two complimentary papers the authors present their findings on the theme of assessing and reducing the 'slipperiness' of existing floors in restaurants and retail premises.

Are swinging clubs a potential source of legionella infection and, if so, what are the implications for investigations officers? An investigating team from the Unit of Clinical Epidemiology and Public Health, University of Manchester and the Greater Manchester Health Protection Unit present a case study on their recent experiences.

After much debate, delay and disagreement it will happen on 2nd April, 30th April and 1st July – the introduction of the smoke-free laws which will benefit workers and all those who use enclosed pubic spaces in Wales, Northern Ireland and England respectively! Diane Black, Dr Ivan Gee and Helen Casstles, in a detailed study of the exposure of hospitality workers to second–hand smoke, remind us of just how important these new laws are to individual employees. Their work also establishes a baseline from which to judge the success of the new laws in this employee-intensive industry.

Professional journals such as this need to meet the key needs of their readership, so this issue of the Journal addresses a number of significant issues. Inclusion in a major academic data-base enhances the status and availability of papers published in the Journal. Enhanced assistance is given to contributors to the Journal and a number of papers carrying forward our knowledge in key areas of environmental health practice are included. Overall, we are seeking to ensure that the Journal best meets your needs in providing an expert evidence base for environmental health. Let us know if you feel it is helpful in this respect.

Harold Harvey and Paul Fleming

Monitoring the exposure of hospitality workers to second-hand smoke: establishing a base-line in advance of the smoke free legislation

Diane Black[1] MSci, Dr Ivan L. Gee[1] PhD and Helen Casstles[1] RGN BSc

[1] Centre for Public Health, Liverpool John Moores University

Correspondence: Helen Casstles, Centre for Public Health, Liverpool John Moores University,
Email: h.casstles@ljmu.ac.uk, Tel: 0151 231 4516. Website: www.cph.org.uk

Abstract

Exposure to second hand smoke (SHS) has been linked with adverse health outcomes, with staff in hospitality premises being particularly at risk. This study measured the exposure to SHS for employees within hospitality settings in Liverpool, prior to the decision by the UK government to introduce comprehensive smoke-free legislation and thereby protect all workers. This legislation comes into force on 2nd April 2007 in Wales, 30th April in Northern Ireland and 1st July 2007 in England (with Scotland having already gone smoke free in March 2006).

Fifty five premises were chosen at random from the 'Flare' database held by Liverpool City Council and testing was carried out on Friday and Saturday evenings. Monitoring equipment was positioned in the bar area and measurements of SHS were taken using validated equipment to standardised methods over a four-hour period. The personal exposure to SHS of non-smoking employees, working for more than four hours at the time of testing, was measured via a saliva sample prior to and after their work shift and by wearing a non-invasive monitoring badge during their shift.

SHS markers were only considered in the analysis: nicotine (vapour), 3-Ethenylpyridine, respirable suspended particulates and solanesol related particulate matter (SolPM). High levels of SHS were found in a number of bars, restaurants and social clubs compared to the non-smoking venues tested. In particular, the tobacco specific marker compounds (SolPM and nicotine) were found to be significantly higher in bars in comparison to restaurants, a reduction of 75% and 80% respectively.

This study provides baseline data for levels of SHS within licensed premises in Liverpool. It demonstrates that the original proposal, to make only premises that served prepared food, smoke free had the potential to increase health inequalities. It also provides timely evidence for the recent Green Paper adopted by the European Commission, 'Towards a Europe free from tobacco smoke: policy options at EU level' (Commission of the European Communities, 2007).

Key words: Environmental tobacco smoke; environmental health; occupational exposure; public health; second-hand smoke; smoking ban.

Introduction

Millions of employees are regularly exposed to SHS in their workplace. It is estimated that 1.3 million workers in the UK are exposed to SHS for at least 75% of their working time (Kauppinen *et al*., 2000). Occupational exposure to second-hand smoke (SHS) has been linked with several adverse health outcomes including lung cancer, cardiovascular disease and respiratory disease (SCOTH, 2004). Research evidence has shown that workers in the hospitality industry, particularly in bars are at a high risk of exposure to SHS (Bates *et al*., 2002; Siegel & Skeer, 2003) and at least 52 employees per annum in the British hospitality industry die from such exposure (Jamorozik, 2005).

The effect of SHS exposure is an ongoing issue for the hospitality industry. At present the UK does not have an occupational exposure standard for SHS, although the Health and Safety at Work etc Act 1974 states that employers have to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all their employees (HMSO, 1974).

These high exposure rates, associated with hospitality workers (particularly in bars and restaurants), constitute the medical cause for establishing smoking policies for the restriction and banning of smoking in the workplace (Quan, 1998). The public health White Paper, 'Choosing Health' (DH, 2004) proposed a staged approach to the implementation of a smoking ban in enclosed public places and workplaces in England by 2008. At the time of this research some believed that the suggested legislation for a partial ban did not go far enough to protect the general public and workers within hospitality premises from the harmful effects of SHS (Gee *et al*., 2006). Many supported the introduction of comprehensive smoke-free laws like those introduced in the Republic of Ireland (Public Health (Tobacco) Acts 2002 and 2004), covering all indoor workplaces, including bars and restaurants, thereby offering non-smoking bar workers significant protection from exposure to SHS (Allwright *et al*., 2005).

Since the conclusion of this research, comprehensive smoke-free legislation has been enacted in Wales and England (2nd April and 1st July 2007 respectively); this study provides base line data to facilitate the evaluation of the impact of the legislation at a future date.

With an estimated prevalence of 33.1% (aged 16 years or over), Liverpool has the highest proportion of

smokers in the North West region of England (Wood *et al*., 2005). Smoke Free Liverpool was established in 2003 to take forward the objective of the Liverpool First for Health Strategic Partnership, to make Liverpool a Smoke Free City by 2008 (Smoke Free Liverpool, 2006). Although previous studies have assessed exposure to SHS (Cenko *et al*., 2004; Carrington *et al*., 2003 and Bates *et al*, 2002) such a study has not been carried out within the Liverpool area. This research measures constituents of SHS in the indoor environment of a sample of occupational premises (including bars, restaurants, night clubs and social clubs) in Liverpool and the associated personal exposure of workers within these premises.

This study aimed to examine the exposure of employees to SHS within the hospitality industry in Liverpool. This was achieved in two ways: by measuring the levels of constituent particles of SHS in the indoor environment from a sample of hospitality premises within the Liverpool area and measuring the workers' personal exposure to SHS using the biomarker cotinine and personal monitors.

Methods

Sampling

Ethical approval was obtained from the Central Office for Research Ethics Committees (COREC), Liverpool Primary Care Trust.

A random sample of hospitality (licensed) premises in Liverpool was derived from the 'Flare' database held by the Environmental Health Department at Liverpool City Council, comprising 55 hospitality premises and four non-smoking premises.

Hospitality premises were contacted by letter outlining the proposed study and requesting their co-operation. Eight refused to take part in the study and three premises were either closed or under refurbishment. To achieve the recommended sample size, further premises were randomly selected. Premises were then visited by environmental health staff to discuss the study and its implications. A time for testing at each of the premises was agreed in advance, subject to the opening hours of the premises.

Prior to the study, environmental health staff received training on the correct use of the monitors and the procedures necessary to collect valid samples and a risk assessment was completed for the proposed research for exposure to SHS, noise and potential violence.

A pilot study was completed to highlight any potential problems and to ensure the correct sampling procedures were followed. An inspection was conducted to assess the layout of the premises and the method of ventilation, if any, currently in use. The ventilation inlets and outlets were noted, showing the direction of airflow where possible, as this had implications for the positioning of the monitors. In addition an operational audit was carried out to determine the position of the monitors, note the number of staff on duty and record other relevant information.

The hospitality premises were categorised by their current smoking policy (smoking throughout, separate designated smoking or non-smoking areas) and ventilation status to determine the effect on the SHS concentrations measured (natural ventilation, inlet/outlet ventilation, air conditioning/air cleaning or ducted ventilation).

Indoor atmospheric monitoring

The measurements of indoor SHS and personal exposure were completed on either a Friday or Saturday night (two premises per night) during the period June to October 2005 by environmental health staff from Liverpool City Council using validated equipment to standardised methods. The monitors (SKC Double Take Samplers) were placed at two locations (sufficiently protected to prevent tampering) and the sample heads/inlets were positioned at head height, so far as was reasonably practicable, for example on the back of bars rather than on the counters. This enabled sampling of both the particulate and vapour phase of SHS over a four-hour period. The vapour phase constituents nicotine and 3-Ethenylpyridine were collected using adsorbent tubes (XAD-4) to BS 5202-18 (British Standards, 1997) and the particulate phase constituent, respirable suspended particles (RSP) were collected on a 37mm, 1μ pore size Teflon filter by the use of a cyclone to ISO 15593 (British Standards, 2001). The airflow rate was monitored each hour and was kept at 2.2 litres per minute for the cyclone and 400ml per minute for the adsorbent tubes.

Personal monitoring

The personal exposure of non-smoking employees to SHS was measured using the biomarker cotinine, a

metabolite of nicotine. All of the participants were approached prior to the start of their work shift, given an explanation of the study and invited to take part in the study on a voluntary basis. Volunteers were then screened to ascertain that they fulfilled the research criteria, i.e. were a non-smoker, (should not have smoked for six months prior to the study) and on the day of the testing were working for at least four hours. Consent was obtained and further information provided.

Volunteers' employment history, within the hospitality industry, was recorded along with age and sex and they were assigned a code, which was used to identify them for the duration of the study, thus assuring anonymity.

A saliva specimen was taken (by means of an oral swab) using an Omni-SAL kit prior to participants starting their shift, to determine their baseline exposure to nicotine and a second sample after four hours at work to establish their exposure during their shift. Participants took the saliva sample themselves by placing the sampling device under their tongue until the indicator turned blue (approximately three minutes). Previous research indicates that four hours is the optimum time for determining salivary cotinine levels (Curvall *et al*., 1990). The supplied sample was placed in a buffer solution, sealed and labelled with the participant's code number and sent by first class post within 24 hours to the laboratory.

The participants wore a non-invasive adsorption badge (SKC 3M type 3500 passive samplers) to measure their personal exposure to atmospheric SHS during their shift (vapour phase, 3-Ethenylpyridine, a known marker of SHS).

Analysis

Analysis of all the samples (atmospheric and personal) was carried out by the Health and Safety Laboratory using established sampling and analytical methods. For each particulate filter sample, the overall mass gain and the mass of each analyte was recorded. The samples were analysed using ultraviolet absorbing particulate matter (UVPM), fluorescing particulate matter (FPM) and solanesol related particulate matter (SolPM) methods (Carrington *et al*., 2003). For each of the vapour sorbent tubes, the mass of 3-Ethenylpyridine and nicotine was recorded. All of the measurements were converted into average concentrations (using the volumes obtained from the filters/sorbent tubes) in air for the four-hour period of monitoring in the premises being tested.

Analysis of the saliva samples was carried out using two aliquots of the sample provided by the participants to allow the individual participants' mean saliva cotinine concentration prior to and after four hours at work to be ascertained. The saliva samples were destroyed after analysis and were not used for any other purpose.

The mass of 3-Ethenylpyridine and nicotine was recorded from each personal sampling badge and the results converted into concentrations in air.

Results

Atmospheric monitoring

For ease of comparison between the different types of hospitality venues, the concentrations of the following SHS markers were only considered in the analysis: nicotine (vapour), 3-Ethenylpyridine (3-EP), respirable suspended particulates (RSP) and solanesol-related particulate matter (SolPM). When the levels of SHS markers were below the level of quantification, the concentration was concluded to be half that of the limit of quantification for the particular SHS marker (Baek *et al*., 1997).

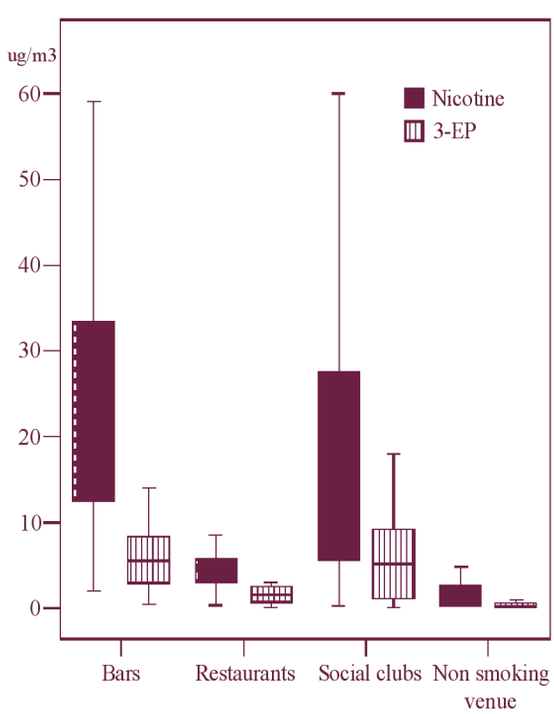
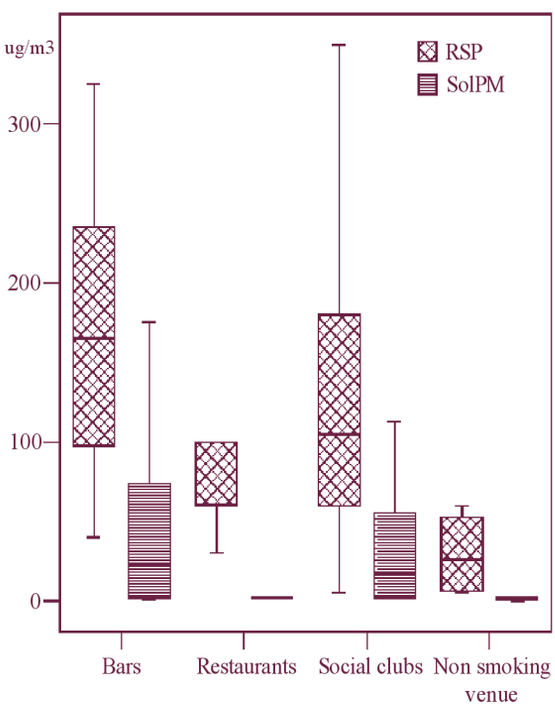
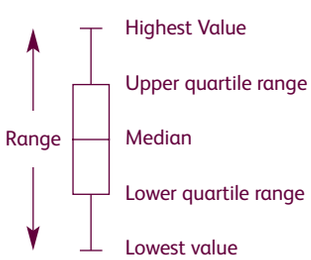


Figure 1.0
Boxplot to show the levels of Nicotine and 3-EP categorised by type of venue.

Figure 2.0
Boxplot to show the levels of RSP and SolPM categorised by type of venue.



Key to Boxplots



The box plots (Figures 1 and 2) show the range of SHS marker concentrations measured in the various types of hospitality premises tested. In general the mean concentrations of all the SHS markers are shown to be higher in bars and social clubs compared to the levels measured in restaurants. In particular there is a considerable reduction in the concentration of tobacco specific markers SolPM and nicotine measured in restaurants compared with dbars (a reduction of 75% and 80% respectively). This reduction is not as noticeable (only 40% reduction) when considering the mean RSP concentrations. The levels of SHS markers found in social clubs are of the same order of magnitude of the levels found in bars. In addition the mean levels of the SHS markers measured are noticeably higher when compared with levels measured in the non-smoking venues (Figures 1 and 2) and for bars, there are many more venues with high levels of SHS markers.

Differences in the mean concentrations of all the SHS markers measured in bars compared with restaurants and to non-smoking venues were found to be statistically significant when examined using a non-parametric Mann-Whitney test (p-value < 0.05) (Table 1).

Owing to the larger sample size for bars the levels of SHS markers were considered by smoking policy for bars only. The bars were classified as either venues that allowed smoking throughout or venues with separate designated smoking and non-smoking areas. The data collected suggest that for the tobacco specific markers (nicotine, 3-EP and SolPM) levels at the bar in premises with designated areas were higher than premises allowing smoking throughout. However, these differences were not statistically significant (Table 2).

Table 1.0
Results of significance tests comparing the mean levels of SHS markers.

	SHS marker (P-value)			
	Nicotine	3-EP	RSP	SolPM
Bars vs. Restaurants	**0.000**	**0.002**	**0.030**	**0.024**
Bars vs. Social clubs	0.184	0.390	0.102	0.831
Bars vs. Non-smoking venue	**0.002**	**0.002**	**0.003**	**0.027**
Restaurants vs. Social clubs	**0.009**	0.055	0.374	**0.008**
Restaurants vs. Non-smoking venue	**0.037**	0.064	**0.026**	0.348
Social clubs vs. Non-smoking venue	**0.010**	**0.005**	**0.019**	**0.012**

SHS marker	Smoking throughout (n=29) Mean ($\mu g/m^3$)	Smoking throughout (n=29) Range ($\mu g/m^3$)	Designated areas (n=6) Mean ($\mu g/m^3$)	Designated areas (n=6) Range ($\mu g/m^3$)	P-value for difference in smoking status
Nicotine	22.9	57.0	32.0	29.0	0.115
3-EP	6.1	20.6	7.6	7.8	0.237
RSP	178.6	405.0	145.4	215.0	0.457
SolPM	41.4	174.5	56.2	96.0	0.244

Table 2.0 Descriptive statistics for the SHS markers in bars categorised by smoking status.

SHS marker	Natural ventilation (n=12) Mean ($\mu g/m^3$)	Natural ventilation (n=12) Range ($\mu g/m^3$)	Inlet/outlet ventilation (n=4) Mean ($\mu g/m^3$)	Inlet/outlet ventilation (n=4) Range ($\mu g/m^3$)	Air conditioning/ Air cleaning (n=12) Mean ($\mu g/m^3$)	Air conditioning/ Air cleaning (n=12) Range ($\mu g/m^3$)	Ducted ventilation (n=7) Mean ($\mu g/m^3$)	Ducted ventilation (n=7) Range ($\mu g/m^3$)
Nicotine	24.9	55.5	25.2	47.0	26.1	36.5	20.5	31.0
3-EP	5.7	12.2	6.6	12.0	6.6	9.5	7.2	20.6
RSP	181.5	280.0	200.0	195.0	155.8	260.0	172.1	375.0
SolPM	43.5	142.0	56.9	134.0	41.0	97.0	42.3	173.5

Table 3.0 Descriptive statistics for the SHS markers in bars categorised by ventilation status.

The bars were also categorised by the type of ventilation currently in use (natural ventilation, inlet/outlet ventilation, air conditioning/air cleaning or ducted ventilation). Table 3.0 shows the levels of SHS constituents dependent on the type of ventilation currently in use at the premises.

The collected data indicates that there are lower mean RSP concentrations in bars with ducted ventilation but this is not apparent for tobacco-specific markers (nicotine, 3-EP and SolPM). However there was found to be no statistically significant difference in the mean SHS concentrations in bars that had natural ventilation compared with bars that had air conditioning or bars that had ducted ventilation.

Personal exposure

In addition to the atmospheric monitors measuring the ambient levels of the SHS marker compounds within the various hospitality premises, passive samplers measured the associated personal exposure of the employees within these premises at the time of testing to the vapour phase of SHS.

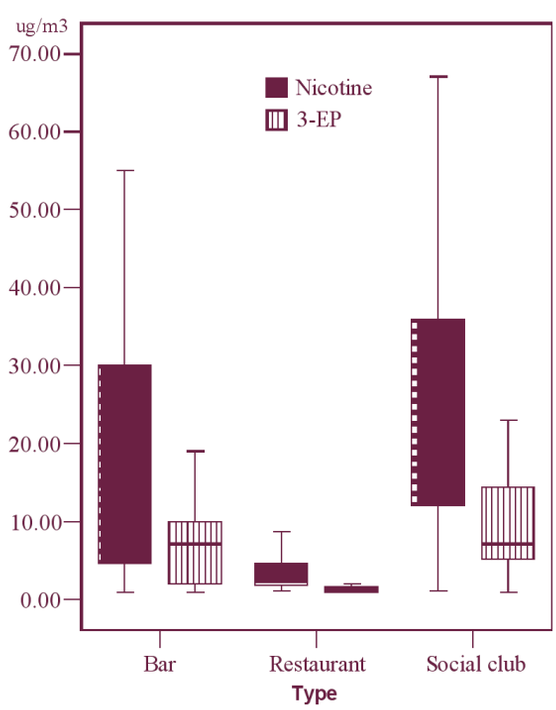


Figure 3.0 Descriptive statistics for the SHS markers ($\mu g/m^3$) categorised by venue type.

Table 4.0
Results of significance tests comparing the mean levels of SHS markers for personal monitors.

	SHS marker (P-value)	
	Nicotine	3-EP
Bars vs. Restaurants	0.000	0.000
Bars vs. Social clubs	0.249	0.093
Restaurants vs. Social clubs	0.000	0.000

Figure 3 shows the mean levels of nicotine and 3-EP measured by the personal monitors. As with the atmospheric monitoring, the mean levels of these markers are found to be generally higher within the bars and social clubs compared with the restaurants. In particular, the mean nicotine levels in restaurants were found to be 20% of that found in the bars.

Differences in the mean concentrations of the tobacco-specific SHS markers nicotine and 3-EP measured in bars and social clubs compared with restaurants were found to be statistically significant when examined using a non-parametric Mann-Whitney test (p-value < 0.05). There was no significant difference between the mean concentrations of nicotine and 3-EP between bars and social clubs (Table 4).

Owing to the large sample size, the mean SHS marker concentrations obtained from the personal badges worn by employees within bars only were categorised by the smoking status of the venue the employee was working in at the time of testing.

As also indicated by the atmospheric measurements, it appears that employees working within bars categorised as having designated smoking and non-smoking areas are shown to have greater exposure to the tobacco-specific SHS marker compounds nicotine and 3-EP, than employees working in bars that allow smoking throughout. This relationship has, however, not been shown to be statistically significant for either nicotine or 3-EP concentrations (Table 5).

In addition the mean SHS marker concentrations obtained from the personal badges worn by employees within bars were also categorised by the ventilation currently in operation at the venue the employee was working in at the time of testing. A significant difference was found when comparing the mean levels of 3-EP measured by the personal monitors in bars with natural ventilation compared with bars with air conditioning and compared to the bars with ducted ventilation (Table 6). However, when considering the mean levels of nicotine measured by the personal monitors, there was no significant difference.

On analysis of the cotinine concentrations there appeared to be no clear pattern in the results obtained.

Table 5.0
Results of significance tests comparing the mean levels of SHS markers for personal monitors by smoking status of venue.

	Smoking throughout (n=48)		Designated areas (n=12)		P-value for difference in smoking status
SHS marker	Mean ($\mu g/m^3$)	Range ($\mu g/m^3$)	Mean ($\mu g/m^3$)	Range ($\mu g/m^3$)	
Nicotine	17.0	54.0	21.8	37.50	0.186
3-EP	7.2	31.0	9.1	18.0	0.394

Table 6.0
Descriptive statistics for statistics for the SHS markers in bars categorised by ventilation status.

	Natural ventilation (n=16)		Inlet/outlet ventilation (n=6)		Air conditioning/ Air cleaning (n=25)		Ducted ventilation (n=13)	
SHS marker	Mean ($\mu g/m^3$)	Range ($\mu g/m^3$)	Mean ($\mu g/m^3$)	Range ($\mu g/m^3$)	Mean ($\mu g/m^3$)	Range ($\mu g/m^3$)	Mean ($\mu g/m^3$)	Range ($\mu g/m^3$)
Nicotine	12.1	35.0	13.4	26.5	16.8	35.0	29.5	50.5
3-EP	4.8	12.0	5.7	9.0	7.7	18.0	11.7	31.0

Limitations

Excluding the premises that refused to take part in the study could have introduced bias in the sample as it is possible that they could have particularly high or low levels of tobacco smoke present. It was not practical to sample all the premises on the same night, so in the summer months overall exposure to SHS may have been underestimated because pf the windows/doors being left open. In addition, the numbers present within the premises on the night of testing may not have been typical–for example, due to weather conditions and special events.

Although set criteria were adhered to, so far as practicably possible, the position of the atmospheric monitors varied in each of the premises tested because of the different layouts, which may have had an effect on the SHS measurements. While the monitors were positioned to deter tampering it is possible that this may have occurred.

The classification of ventilation currently in operation at the premises was subjective as often it was difficult to ascertain (by observation) what systems were in place and if the systems were in working order or in operation.

A convenience sampling approach was adopted to measure the personal exposure of the employees consequently the results may not be statistically representative of all hospitality workers in Liverpool.

Discussion

This study provides a snapshot of SHS levels within a number of hospitality premises in Liverpool on a particular night of testing: therefore, the results should be generalised with caution.

However, high levels of all the SHS marker compounds were found in a number of bars, restaurants and social clubs compared with the non-smoking venues tested. In particular, the tobacco-specific compounds (SolPM, nicotine) were found to be noticeably higher in bars in comparison to restaurants. This could be explained by increased numbers of smokers in bars or by the culture that is apparent in restaurants, with many smokers only lighting up after their meal or between courses rather than smoking during the whole evening as in a pub.

The difference in mean concentrations between bars and restaurants was not as noticeable for the marker RSP. Restaurants could potentially have additional contributions to the levels of RSPs because of other sources including cooking.

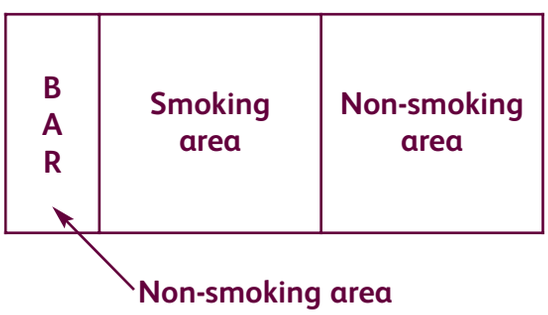


Figure 4.0
Typical layout of pub with designated smoking and non-smoking areas.

For the tobacco-specific SHS markers (nicotine, 3-EP and SolPM), the mean levels are shown to be higher (or very similar) in the venues that have separate designated smoking and non-smoking areas compared with those that allow smoking throughout. This would appear to be contradictory but can be explained by considering the layout in most bars with designated areas (Figure 4). In general these venues have a small non-smoking area directly in front of the bar, with the majority of smokers congregating next to this in the smoking area, increasing exposure to SHS at the bar with the main non-smoking area furthest from the bar. Nicotine is less mobile (Carrington *et al*., 2003) than the particulate phase; therefore, it tends to stay in the vicinity of the smoking area, increasing the exposure to SHS to staff working at the bar.

The levels of SHS markers found within the hospitality premises in Liverpool are comparable with levels measured in previous research studies. Carrington *et al*. (2003) found that SHS marker concentrations were higher in smoking areas compared with non-smoking areas in a sample of pubs in Greater Manchester, and Cenko *et al*. (2004) showed the average concentrations of nicotine and particulates were higher in smoking areas compared with dining areas, with approximately a twofold reduction of SHS within non-smoking areas.

Employees were found to be exposed to high levels of SHS during their shift within hospitality premises that allowed some degree of smoking compared to venues that were smoke free. This was found to be true for venues that allowed smoking throughout and venues that had separate designated smoking and non-smoking areas. This is in agreement with the link highlighted by Bates *et al*., in 2002, which concluded that the hospitality

workers who completed their shift in premises in which smoking was allowed throughout had more significant increases in cotinine (a marker for SHS exposure) than for those who worked in smoke-free work places.

The lack of any conclusive results for the cotinine testing in this study could possibly be caused by problems with the analytical methods used, the storage and transportation of the samples or inconsistencies in the sampling procedure. This is, however, still under investigation.

When the bars were classified by the type of ventilation currently in use at the premises, there was found to be no significant difference in the SHS marker concentrations within the bars that had natural ventilation and those that had either air conditioning or ducted ventilation. This result suggests that the types of ventilation system currently in use in bars are not adequate for the removal of SHS. The effectiveness of such ventilation methods in controlling SHS levels in pubs and bars has been shown to be limited (Gee *et al*., 2005).

Previous studies have shown that unenclosed non-smoking areas had higher SHS concentrations than non-smoking areas that were separately enclosed from smoking-permitted areas (Cenko *et al*., 2004). This was again highlighted in a study by Mulcahy (2001) conducted in Ireland. It was concluded that not only were bar ventilation systems unable to maintain SHS at low levels; extremely high levels of carbon monoxide were found in two out of 14 bars tested (Mulcahy, 2001).

At the onset of this research study, the Government White Paper, 'Choosing Health 2004', proposed a staged approach for the implementation of a smoking ban in enclosed public places and workplaces by 2008. This strategy exempted non-food serving premises, which would leave a large number of employees still exposed to SHS. However, after a recent free vote by Members of Parliament in relation to the proposals outlined in the White Paper, comprehensive smoke free legislation, banning smoking in all workplaces and public places is set to be introduced in the UK in 2007.

This comprehensive smoke-free legislation will protect most workers from the harmful effects of SHS and will create the right environment to encourage people to quit, reducing the current smoking prevalence. Previous studies carried out in New York (Travers, 2004) and Italy (Giuseppe *et al*., 2005) have shown significant reductions in SHS concentrations in hospitality venues after smoking legislation. Levels of RSP have been shown to decrease substantially in western New York hospitality venues after the implementation of their smoking law that requires almost all workplaces and public places to be smoke free, thus suggesting that improvements can be made within months of policy implementation.

Reductions in salivary cotinine levels of bar workers (reduction of 80%) have been shown in the Republic of Ireland since the introduction of the comprehensive smoke-free laws (Public Health (Tobacco) Acts 2002 and 2004) thereby offering non-smoking bar workers significant protection from exposure to SHS (Allwright *et al*., 2005). This was also supported in a recent study (Mulcahy *et al*., 2005), which assessed the SHS exposure to hotel workers. Significant reductions in saliva cotinine concentrations (70%) were observed following the smoking ban.

As a follow up to this study, it is recommended that a similar research study is completed in Liverpool, post ban, to assess the true reduction in SHS concentrations as a consequence of the smoking restrictions.

Conclusions

- High levels of all of the SHS marker compounds were found in hospitality premises that allowed smoking compared to the non-smoking venues tested.
- Employees' personal exposure to SHS was significantly increased in bars and restaurants that allowed smoking compared with premises that were smoke-free.
- There was a significant difference in levels of SHS in bars compared to restaurants, strongly suggesting that allowing smoking to continue in premises that served food has the potential to widen health inequalities.
- This study provides a snapshot of SHS levels within hospitality premises in Liverpool and adds to the evidence base, supporting the proposed smoking ban in England due to take affect in 2007.

Acknowledgements

Andrew Easterbrook and colleagues from the Health and Safety Laboratory for training staff in the use of monitoring equipment and conducting laboratory

analysis; Environmental Health Department, Liverpool City for negotiating access to premises and assisting with the testing programme.

References

Allwright S, Paul G, Greiner B, Mullally B J, Pursell L, Kelly A, Bonner B, D'Eath D, McConnell B, McLaughlin J P, O'Donovan D, O'Kane E, and Perry I J (2005) Legislation for Smoke-free Workplaces and Health of Bar Workers in Ireland: before and after study. *British Medical Journal* 331, 1117.

Bates M N, Fawcett J, Dickinson S, Berezowski R, and Garrett N (2002) Exposure of Hospitality Workers to Environmental Tobacco Smoke. *Tobacco Control* 22, 125-129.

Beak S O, Kim Y, and Perry R (1997) Indoor Air Quality in Homes, Offices and Restaurants in Korean Urban Areas-Indoor/Outdoor Relationships. *Atmospheric Environment* 31(4), 529-544.

British Standards (1997) BS 5202-18:1997, Methods for Chemical Analysis of Tobacco and Tobacco Products. Determination of Vapour-Phase Nicotine in Air (Gas-Chromatographic Method). *British Standards*.

British Standards (2001) BS ISO 15593:2001, Environmental Tobacco Smoke. Estimation of its Contribution to Respirable Suspended Particles. Determination of Particulate Matter by Ultraviolet Absorbance and by Fluorescence. *British Standards*.

Carrington J, Watson A F R, and Gee I L (2003). The Effects of Smoking Status and Ventilation on Environmental Tobacco Smoke Concentrations in Public Areas of UK Pubs and Bars. *Atmospheric Environment* 37, 3255-3266.

Cenko C, Pisaniello D, and Esterman A (2004) A Study of Environmental Tobacco Smoke in South Australian Pubs, Clubs And Cafes. *International Journal of Environmental Health Research* 14, 3-11.

Commission of the European Communities (2007) Towards a Europe free from tobacco smoke: policy options at EU level: COM(2007) 27 final. Available online at: *http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/109&format=HTML&aged=0&language=EN&guiLanguage=en* [accessed 02/02/07].

Curvall M, Vala E K, Enzell C R, and Wahren J (1990) Simulation and Evaluation of Nicotine Intake During Passive Smoking: Cotinine Measurements in Body Fluids of Non-Smokers Given Intravenous Infusions of Nicotine. *Clinical Pharmacology and Therapeutics* 47, 42-49.

Gee I L, Watson A F R, and Carrington J (2005) The Contribution of Environmental Tobacco Smoke to Indoor Air Pollution in Pubs and Bars. *Indoor and Built Environment* 14 (3-4), 301-306.

Gee I L, Watson A F R, Carrington J, Edwards P R, Van Tongeren M, McElduff P, and Edwards R E (2006) Second Hand Smoke Levels in UK Pubs and Bars: Do the English Public Health White Paper Proposals Go Far Enough? *Journal of Public Health* 28(1), 17-23.

Giuseppe G, Gasparrini A, Fondelli M C, Costantini A S, Centrich F, Lopez M J, Nebot M, and Tamang E (2005) Environmental Tobacco Smoke (ETS) Exposure in Florence Hospitality Venues Before and After the Smoking Ban in Italy. *Journal of Occupational and Environmental Medicine*. 47 (12): 1208-1210.

Her Majesty's Stationery Office (1974). Health and Safety at Work etc Act 1974. London, HMSO.

Department of Health (2004) Choosing Health: Making Healthier Choices Easier. London, Department of Health.

Jamrozik K (2005) Estimate of Deaths Attributable to Passive Smoking Among UK Adults: Database Analysis. *British Medical Journal* 330, 812-815.

Kauppinen T, Toikkanen J, Pedersen D, *et al* (2000). Occupational Exposure to Carcinogens in The European Union. *Occupational and Environmental Medicine* 57, 10-18.

Mulcahy M (2001) Pub Smoke-Passive Smoking and Bars. *Environmental Health Officers Association Yearbook 2000/2001*. Environmental Health Officers Association, Dublin.

Mulcahy M, Evans D S, Hammond S K, Repace J L and Byrne M (2005) Second Hand Smoke Exposure and Risk Following the Irish Smoking Ban: An Assessment of Salivary Cotinine Concentrations in Hotel Workers and Air Nicotine Levels in Bars. *Tobacco Control* 14, 384-388.

Quan C (1998) Comparing Environmental Tobacco Smoke Intake Among Restaurant Workers and Adults at Home. *Berkeley McNair Journal*; 6. *www.mcnair.berkeley.edu/98journal/ChancellorsIntro.html* Accessed 01/02/07.

Scientific Committee on Tobacco and Health (2004) Second Hand Smoke: Review of the Evidence Since 1998. Update of Evidence on Health Effects of Second Hand Smoke. London, Scientific Committee on Tobacco and Health.

Siegel M and Skeer M (2003) Exposure to Second Hand Smoke and Excess Lung Cancer Mortality Risk Among Workers in the "5b's": Bars, Bowling Alleys, Billiard Halls, Betting Establishments and Bingo Parlours. *Tobacco Control* 12, 333-338.

Smoke Free Liverpool (2006), Resourcefully Smoke Free. Available on-line at: *www.smokefreeliverpool.com/html/howtodoaliverpool/liverpool_index.php* [accessed 01/02/2007].

Travers M J, Cummings K M, Hyland A, Repace J, Babb S, Pechacek T, Caraballo R (2004) Indoor Air Quality in Hospitality Venues Before and After Implementation of a Clean Indoor Air Law-Western New York. *Morbidity and Mortality Weekly Report* 53, 1038-1104.

Wood J, Hennell T, Jones A, Hooper J, Tocque K, and Bellis M A (2005) Where Wealth Means Health: Illustrating Inequality In The North West. Liverpool, North West Public Health Observatory.

Factors affecting undergraduate environmental health students' choice of career and degree subject at six universities: A study in the context of policies introduced to counter the 2001 recruitment crisis

Michael Cooper[1] BSc Grad.CIEH and Norman Parkinson[1] MA Dip.EH Dip.HM FCIEH

[1] Department of Public Health Sciences, School of Medicine, Kings College London, Capital House, Weston St, London SE1 3QD, United Kingdom

Correspondence: Norman Parkinson, Department of Public Health Sciences, School of Medicine, Kings College London, Capital House, Weston St, London SE1 3QD, United Kingdom, Email: norman.parkinson@kcl.ac.uk, Telephone: +44 (0)207 848 6618

Abstract

Applications to university programmes accredited by the UK Environmental Health Registration Board (EHRB) fell from a mean of c300 to a mean of c50 over the 5 years to 2001. This led to the closure of two programmes and put others under threat. In response, in 2002, the Chartered Institute of Environmental Health (CIEH) and government agencies introduced a range of remedial polices.

The purpose of this study is to clarify the trend in admissions and to better understand how entrants choose environmental health as a career, in the context of the remedial policies.

In March 2006, questionnaires were sent to undergraduate programme leaders and students at six universities.

It was found that while there had been an overall increase in student numbers at the respondent universities, this was mainly owing to the opening of one new programme and a marked increase at one existing programme. This university had enrolled a large proportion of 'unconventional' students. This may have quality implications, and should be studied further. Some of the overall increase may have been a result of applicants switching owing to the closure of other programmes. The targeting of the existing technician workforce is identified as a mere short-term measure.

The major influences on the choice of EH by entrants are its *desirable conditions of service* and its *altruistic characteristics*. These factors coincide with the job characteristics ranked most desirable by *all* potential university applicants in other studies. Environmental Health is thus an attractive career option, but many young people are not receiving appropriate career information and guidance.

The percentage of entrants that comes straight from school is relatively low (c60%). This is because of the lack of paid placements, the limited number of universities offering undergraduate EH programmes, and the lack of information from school advisors

The CIEH initiatives have been useful to many entrants but have had relatively little influence on career choice. Recruitment activity should be targeted at raising awareness of the desirable job characteristics of an EHP through talks to schools by serving practitioners; through offering work experience, and via improved careers information and advice. The CIEH should lobby for all practical training to be publicly funded.

Key words: Accredited courses; careers; environmental health practitioners, environmental health officers, Environmental Health Registration Board; universities.

Introduction

Environmental health practitioners (EHPs) are employed by UK local authorities, other agencies of government, and the private sector. They fulfil regulatory and advisory public health roles in programmes such as food hygiene and food safety; health and safety in workplaces; improving housing conditions; disease and vector control; nuisances, and pollution control and environmental protection. The qualifications and training of EHPs and EH technicians in England, Wales and Northern Ireland are overseen by the Chartered Institute of Environmental Health (CIEH) and the Environmental Health Registration Board (EHRB). Applications to university courses accredited by the EHRB fell from a mean of c300 to a mean of c50 over the five years to 2001 (Harvey, 2000). This decline led to the closure of programmes at Greenwich, Edinburgh and, later, it was a factor in the closure of the undergraduate programme at King's College London. It also put pressure on the remaining universities. Robinson (2001) reported that the number of students on accredited courses had fallen by 20%, and this despite the lowering of university entrance requirements. A fall in the number of graduates could lead to posts being left vacant, or to the employment of unqualified or under-qualified staff, which could put the public at risk. It was later reported that 63% of local authorities had recruitment difficulties (Employers Organisation for Local Government *et al*., 2002).

Nicholls and Parkinson (2002) suggested reasons for the decline, including: the reduced number of secondary students taking science Advanced Level subjects; national socio-economic factors such as the abolition of the student grant system and the introduction of university fees; low salaries; the 'blame culture' and a fall in the value that society accords to public service; a poor public image of EHPs; low public awareness; the rigorous professional qualification regime; the loss of local authority training places, the general failure of the employers to contribute adequately to the cost of training its future workforce; the widening gap between public and private sector pay, and structural changes in local government.

Their study, carried out in 2001, found that numerous and wide ranging characteristics influenced students' choice of course and university. No single factor predominated. However, the four characteristics most frequently ranked by respondents as 'most important' were: Teaching and research reputation of the University, the nature of the course, the overall image of the University and the nature of the likely career. They stressed that these four factors must be accommodated in addressing the decline in applications to environmental health courses.

With regard to the *nature of the likely career*, they found that a lack of awareness of the EHP was not a major factor in the reduction in the number of applicants to EHP courses. However, potential applicants had a misconception of the EHP's role; they were not aware that it has many desirable characteristics, and they incorrectly attributed to it some undesirable characteristics, probably as a result of the *'A Life of Grime'* television programme. They also found that potential applicants were unaware that seven of the eight job characteristics most frequently cited as 'desirable' are indeed features of EHP work. They recognised that while the most frequently cited 'desirable' characteristic, 'a high salary', is unlikely ever to be a characteristic of local authority EHP posts, nevertheless market forces and the widening gulf between private and public sector salaries should be addressed. A wide range of negative influences on the number of potential applicants to environmental health courses was identified. They concluded that central government departments, local government employers and the professional bodies should adopt a strategy to ensure that the public is better informed of the training, qualifications and role of the EHP (Nicholls and Parkinson, 2002).

The CIEH commissioned Gaber and Wardle to investigate the problem and their 'CLEAR Report', (2002) suggested many reasons for the decline in student numbers and recommended three interventions:

- *A media relations campaign* would aim to raise awareness of the work of an EHP and the ways an EHP makes a significant difference in people's lives.
- *Working with schools and careers guidance professionals* including the development of careers education and advisory resources.
- *A Public Affairs Campaign* to raise the general status of environmental health and to secure funding for additional training placements and the recruitment of new professionals by local government and the private sector. (Gaber and Wardle, 2002).

In July 2002, the CIEH revealed that local authorities in England and Wales were experiencing difficulties in recruiting environmental health officers, and yet all environmental health courses were classed as 'at risk' because of low entry levels. (CIEH, 2002) The CIEH subsequently announced its package of remedial measures:

- A new careers pack and support materials for speakers and trainers;
- Redesigning the careers section on the CIEH website;
- Encouraging local authorities to provide work experience and sponsored training;
- A helpline to help with recruitment enquiries;
- Re-examining the core curriculum and training pathways, and
- Discussing recruitment issues with government, local authorities and members.

(CIEH, 2002)

At the 2003 Local Government Association (LGA) conference in Harrogate, it launched a joint initiative with the LGA to tackle the recruitment and retention crisis. This focussed on making key decision makers aware of the role of local government in providing regulatory services such as environmental health. This was to be done by showing how environmental health contributes to the social and economic wellbeing of local communities. They would also lobby for external funding from central government for a bursary scheme for EHO students. (CIEH, 2003a)

In June 2003, the CIEH published a new Core Curriculum that, inter alia, would allow students to undertake more of their practical training in the private and non-profit sectors (CIEH, 2003b). This was aimed at reducing the burden of finding a local authority placement, which is a potential barrier to student entry.

In its Annual Report for 2002, the CIEH reported that the decline in student applications had been halted and that there had been a small increase at some universities. The CIEH pointed to its new careers website, that had had 40,000 'hits' in its first six months, and new promotional material such as brochures, flyers, posters and exhibition material, and a CD-Rom with information on how to engage the enthusiasm of potential students. The CIEH had also been encouraging local authorities to provide more training places (CIEH, 2003c).

Factors affecting undergraduate environmental health students' choice of career and degree subject at six universities: A study in the context of policies introduced to counter the 2001 recruitment crisis

The purpose of this study is to clarify current trends in the recruitment of environmental health students, and to better understand how entrants choose environmental health as a career, in the context of the remedial policies.

Methods

Data were collected by literature review, personal communications with CIEH staff and questionnaire surveys of students and of university programme leaders.

In September 2005, 10 UK universities offered the EHRB accredited BSc in Environmental Health to new students. The University of Strathclyde was not included in the survey, because of the role of the Royal Environmental Health Institute of Scotland, and because the Scottish education system, local authorities and professional structure is different. Two universities declined to participate and one did not respond to a request; therefore questionnaires were sent to six universities. Few student questionnaires were received from two of the universities. There is no reason to believe that the respondent students were not representative of the student population at the six universities. In considering the results, one must bear in mind that one of the respondent universities was not typical, in that it had enrolled a relatively high proportion of 'unconventional' entrants.

Students from the intake of 2005 were chosen because the factors that influenced them to pursue a career in Environmental Health would still be fresh in their minds, and also because the changes initiated by the CIEH from 2002 would have had time to become established and therefore to have had an impact on students researching their career options in the two years prior to making their university applications.

The student questionnaires were sent to course leaders in March 2006 and they were then distributed to first year students. The questionnaires were self-administered and were of a simple, structured format, incorporating space for qualitative comments. The questionnaire covered: the student's background; the student's funding; factors that had influenced their choice of environmental health, and their suggestions for the better marketing of environmental health.

University programme leaders were asked to complete a separate questionnaire. Their questionnaire covered: the numbers of students recruited in 2002/3/4/5; the background of the students; their opinions on the reported upturn in recruitment numbers, and CIEH and other agencies' policies, and their own efforts to increase recruitment.

Quantitative results were analysed using The Statistical Package for the Social Sciences.

Results

Student Survey

109 questionnaires were received from students at the six respondent universities. These universities had enrolled a total of 206 entrants in 2005. Confidence intervals for percentages of entrants are therefore based on a sample of 109 and a population of 206. One of the respondent universities had recruited for the first time in 2004.

Entrants' background

About 60% of entrants to the respondent university programmes came straight from school (59%, p=0.05 CI 53–65%). About 10% (11%, p=0.05 CI 7–15%) came from higher education college/universities. 10% (p=0.05 CI 6–14%) of entrants were technicians, already working within local authorities. The remaining 20% (p=0.05 CI 15–25%) came from a wide variety of 'other' backgrounds, the most frequent of these being the food industry (n=5).

Funding of practical training

Three quarters of entrants were wholly or mainly self-funded for their practical training. About half of entrants (49%, p=0.05 CI 43–55%) were wholly self-funded, and a further quarter were self-funded but with an Employers Organization for Local Government bursary (27%, p=0.05 CI 21-33%). 15% (p=0.05 CI 10–20%) of entrants had fully or partly salaried practical training placements with a local authority. 7% (p=0.05 CI 4-10%) of entrants were technicians already working within local government.

Where entrants first heard about environmental health

About 20% of entrants first heard about environmental health through work experience in an environmental health department (19%, p=0.05 CI 14–24%). About 15% (16%, p=0.05 CI 11–21%) discovered environmental health in their previous employment.

15% of entrants first heard about environmental health through television programmes like *'A Life of Grime'* (p=0.05 CI 10–20%). Personal recommendations stimulated 15% of entrants (p=0.05 CI 10–20%) and careers literature/guidance was responsible for about

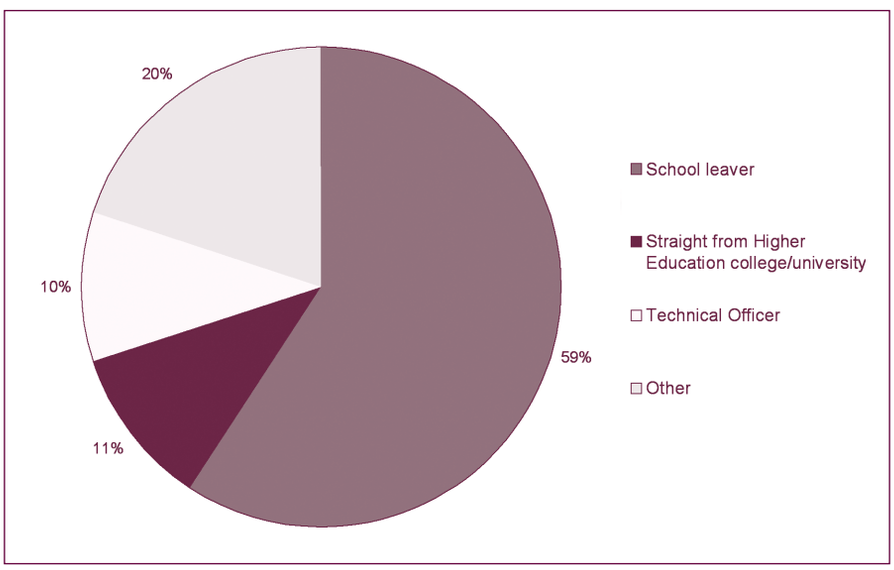


Figure 1.0
Entrants' background

another 15% (14%, p=0.05 CI 10–18%). The CIEH CD-Rom (2%) and the ehcareers.org website (3%) accounted for very few entrants.

Influences on entrants' choice of career in environmental health

The most frequent influences (total of major and minor) were desirable conditions of service: 'Attractive salary' (85%, p=0.05 CI 80–90%),; 'Not office based'(80%, p=0.05 CI 75–85%); 'Career progression'(78%, p=0.05 CI 73–83%), and 'Job Security' (75%, p=0.05 CI 69–81%).

These were followed by altruistic characteristics: 'improving public health', 'helping people', and 'protecting the environment'. The least frequent

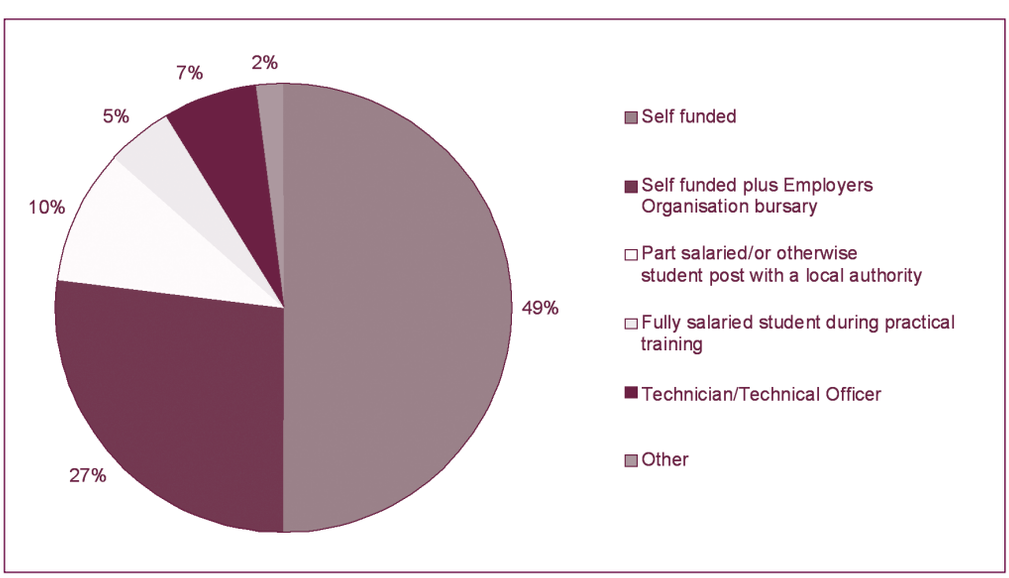


Figure 2.0
Funding of practical training

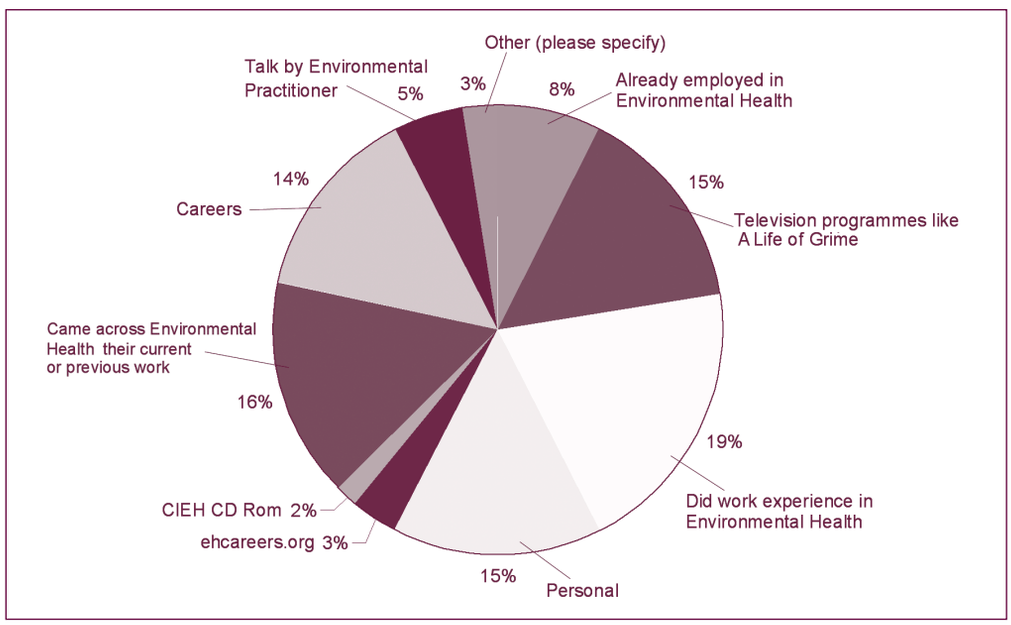


Figure 3.0
Where entrants first heard about environmental health

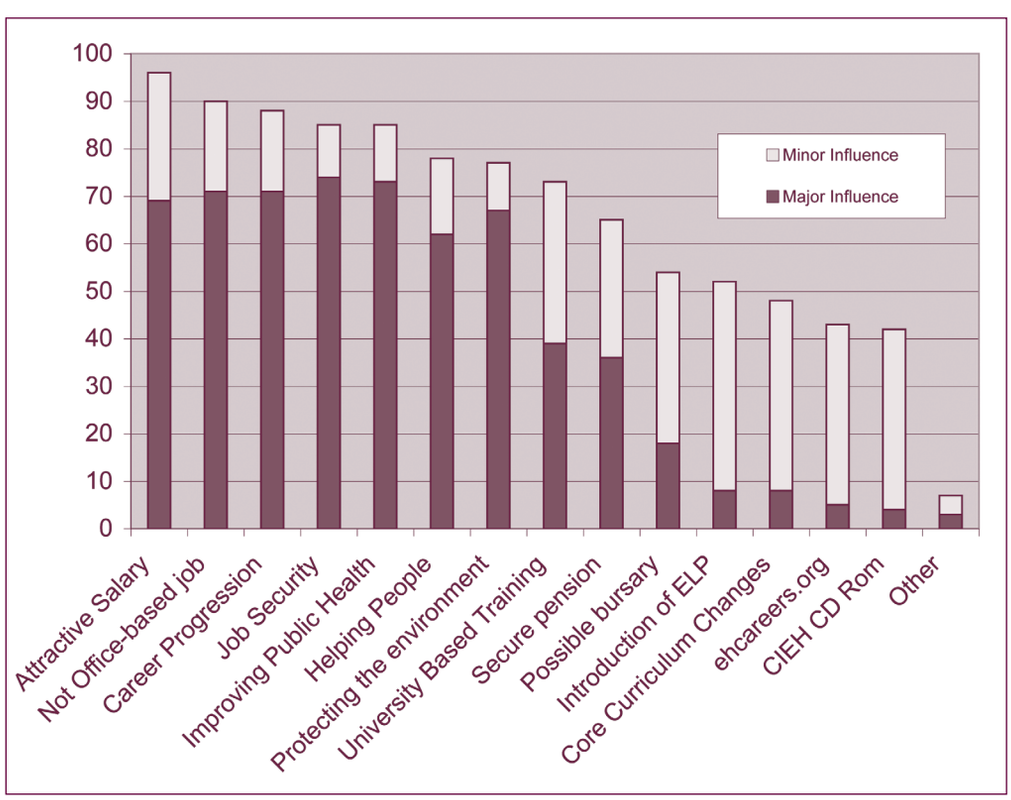


Figure 4.0
Influences on entrants' choice of career in environmental health

Figure 5.0
Negative influences on entrants choice of environmental health

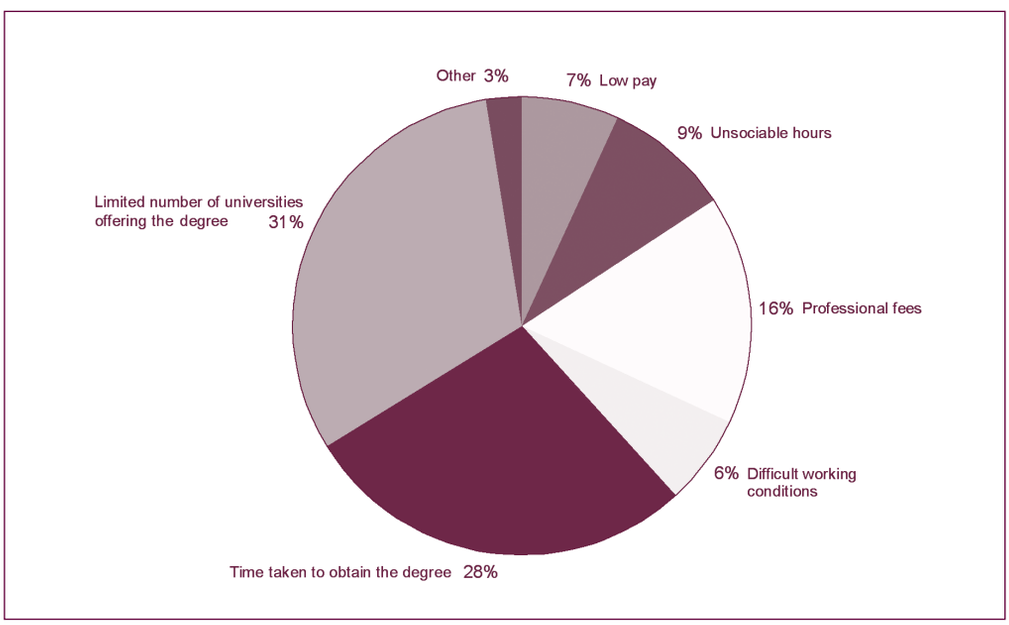
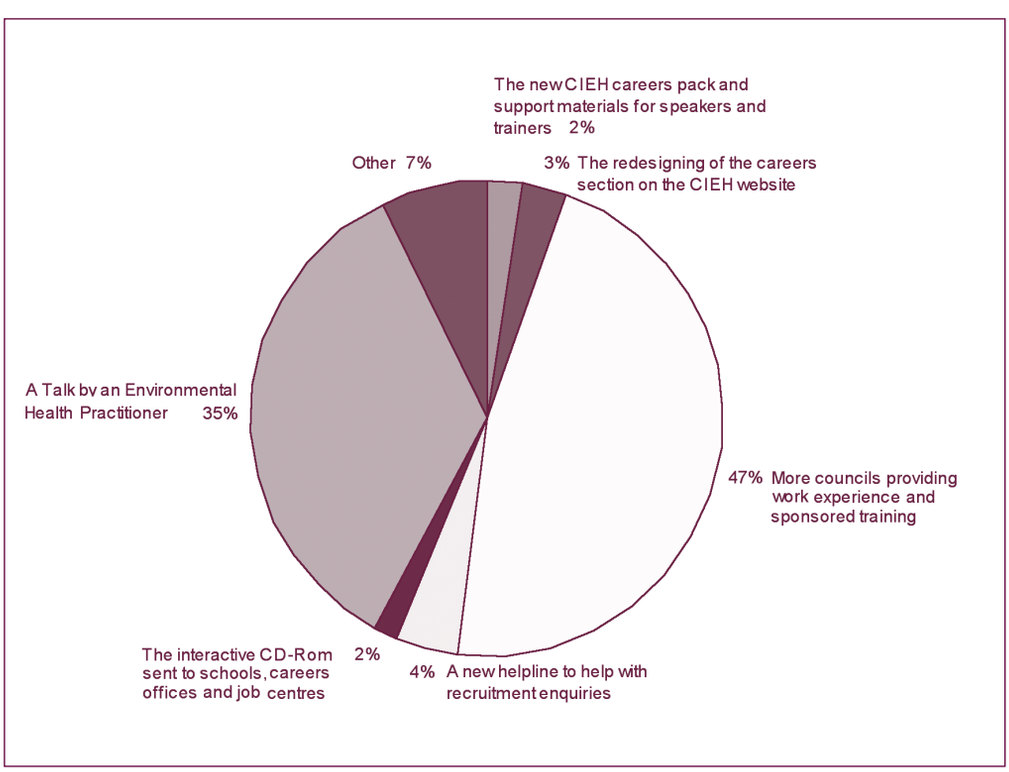


Figure 6.0
Important factors in the choice of a career in environmental health



influences were the CIEH initiatives: CIEH CD Rom, ehcareer.org, 'changes to the core curriculum and the 'new log book' (ELP).

The same desirable conditions of service were also the most frequent 'major' influences on career choice, and the CIEH initiatives were the least frequent 'major' influences, though each were at least 'influential' to over 40% of all entrants.

Negative influences on entrants' choice of environmental health

The most frequent concern (31%, p=0.05 CI 25 – 37%) was the limited number of universities offering the BSc Environmental Health.

The second most frequent negative influence (28%, p=0.05 CI 22 – 34%) was the time taken to achieve the degree with integrated practical training. The third most frequent (16%, p=0.05 CI 11 – 21%) was the cost of the professional assessments.

Relatively low pay, difficult working conditions and unsocial hours, all negative aspects of the job itself, taken together accounted for nearly all (23%) of the remaining concerns to entrants.

Important factors in the choice of a career in environmental health

Respondents were able to select more than one factor. About half indicated that 'councils providing work experience and sponsored training' was an important factor (47%, p=0.05 CI 41 – 53%). The next most frequent choice was 'a talk by an environmental health practitioner (35%, p=0.05 CI 29 – 41%).

The most frequent 'Other' factor was 'career progression' – all of these respondents (n=5) were existing technicians in environmental health departments who wished to progress to EHP status.

How entrants thought a career as an environmental health practitioner could have been better marketed

This was an open-ended question and 39 students responded with their suggestions.

22 respondents referred to a lack of information from schools and the careers service,

> *"At careers days there is no information about environmental health as a career."* (Student 86)

eleven respondents felt that there was a need for more marketing and promotion of EH careers

> *"The benefits of a career in environmental health need to be promoted i.e. there is lots of work available nationwide, challenging, variety in the work, good career prospects throughout the working life and helping the environment."* (Student 08)

> *"There needs to be a national campaign on television and in the press."* (Student18)

> *"There needs to be more awareness of the fact that its actually an attractive vocation."* (Student 84)

Eight stressed a need for more talks in schools by serving practitioners and two respondents felt that more local authorities should offer work experience.

Four of the 38 respondents mentioned the CIEH initiatives.

Programme leader questionnaire survey

Five programme leaders responded to the questionnaire survey.

Students entering respondent programmes in 2002/03/04/05

The programme at university B commenced in 2004, so no data are shown for earlier years. The other four universities taken together showed an increase between 2002 and 2004 and then a small drop in 2005.

Reasons for the increase in intake

Respondents were told that the CIEH has stated that nationally there has been in increase in student numbers. They were asked to indicate the factors that felt may have contributed to this. Four out of the five programme leaders felt that the increase was owing to a better understanding among young people of the work of environmental health practitioners. Three felt that there had been better marketing of environmental health in schools. Two indicated an increase in the number of paid student placements and sponsorships. Two said that the CIEH offered more advice about the profession and "other" factors. One leader referred to " a higher profile of EHPs in the media" and another to the "employers organisation providing funds to develop placements".

How students are hearing about environmental health?

The five programme leaders' perceptions of how

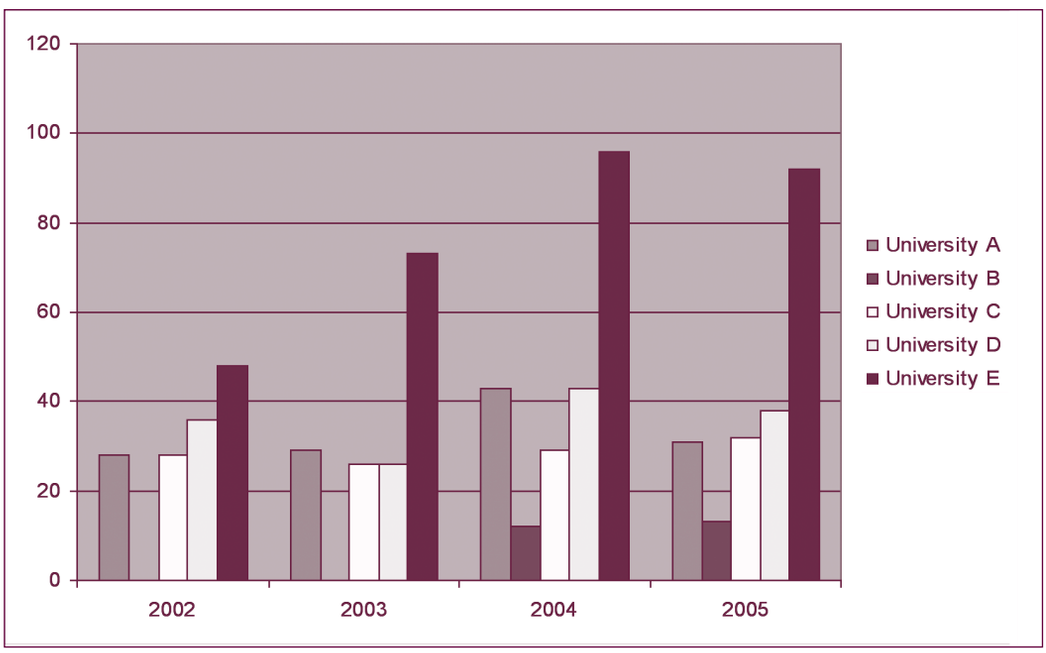


Figure 7.0
Students entering respondent programmes in 2002/03/04/05

students were hearing of EH were:

Work experience in an environmental health department	5
Personal recommendation	5
Talks by environmental health practitioner	3
Came across it in their current or previous work	3
TV programmes such as *"A Life of Grime"*	3
From the university of their choice	2
Careers literature guidance	1
Internet/ehcareers.org	1

These perceptions parallel the results of the student questionnaire.

Table 1.0
Percentage of 2005/2006 intake who were previously technicians, mature entrants, school leavers

University	Previously Technicians	Mature Entrants	School Leavers
A	25 %	40 %	60 %
B	8 %	70 %	30 %
C	0 %	20 %	80 %
D	0 %	7 %	93 %
E	50 %	75 %	25 %

What more the CIEH should do?
Four of the five programme leaders felt that more should be done to encourage practical training placements:

> *"Resources must be allocated to encourage placement opportunities with local authorities and ways should be sought to make professional training more flexible."* (Programme Leader S)

> *"The CEIH should be encouraging relevant industries and consultancies to take on students for practical training."* (Programme Leader P)

Three of the programme leaders felt that there should be more and better marketing of a career in EH:

> *"An introductory video presentation would be an effective way of showing prospective students what EHPs do, to counter the impression given by television documentaries."* (Programme Leader Q)

What more could be done by other agencies?
'Other agencies' included local government employers, central government agencies, etc.

The programme leaders at three universities stressed the

need for more placements, and that the financial implications of training in EH put it at a disadvantage in comparison with other health professions.

What the universities have done to increase student numbers?

All five universities had taken a range of similar actions including: open days; attendance at career fairs; talks at schools, and meeting prospective students at the university. Two offered 'taster courses'. They all try to emphasise the achievements of recent graduates, e.g. Ronald Williams Awards, and the career prospects in environmental health.

Discussion

Intake numbers

While there has been an overall increase in student numbers at the respondent universities, this was mainly owing to the opening of one new programme and a marked increase at University E. The increases at the other universities have been modest. Some of the overall increase may have been a result of applicants 'switching' owing to closure of other programmes. The overall increase merely compensates for the loss of the three programmes in 2001/2. University D is now running at full capacity.

University E, which has increased its intake by 92%, has adopted an atypical admissions policy. It appears to target 'unconventional entrants' and existing EH technicians (see Table 1.0). It initially enrols some students who do not qualify for entry to degree level study onto lower level programmes. Its intake figure includes all such students. Students enrolled on these sub-degree programmes may later transfer to the BSc. This policy has undoubtedly contributed to the increased intake, but may have quality implications, which should be the subject of further evaluation.

Entrants' background

The proportion of school leavers overall was about 60% (59%, P=0.05 CI 53-65%), but the figure varies considerably between universities. At University D 93% of respondents were school leavers while at University E it was less than 25%.

No data on the percentage of school leavers in earlier intakes could be found, but the overall figure of c60% seems low, and this and the figure of 25% at University E, which is the only undergraduate programme in its region, suggests that work remains to be done to get school leavers interested in a career in environmental health, and that there is potential to develop this source of entrants.

The need to fund the practical training period is an obstacle to entry for school leavers. 88% of school leaver respondents had to fund their practical training themselves, though 17% of them were aided by a bursary. 9% students were salaried or otherwise part funded by a local authority. Only 3% students had a fully salaried student post, though this was the norm 25 years ago. Other health professionals do not fund their own practical training and the employers and government should look closely at the equity of the current arrangements in environmental health.

> *"More placements are desperately needed."* (Programme Leader P)

> *"It is up to the employers … paid sponsorships should be the norm."* (Programme Leader R)

> *"They should provide more placement opportunities."* (Programme Leader S)

University 'top-up fees' of up to £3,000 p.a. were introduced in September 2006, and the additional impact of this will need to be monitored.

One half of University E's entrants were existing technicians. Over the five universities, about 10% of entrants were previously technicians. While this is an important source of entrants, and it is important that a career progression 'bridge' for technicians is maintained, the targeting of the existing technician workforce as an answer to shortages is a mere short-term measure, as the supply of suitable, willing technicians is finite.

How entrants first hear about environmental health

CIEH initiatives such as the CD-Rom and the ehcareers.org website accounted for very few entrants. The CIEH had 40,000 hits on its website in its first six months alone, raising questions about why the website seems to inspire so few entrants. Nevertheless, these resources are important *secondary* sources, being at least influential to about 40% of entrants. The problem appears to be that potential entrants are not aware of their existence until *after* their interest in EH has been raised.

> *"I had not heard of the new CIEH careers pack, the redesigning of the CIEH website, the new website to help recruitment enquiries and the CD-Rom."* (Student 12)

Raising that first interest in a career in EH is crucial, and yet careers information and guidance in schools, etc, is failing; it accounts for only 25% of school leaver entrants and 14% of all entrants. Respondents pointed to the need for more and better information. A recurrent theme was that while respondents later found that EH was the right career for them, they had not been told about it at school.

> *"Careers advisors should be better informed; the job fitted my needs perfectly but it was not mentioned as a possible career."* (Student 21)

The offer of work experience in an environmental health department accounted for 27% of school leaver entrants and is clearly a successful way of attracting potential EHPs. More EH departments should be encouraged to offer work experience opportunities (work experience is now mandatory within the national curriculum) and this could be linked with talks at schools from serving EHPs.

5% of entrants first heard of EH at 'talks' from serving EHPs, and for about 35% it was an important factor in their career choice. The need for more such 'talks' was stressed by eight of the 39 entrants who made suggestions for improved marketing of EH.

> *"A talk by an environmental health practitioner is a good way to learn about the job … they give a better insight."* (Student 43)

The importance of career talks was recognised by university programme leaders, and was accepted by the CIEH Working Group (2002c). The CLEAR report recommended that the CIEH should train volunteers to go into schools to talk to students and career advisors (Gaber and Wardle, 2002). The CIEH produced audiovisual resources for speakers, but: *"The current EH careers presentation is rather limited (though very well produced). A careers road show is another possibility."* (Programme Leader Q)

The CIEH should now encourage more of its members and local authorities to take on this task at a greater number of schools and colleges.

> *"There is a need for more interaction at a local level from environmental health practitioners."* (Student 41)

> *"People should come into school and give a better explanation of the course and jobs afterwards."* (Student 71

'Passive' sources such as personal recommendations or coming across EHPs in everyday life are important factors; they attracted about 30% of all respondents. This cannot be increased by policy initiatives, but presumably will continue to be a steady source of entrants. The high percentage of entrants who first heard of EH in this way says much about the ineffectiveness of other awareness initiatives.

Despite evidence from Nicholls and Parkinson (2002) that the '*A Life of Grime*' programme was responsible for misconceptions of the role of the EHP, it nevertheless raised the interest of about 15% of entrants.

> *"Surprisingly, some students have stated that the "A Life of Grime" TV documentary attracted them to the profession."* (Programme Leader P)

However, it is not known how many potential applicants were misinformed, or put off by these programmes.

The entrants' choice of career

The most frequently cited influences on the choice of a career in EH were its *desirable conditions of service*, followed by its *altruistic characteristics*. This finding is important since it mirrors the findings of Nicholls and Parkinson (2002) that the characteristics of EH work are among the highest ranked desirable job characteristics cited by all potential university applicants. Environmental health is an attractive career option, but young people are not being told about it.

> *"More information should be given out to sixth formers. Some people have no idea this course exists."* (Student 53)

The task remains to make more potential applicants aware that EH work has the job characteristics that they are looking for.

> *"A campaign with career services and schools needs to be implemented…. the role and career structure of EH will sell itself. There are few jobs that offer such a range of daily opportunities or in which skills are so attractive to a wealth of employers."* (Course Leader T)

The CIEH *marketing initiatives* had relatively little influence on career choice, but they at least had minor influence on about 40% of entrants.

> *"I had not heard of the new CIEH careers pack, the redesigning of the CIEH website, the new website to help recruitment enquiries and the CD-Rom."* (Student 12)

The CD and website are useful to potential entrants who have already heard about EH, but it is not an effective first contact with potential entrants.

> *"More publicity on the actual career is needed. The website is very good; you just wouldn't know to look there."* (Student 50)

The most frequent (48%, n=58) negative factor cited by school leaver entrants was the limited number of universities offering the programme. Seven Universities offer the BSc in England and one in each of Northern Ireland, Scotland and Wales. In London and the South East of England, where there is the highest concentration of population in the UK, there is only one university offering the BSc, Greenwich and King's College London having closed their BSc courses. Government policies have resulted in more students seeking a university education near their home, and so the relatively small number of universities offering the BSc is a handicap. University D is turning applicants away, but, as it is the only programme in its region, potential entrants are being lost. Universities will not establish new programmes unless there is a sufficient demand.

The second most frequent concern cited by entrants was the cost and time taken to obtain a degree in environmental health (44%) and then the professional fees (31%). In fact the time taken is no longer than for similar professions, but EH students do bear more of the costs of their training than other public health professionals and this inequitable situation requires further study.

"Key worker status could help…if EHPs are so important to the public health of the nation, then they should pay students to train – other public health workers are." (Course Leader T)

In 2002 the CIEH lobbied for external funding from central government to continue and enhance the bursary scheme. The scheme has had some impact, but more work needs to be done to make paid placements the rule rather than the exception.

Adverse conditions of service, relatively low pay, difficult working conditions and unsocial hours, were of concern to 23% of respondents. While these factors were apparently not sufficient to have put them off, we don't know their impact on those who chose not to enter EH.

Conclusions

- It was found while there had been an overall increase in student numbers at the respondent universities, this was mainly because of the opening of one new programme and a markedly increased intake at an existing programme. Some of the overall increase may have been a result of applicants 'switching' owing to the closure of other programmes.

- To increase its intake, one university had changed its admissions policy and had accepted a large proportion of 'unconventional' mature students. This may have quality implications, and should be studied further. The targeting of the existing technician workforce is identified as a mere short-term measure.

- The percentage of entrants that comes straight from school is relatively low (c60%). This is because of the lack of student funding opportunities, especially paid placements, the limited number of universities offering undergraduate EH programmes, and the lack of knowledge among school advisors of careers and degree programmes in environmental health.

- The major influences on the choice of EH by entrants are its *desirable conditions of service* and *altruistic characteristics*. These factors coincide with highest ranked desirable job characteristics cited by all potential university applicants. Environmental health is thus an attractive career option, but many young people are not receiving appropriate career information and guidance.

- The CIEH initiatives have been useful to some entrants but have had relatively little influence on career choice. The major thrust of future recruitment activity should be targeted at raising awareness of the desirable job characteristics of

an EHP through talks to schools by serving practitioners; through offering work experience, and via more and better careers information and advice.

- The CIEH should lobby the local government employers and government departments to consider the equity of the current funding arrangements for practical training. The goal should be for all practical training to be publicly funded.

Acknowledgements

The authors acknowledge the co-operation of the respondent universities and the Chartered Institute of Environmental Health.

References

CIEH (2002) 'CIEH Drive to Lure Students', in Hatchett W (Ed.) (2002) *Environmental Health News*, Vol.17, Issue 3, Chadwick House Group Ltd, London.

CIEH (2003a) 'Recruitment Boost for Regulators', in Hatchett W (Ed.) (2003) *Environmental Health News*, Vol.18, Issue 26, Chadwick House Group Ltd, London.

CIEH (2003b) CIEH Acts to Reposition the Environmental Health Profession with New Core Curriculum, Press Release (3rd September 2003), CIEH, London.

CIEH (2003c) Building a Healthier Future: CIEH Annual Report for the year ended 31st December 2002. CIEH, London.

CIEH (2006) Ehcareers.org at *www.ehcareers.org* [accessed 6th January 2006].

Employers Organisation for Local Government and Society of Environmental Health (2002) Environmental Health Workforce Survey 2002, EOLG, SEH & CIEH, London.

Gaber I and Wardle A (2002) – Increasing the Number of Applicants to Environmental Health Courses *(The CLEAR Report)*. London, CLEAR Consultants.

Harvey H (2001) 'Countering the Decline'. *Environmental Health Journal*, Vol.109, Issue 9: 266-269, CIEH, London.

Nicholls K and Parkinson N (2002), 'University Applicants' Perception of Environmental Health as a Career and Degree Subject'. *Journal of Environmental Health Research*, Vol.1, Issue1: 5-10, London.

Robinson P (2001) EHOs: A Species Under Threat. in Hatchett W (Ed) *Environmental Health News*, Vol.16, Issue 24, London, Chadwick House Group, Ltd.

Optimal cleaning to prevent slippery floors in restaurants

Dr François Quirion[1], Patrice Poirier[1] and Paul Lehane[2] FCIEH MSc JP

[1] QInc, 2454 Vimont, Longueuil, Québec, Canada, J4L 3Y1
[2] Manager Food Safety, Occupational Safety and Licensing, Environmental Health and Trading Standards, London Borough of Bromley,

Correspondence: Correspondence: Paul Lehane Environmental Health and Trading Standards, London Borough of Bromley, Stockwell Close, Bromley England BR1 3UH . Telephone: +44 (0) 20 8313 4216, Fax: +44 (0) 020 8313 4450, Email: Paul.Lehane@bromley.gov.uk

Abstract

The objective of this investigation was to collect data on floor cleaning in restaurants and to determine if the procedure could be improved in order to reduce floor slipperiness and hence slips and falls in the restaurant sector. Ten restaurants were visited and asked to prepare a cleaning solution in their usual way. The method was noted and the temperature of the water recorded. Samples of the floor cleaner and wash water solution were collected and sent for laboratory determination of the dilution ratio. This data was then used experimentally in the laboratory to reproduce floor cleaning.

In most cases, degreasers were over diluted, resulting in a reduction of the cleaning efficiency compared with using the dilution recommended by the manufacturers. Neutrals were often overdosed but with no significant improvement of their cleaning efficiency relative to the dilution recommended by the manufacturers.

Wash water prepared with water at 24°C was as effective as that prepared with water at 50°C.

It was found that in all but one case, the floor cleaning procedure could be improved by using a two-step cleaning method with a cleaning solution prepared with room temperature water and a degreaser at the dilution recommended by the manufacturer.

Although this investigation does not cover all the parameters that may affect the floor cleaning efficiency, it shows that simple actions such as changing the floor cleaning procedure may produce up to a seven-fold improvement of the floor cleaning efficiency, which in turn should result in less slippery and safer floors.

Key words: Floor cleaning efficiency, environmental health, restaurants, safety, slips, trips, falls.

Introduction

Chang *et al.* (2006) suggest that the average friction coefficient is a reasonably good indicator of floor slipperiness in fast-food restaurants. It is well known that the friction coefficient decreases with the accumulation of greasy contaminant at the surface of floorings. For instance, Underwood (1992) reported a rapid decrease of the friction coefficient of quarry tiles with increasing fat concentration at the surface and Quirion and Poirier (2006) correlated the sharp decrease of floor friction with its saturation with oil.

The purpose of floor cleaning is to eliminate dirt including the reduction of the level of fat and oil contamination. Reducing the amount of fat and oil at the surface of kitchen floors should contribute to making them less slippery. Leclercq *et al* (1997) however, noted that floor cleaning in the food industry led to either a significant increase or little change of floor friction depending on the type of flooring being cleaned. They also emphasised the importance of the choice of cleaning method and of the cleaning products used.

Since 1997, the Institut de recherche Robert Sauvé en santé et en sécurité du travail (IRSST) has conducted research projects on the optimisation of floor cleaning (Quirion 2004a) in order to reduce floor slipperiness in the food industry and restaurant sector. Quirion (2004b) found that the cleaning efficiency depends on the type and concentration of the floor cleaner used, the type of flooring to be cleaned, the type and amount of fat to be removed and, most of all, the cleaning method used.

In a field study, Quirion (2004c) observed that the floor friction did not increase much when the floor was cleaned "as usual" but it increased significantly (average of 24% in 12 restaurants) when a more vigorous cleaning method was used. This supports the idea that the optimisation of the floor cleaning procedure used in restaurants could be a means of increasing floor friction and thus help to reduce slips and falls.

The purpose of this investigation was to examine the hypothesis that the floor cleaning procedures currently in use in many restaurants around the world could be improved. Food safety officers from the London Borough of Bromley undertook the collection of data on the current cleaning procedures used in 10 restaurants in the South East of London. The cleaning efficiency of these procedures was then determined in the laboratory by QInc. The impact of the floor cleaner concentration, the wash water temperature and the cleaning method on the cleaning efficiency was determined to identify the optimal floor cleaning procedures.

Methodology

Wash water sampling and dilution

Ten European-style restaurants in the London Borough of Bromley were chosen at random. The restaurants were independently operated or part of a small chain (two or three premises) typically with 50 to 100 seats. Visits to the restaurants by the food safety officers were

unannounced. After explaining the purpose of the visit, the manager was asked to have a floor wash water solution made up in its usual way. After noting the method for the preparation of the solution, its temperature was taken and a sample of the floor cleaner concentrate and the wash water solution were collected.

The floor cleaner and wash water samples were submitted to a UKAS accredited independent laboratory for the determination of the dilution ratio. The methods used were either acid-base titration, absorbance at a specific wavelength (either 440 nm, 520 nm or 650 nm) or turbidity measurement at 277 nm. The uncertainty is reported to be ± 5 dilution ratio units. For instance, the dilution ratio for site No 1 was 70, i.e. 70 ± 5 parts of water for one part of floor cleaner.

Flooring tested

In a previous field investigation (Quirion 2004c), it was noticed that kitchen floors were often covered with quarry tiles and that these tiles were smooth and impermeable to oil. This observation contrasted with the rather high roughness and porosity of new quarry tiles. It is known that porous floorings may become fouled if they are not initially sealed (Underwood 1992, Leclercq and Saulnier 2002).

For the purpose of this investigation, fouled and worn tiles quarry tiles were prepared from new tiles according to a procedure developed by Quirion and Massicotte (2002). The characteristics of the tiles before and after the treatment are summarised in Table 1.0. As noted earlier, fouled and worn tiles are smoother than new tiles as indicated by the higher reflectivity and the lower roughness. In this investigation, it is assumed that the onsite floorings were similar in nature to the fouled quarry tiles.

Cleaning Method: Damp and two-step mopping

It has been observed that most restaurant workers use damp mopping to clean the floors, i.e. they pass a damp mop (wet with the wash water but not dripping) over the floor and leave it to dry. Typically, the mop spends less than a second on a given area so that the ingredients of the floor cleaner do not have much time to work on the accumulated fat.

To increase the contact time for the floor cleaner to act, a two-step cleaning method may be used. In the first step, cleaning solution is applied to a section of the flooring with a wet mop (almost dripping). In the second step, the cleaning solution and the dirt it dislodged is recovered using a wrung-out mop. Between the application and the removal, the cleaning solution works on the dirt and improves the cleaning efficiency. Moreover, the recovery of the cleaning solution with a wrung-out mop leaves about one third less liquid on the floor than damp mopping alone so that it dries faster.

Cleaning efficiency

The cleaning efficiency was determined for the removal of olive oil (Extra-Virgin) by mopping the quarry tiles with a cleaning solution. The cleaning efficiency is expressed in terms of the residual coverage of oil on the quarry tiles after they were cleaned. The lower the residual coverage, the better the cleaning efficiency (Massicotte *et al*., 2000).

The determination of the oil coverage of a tile is based on the observation that the reflectivity of the tile, $\mathbf{R_c}$, increases from its value without oil, $\mathbf{R_o}$, to a plateau value when the surface becomes completely saturated, $\mathbf{R_p}$ with oil.

Table 1.0
Characteristics of the quarry tiles tested

	New tiles
Initial average roughness, R_a	5.1 ± 0.5 µm
Reflectivity[1] without oil, R_o	39.8 ± 1 %
	After fouling and wear
Average roughness, R_a	1.1 ± 0.1 µm
Reflectivity[1] without oil, R_o	49.6 ± 1 %
Oil saturation concentration	0.25 mg/cm^2
Reflectivity[1] at saturation, R_p	102.2 ± 1 %

[1] The reflectivity is relative to a shiny reference tile.

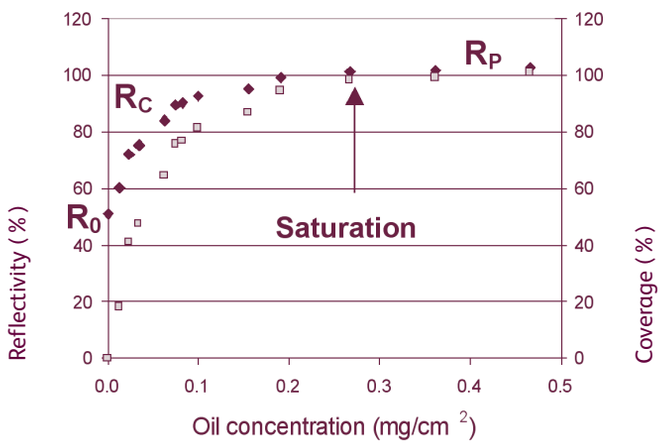


Figure 1.0
Reflectivity (black diamonds) and Coverage (grey squares) of a fouled and worn quarry tile as a function of the concentration of olive oil at the surface. R_0, R_C and R_P refer to the reflectivity without oil, at any oil concentration and at the plateau.

Reflectivity was determined experimentally using a light beam (LED, 633 nm, ϕ~1 cm) directed on the tile at an angle of 45° and the intensity of the specular reflection measured with a photoresistive cell. The reflectivity of a sample, ***R***, is expressed as the ratio of the intensity of the light reflected by the sample, I_{sample}, to the intensity of the light reflected by a reference tile, $I_{reference}$.

$$(1)\ R = 100\ \frac{I_{sample}}{I_{reference}}$$

The values of $\mathbf{R_c}$, $\mathbf{R_o}$ and $\mathbf{R_p}$ are combined in Equation 2 to calculate the oil coverage on a tile.

$$(2)\ \text{Coverage}(\%) = 100\ \frac{(R_c - R_o)}{(R_p - R_o)}$$

The evolution of the reflectivity and coverage of quarry tiles with olive oil is shown in Figure 1.0. The coverage, calculated from the reflectivity values, increases from 0 to 100 % with a saturation of the fouled and worn quarry tiles at 0.25 mg/cm^2 of olive oil. The $\mathbf{R_o}$ and $\mathbf{R_p}$ values are reported in Table 1.0. The $\mathbf{R_C}$ values necessary for the calculation of the residual coverage were determined after cleaning using either damp or two-step mopping.

For the cleaning efficiency experiments, the fouled and worn quarry tiles were initially covered with 0.30 mg/cm^2 of olive oil, i.e. over the saturation concentration. This is in accordance with Underwood (1992) who observed that a value higher than 0.43 mg/cm^2 was seldom encountered on fouled tiles from restaurants. Two 7.5 cm x 7.5 cm sample tiles were fitted into the set-up used for the cleaning experiments. Sixty gram mops (cut from 454 g mops) were immersed in a given amount of wash water and passed a given number of times over the sample tiles with no additional pressure other than the pressure exerted by the weight of the wet mops. The

Cleaning methods characteristics	Damp mopping	Two-step mopping	
		Step 1	Step 2
Weight of dry mops[1]	60 g	60 g	60 g
Amount of wash water	150 ml	233 ml	70 ml
Number of passages	4	2	4
Time to dry	30 min	2 min[2]	30 min

Table 2.0
Description of the conditions for damp and two-step mopping

[1] The size of the mops is 10 cm wide, 20 cm long and 2.5 cm thick.
[2] The cleaning solution left on the tiles after step 1 act on the oil for 2 minutes before being removed in step 2.

amount of wash water and the number of passages for damp and two-step mopping are reported in Table 2.0.

After the cleaning, the tiles were dried and the reflectivity, R_C, was measured at five different locations on each tile. Statistically, it was found that measuring five locations per tile on two tiles led to the same coverage, within experimental uncertainty, as measuring one location per tile on 10 tiles. It is thus assumed that the average results presented in this paper are equivalent to the average of 10 independent experiments.

Results

The first part of this section summarises the onsite floor cleaning procedures noted when visiting the 10 restaurants. The second part reports the results of a series of cleaning experiments performed in the laboratory to identify the optimal cleaning procedures for the eight floor cleaners collected onsite. The third compares the cleaning efficiency obtained using the onsite cleaning procedures with the cleaning efficiency using the optimal cleaning procedures.

Onsite cleaning procedures

The main observations gathered during the onsite visits are summarised in Table 3.0. A general description of a typical floor cleaning procedure is:

> *"Pour the floor cleaner in a bucket and then fill it with water. Wet the mop with the cleaning solution, wring it out so that it is still damp and pass it over the floor. Leave it to dry."*

In addition to these observations, the restaurant owners confirmed that the most common types of fat likely to be found on the floor are olive oil, vegetable oil and butter. This supports our choice of olive oil as a typical fat to remove during floor cleaning activity.

For safety reasons the detergent should be added to the water to prevent the risk of eye and skin burns caused by the splashing of droplets of the concentrated cleaner. This may happen if water is added to the bucket already containing the detergent. Doing this will, however, cause the detergent to foam, thus obscuring the water level and making it more difficult to obtain the correct dilution ratio.

Eight different floor cleaners were used in the 10 restaurants visited. For the purpose of this investigation, two general categories were identified: neutrals and degreasers. The main differences between neutrals, **N**, and degreasers, **D**, are the higher pH and the presence of a significant amount of co-solvent (such as glycol ethers) for degreasers (Quirion 2004a). The physicochemical properties of the floor cleaners and their category are reported in Table 4.0 along with the wash water

Table 3.0
Frequency of the observations noted during the visits to the 10 restaurants

		Frequency
Type of floor cleaner	Degreaser	3 /10
	Neutral	7 /10
Addition of floor cleaner	Poured	8 /10
	Cap	2 /10
Floor cleaner added	Before water	8 /10
	After water	2 /10
Cleaning method	Damp mopping	10/10
	Two-step mopping	0 /10
Wash water temperature	35°C and higher	5 /10
	Between 15 and 35°C	3 /10
	15°C and lower	2 /10

Site No[1]	Onsite		Recommended	Volatile[4]	Conc.[5]	pH
	Temp (˚C)	Dilution[2] (1 in)	Dilution[3] (1 in)	(%)	(%)	(diluted)
D1	10	70	15	92.2	0.52	13.0
D2	72	140	12	90.1	0.82	13.2
D3	52	40	20	87.0	0.65	10.7
N4	36	70	30	96.4	0.12	7.7
N5	58	20	83	89.9	0.12	8.4
N6	19	150	100	84.5	0.15	11.6
N7	54	30	80	96.6	0.04[6]	7.2
N8	15	50	83	89.9	0.12	8.4
N9	22	10	58	87.8	0.21	11.3
N10	33	60	83	89.9	0.12	8.4

Table 4.0
Onsite conditions and physico-chemical properties of wash water at the recommended dilution

[1] Site number preceded by either N = neutral or D = degreaser.
[2] The uncertainty on the dilution ratio is ± 5.
[3] Average of the range recommended for normal and heavy cleaning.
[4] Air dried at low temperature (30-40˚C) for 18 hours.
[5] Concentration based on non volatile ingredients at the recommended dilution.
[6] This product contains hydrogen peroxide which is a volatile ingredient.

temperature recorded on site. Notice that on site **D2**, a wash water temperature of 72˚C was recorded, which is dangerously hot. The dilution recommended by the manufacturers was taken as the average for normal and heavy cleaning and it is compared with the dilution used at the restaurants.

The concentration of non-volatile active ingredients in the cleaning solution can be estimated using the volatile content and the dilution used. For instance, **D3** has a volatile content of 87.0% and a recommended dilution of 1 in 20. The active ingredient concentration is thus (100-87)/20 = 0.65 %. Table 4.0 shows that the recommended concentration of active ingredients is higher for the degreasers (0.52 – 0.82 %) than for the Neutrals (0.12 – 0.21 %).

Only three of the 10 sites used a degreaser. At this point, it is only possible to speculate on the reasons why. Maybe the owners do not know that it is better to use a degreaser or maybe it is because degreasers are more expensive than neutrals. Moreover, they are generally recommended for use at a higher concentration than neutrals, resulting in a higher cost per wash. For example, when using the dilution recommended by the manufacturer, the average cost per wash is around £4.10 for the degreasers and £0.70 for the neutrals. The average cost per wash based on the on-site dilution drops to £0.55 for the degreasers but increases to £1.10 for the neutrals. In other words, users tend to over dilute expensive products and overdose inexpensive ones.

Optimal cleaning conditions

In this section, the cleaning efficiency of the floor cleaners was optimised in terms of its concentration (dilution), temperature of the wash water and cleaning method. The experimental results obtained for the three degreasers are averaged and compared to the average obtained for the five neutrals. The lower the residual

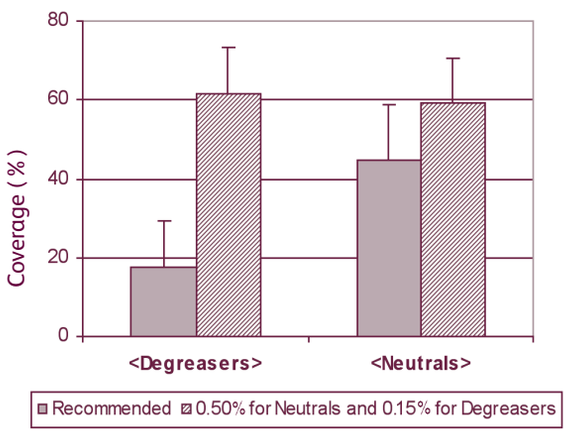


Figure 2.0
Impact of the concentration of the floor cleaners on the coverage of olive oil on fouled quarry tiles using damp mopping at 24°C

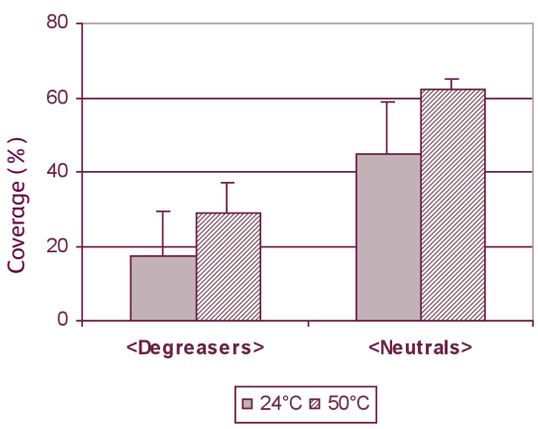


Figure 3.0
Impact of the temperature of the cleaning solution on the coverage of olive oil on fouled quarry tiles using damp mopping at the recommended concentration of floor cleaners.

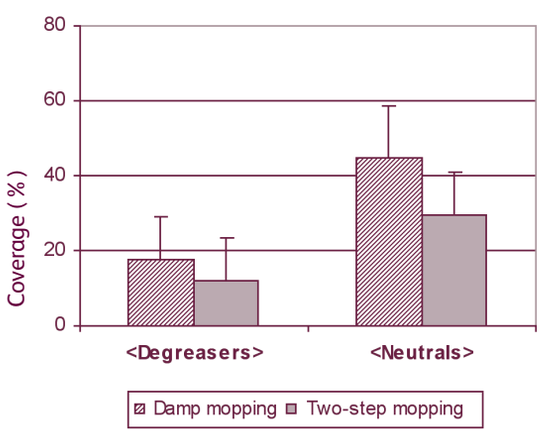


Figure 4.0
Impact of the cleaning method on the residual coverage of olive oil on fouled quarry tiles using damp mopping at 24°C at the recommended concentration of floor cleaners.

coverage the better the cleaning efficiency. The uncertainty bars represent the standard deviation of the average of the three or five results.

Impact of concentration

As observed in the previous section, people tend to over dilute degreasers and overdose neutrals with respect to their recommended dilution. Figure 2.0 shows that decreasing the concentration of the degreasers from their recommended concentration (0.5-0.8 %) to 0.15 % decreases significantly their cleaning efficiency. In the same way, increasing the concentration of neutrals from their recommended concentration (0.1-0.2 %) to 0.5 % also decreases their cleaning efficiency but the effect is not significant within experimental uncertainty. This suggests that the recommended dilution is optimal both for the degreasers and the neutrals.

Impact of temperature

For safety reasons, the temperature of a cleaning solution handled by workers should not be too hot and 50 ± 2°C is often regarded as an upper limit (Katcher 1981). As seen in Figure 3.0, increasing the temperature from 24°C to 50°C slightly reduces the cleaning efficiency of both the degreasers and the neutrals, although the impact is not significant. This, combined with safety and economic considerations, makes wash water prepared at room temperature a better choice than at 50°C (or over).

Impact of the cleaning method

Figure 4.0 compares the cleaning efficiency of the damp mopping and two-step mopping using wash water prepared at room temperature with the dilution recommended by the manufacturers. Not surprisingly, the longer time for action by the floor cleaner's ingredients for the two-step method results in an improved cleaning efficiency, both for the degreasers and the neutrals. This is in accordance with previous results obtained when cleaning stripped vinyl floorings covered with shortening (Quirion 2004b).

The optimal combination of detergent, temperature and method – as it provided the lowest level of residual oil and thus highest level of cleaning - is shown in Figure 4.0. The additional burden involved in applying the two-step method, however, might suggest that the relatively small improvement (6 %) in cleaning is uneconomical and that

damp mopping with a degreaser is more commercially acceptable as an optimum method.

We feel, however, that there are other facts that should be taken into account. First, there are numerous types of flooring materials and finishes, some of which will be more difficult to clean than the rather smooth fouled and worn quarry tiles (Leclercq *et al.* 1997). In such cases, two-step mopping would prove to be significantly more effective, as demonstrated by Quirion (2004b). Second, it was observed that damp mopping leaves about three times as much cleaning solution on the flooring than two-step mopping does. The immediate result is that the floors will dry faster when two-step mopping is used. Wet floors are slippery and the quicker a floor can be returned to use completely dry the safer it will be. Third, the recommended concentration of active ingredients for cleaning solutions containing degreasers is typically around two to three times higher than for cleaning solutions containing a neutral cleaner (see Table 4.0). As the solution dries out, damp mopping with a degreaser will leave three times more 'detergent residues' than two-step mopping.

To reduce the drying time of the flooring and to eliminate 'detergent residues' from the floorings, the floor must be rinsed with clear water and a wrung-out mop. If this step is properly performed, then it would be acceptable to consider damp mopping with a degreaser as the optimal cleaning method for fouled and worn quarry tiles covered with olive oil. However Quirion (2004c) found that none of the 12 restaurants visited in an earlier study actually had a rinsing step in their cleaning process.

For these reasons, we prefer to recommend two-step mopping with a degreaser as a cleaning method that is generally more effective than damp mopping for many flooring-fat combinations.

Optimal vs. Onsite conditions

The results from the previous section suggest that the optimal cleaning procedure consists of two-step mopping with a floor cleaner diluted to the manufacturer's recommendations with water at room temperature (~24°C).

In this section, the cleaning efficiency of the optimised procedure is compared with the onsite procedures. The first part compares the degreasers with the neutrals while the second part compares the individual results.

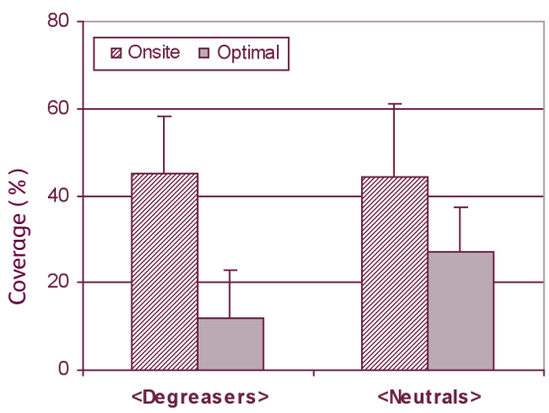


Figure 5.0
Comparison of the residual coverage of olive oil on fouled quarry tiles cleaned using onsite conditions (see Table 4) and optimal cleaning conditions (Two-step mopping at the recommended concentration of floor cleaner and at 24°C).

Degreasers vs Neutrals

Figure 5.0 shows that the optimised procedure provides a better cleaning efficiency (lower residual coverage) than the onsite procedure (see Table 4.0) both for the degreasers and the neutrals.

These results also confirm that degreasers are better suited to clean oily kitchen floors than neutrals.

Individual sites

Figure 6.0 compares the cleaning efficiency of the individual onsite procedures with that obtained using the optimal procedure. The first obvious observation is that the cleaning efficiency can be improved significantly in eight cases just by adopting an optimised procedure.

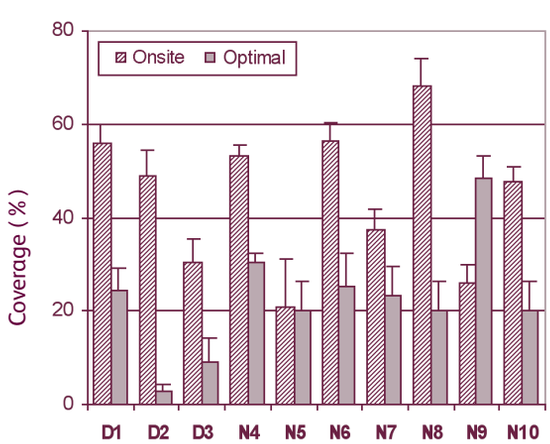


Figure 6.0
Comparison of the residual coverage of olive oil on fouled quarry tiles cleaned using onsite conditions (see Table 4) and optimal cleaning conditions (Two-step mopping at the recommended concentration of floor cleaner at 24°C).

Site **N5** gave the same cleaning efficiency as the optimised procedure while site **N9** gave better results than the optimal procedure. Nevertheless, we feel that it is not too strong to state that the use of an optimised cleaning procedure may improve the cleaning efficiency and thus reduce the amount of fat left on the floor.

The lowest residual coverage was obtained with two degreasers. The optimal cleaning procedure would thus be:

> *Two-step mopping with a wash water solution prepared with water at room temperature and a degreaser at the dilution recommended by the manufacturer.*

If it is assumed that the optimal residual coverage is the average of **D2** and **D3** in optimal conditions (~6 %), then switching from the onsite to the optimal cleaning procedure would result, on average, in seven times less fat on the floorings following floor cleaning.

Conclusions

The objective of this investigation was to identify the floor-cleaning procedures in use in restaurants and evaluate the impact of simple changes on their efficiency in removing oil from the floors. To do so, the floor-cleaning procedures of 10 restaurants were documented during on-site visits and their cleaning efficiency was determined in the laboratory for the removal of olive oil from quarry tiles.

- Three degreasers and five neutral floor cleaners were collected and tested. In most cases, the expensive degreasers were over-diluted, resulting in a reduction of the cleaning efficiency with respect to the dilution recommended by the manufacturers. The cheaper neutrals were often overdosed but with no significant improvement in their cleaning efficiency relative to the dilution recommended by the manufacturers.

- Wash solutions prepared with water at 24°C was as effective as those prepared with water at 50°C.

- Two-step mopping allows the ingredients of the floor cleaner to act on the fat for a longer period of time resulting in a better cleaning efficiency than damp mopping.

- Overall, the cleaning eff-iciency of degreasers used in optimal conditions is better than that of neutrals.

- It is suggested that the optimal cleaning procedure is two-step mopping with a wash water solution prepared with water at room temperature and a degreaser at the dilution recommended by the manufacturer.

- The laboratory experiments suggest that switching from the onsite to an optimal procedure could improve floor-cleaning efficiency on average by a factor of seven.

- These results support our campaign to promote floor cleaning as the first step towards improving slip resistance in the restaurant industry.

Acknowledgements

This collaborative work was conducted for, and financed by, the Institut de recherche Robert Sauvé en santé et en sécurité du travail du Québec (IRSST) and the London Borough of Bromley Environmental Health and Trading Standards.

References

Chang W R, Li K W, Huang Y H, Filiaggi A, Courtney T K (2006) Objective and subjective measurements of slipperiness in fast food restaurants in the USA and their comparison with the previous results obtained in Taiwan. *Safety Science*, 44, 891-903.

Katcher M L (1981). Scald burns from hot tap water, *J. American Medical Association* 246, 1219-1222.

Leclercq S and Saulnier H (2002) Floor slip resistance changes in food sector workshops: prevailing role played by 'fouling'. *Safety Science*, 40, (7-8), 659-673.

Leclercq S, Tisserand M, Saulnier H (1997) Analysis of measurements of slip resistance of soiled surfaces on site, *Applied Ergonomics*, 28, 283-294.

Massicotte A, Boudrias S and Quirion F (2000) Conditions optimales des nettoyants à plancher : Une approche globale. IRSST Report No R-258. Available on-line at *www.irsst.qc.ca* (in French) [accessed 22/02/07].

Quirion F (2004c) Improving slip resistance with

optimal floor cleaning: A preliminary field study, In, *Contemporary Ergonomics* (2004), Ed. Paul T McCabe, p: 48-52. CRC Press.

Quirion F and Massicotte A (2002) Étude préliminaire de la friction des planchers recouverts de matière grasse., IRSST Report No R-294. Available on-line at *www.irsst.qc.ca* (in French) [accessed 22/02/07].

Quirion F (2004a) Floor cleaning as a preventive measure against slip and fall accidents. IRSST Report No RF-366. Available on-line at *www.irsst.qc.ca* (in French) [accessed 22/02/07].

Quirion F (2004b) Optimal cleaning for safer floors. *Contemporary Ergonomics* (2004), Ed. Paul T McCabe, p : 28-32, CRC Press.

Quirion F, Poirier P (2006) Correlation between floor slipperiness and surface saturation with oil. *Proceedings IEA 2006 Congress*, Eds. Pikaar, R N, Koningseld E A P and Settels P J M, Elsevier Ltd.

Underwood D C (1992) Effect of floor soil on coefficient of friction in food service operations, *Ceram. Eng. Sci. Proc.* 13, 78-85.

PROFESSIONAL EVALUATION

Swinging clubs as a potential source of legionella infection: A case study

Ms Fiona Reynolds[1], Dr Rosemary McCann[2], Ms Natasha Franklin[1], Dr Judith Chaloner[2], Dr Aidan Kirkpatrick[2], Dr Marko Petrovic[2]

[1] Unit of Clinical Epidemiology and Public Health, University of Manchester, Stopford Building, Oxford Road, Manchester, M13 9PT
[2] Greater Manchester Health Protection Unit, Peel House, Albert Road, Eccles, Manchester, M30 0NJ

Correspondence: Ms Fiona Reynolds, Unit of Clinical Epidemiology and Public Health, University of Manchester, Stopford Building, Oxford Road, Manchester, M13 9PT; Telephone: +44 (0) 161 275 1637; Email: Fiona.Reynolds-2@manchester.ac.uk

Abstract

Greater Manchester Health Protection Unit was notified of a case of legionella in an in-patient at a local hospital. The patient had visited two spas at swinging clubs, in the weeks prior to his illness. 'Swinging' refers to the activity formerly known as 'wife-swapping' and swinging clubs are venues that provide a safe place to do this. Swinging clubs usually have spa pool facilities.

Investigation of the spa in Greater Manchester was carried out by a local environmental health team and the patient's home was also visited. Water samples were sent to the Health Protection Agency Laboratory for legionella and chemical testing.

Water samples from the spa were negative for legionella but samples from the showers were positive for pseudomonas, indicating inadequate cleaning. The results from the family home were negative. No other cases of legionella linked to the spa pools were identified.

The patient was probably susceptible to the infection because of an underlying respiratory condition. It is likely that the source was one of the pools or the showers. Spa pools are a recognised source of legionella and need to be managed properly to minimise the risk of infection to users.

There is probably a swinging club in most of the UK's major cities. Investigating teams should be aware of swinging clubs as a location for spa pools and also that patients who have visited these clubs may be reluctant to divulge this information during an investigation.

Key words: Environmental health; epidemiology; legionella; public health; swinging clubs.

Notification of case

On 7th February 2006, Greater Manchester Health Protection Unit (GMHPU) was notified of a new case of legionella in a patient in a local hospital. The patient was middle-aged, a smoker and had developed symptoms on 24th January. He was admitted to hospital on 2nd February.

The patient was interviewed by staff from GMHPU on the hospital ward using the national standardised questionnaire for legionella. The patient volunteered that he had visited two spas on the weekend of 20th and 21st of January.

One of these was in the local area of Greater Manchester and the other was in another part of England. The patient had attended these between approximately 9pm and 3am, and he explained that they were 'adult clubs'. He had decided to raise the issue without prompting as the pool at one of the spas had appeared to be very dirty, and he was aware of the link between Legionnaires' disease and swimming pools.

The patient gave the names and addresses of the spas. A search on the internet revealed that the spas advertised themselves as hosting swinging clubs, and a conversation with the local environmental health (EH) team revealed that the local spa had long been known as a venue for swinging.

Legionella

Legionnaires' disease is a serious form of pneumonia and has a case fatality rate of 10-15% in usually healthy individuals (Joseph, 2002). In the UK, approximately 40% of cases of the disease are associated with travel abroad. Although a rare disease, legionella is thought to cause 2-26% of community-acquired pneumonia in industrialised countries (Hawker *et al*., 2005), and 300 cases are reported in the UK each year, about 12% of which are linked to local outbreaks, mainly because of 'wet cooling systems', though showers and whirlpool spas have also been implicated (Bohte *et al*., 1995). The water used in spas is not replaced after each use but disinfected and recirculated (HPA, 2006).

Of the cases reported in the UK, the majority are in males (over 70%) and over 95% are aged over 30 years (Hawker *et al*, 2005). It more commonly affects smokers and those with chest problems (HSE, 2005) – so this patient was typical.

Swinging

Swinging, formerly known as 'wife-swapping' was allegedly started in World War II, by air-force pilots and their wives (Gould, 2000). There are thought to be 3,000 swinging clubs worldwide, with most major cities having at least one permanent venue, according to various swinging websites. However, there seems to be little academic research into the phenomenon outside the US. Bergstrand and Williams (2000) carried out a sociological study into the life-styles of American swingers and reported that 1-15% of American couples have taken part in swinging. It is impossible to estimate how common it is in the UK. Typing 'swinging' into *www.google.co.uk* elicited no fewer

than 12 sites on the first page (including the sponsorship links) that feature reviews of venues, personal ads and guides to the 'swinging life'.

Investigation

The local spa promoted itself as a swinging venue for couples, and the patient had already confirmed that his partner had accompanied him on the visits to both of the spas. He also mentioned that she had been ill at around the same time. However, he had difficulty in remembering other places he had visited in the previous two weeks and so an interview was arranged with the patient's partner.

There had been five cases of Legionnaires' disease reported in Greater Manchester in the previous four months, and the details of these were cross-referenced with the patient's exposures to identify any common sources or patterns in activities. There were none.

Meanwhile, contact was made with the Health Protection Unit at the location of the second spa-based swinging club.

Visiting the swinging club spa

A first visit to the spa where the swinging club was hosted was carried out by the local environmental health team, on the same day as the patient was interviewed.

The venue was down a side-street, off a small industrial/business estate in a semi-rural area. On the ground floor was the spa area – a plunge pool, a spa pool, two steam rooms and three showers. There was no air-conditioning – just a ventilation system. Upstairs was a snooker room, a lounge and a bar serving drinks and snacks.

The owner of the spa was on holiday and the receptionist on duty was covering for a friend. As a result, it was impossible to locate the cleaning and pool maintenance records. However, the owner was contacted by telephone and was able to direct the officers to the thermostat to check the temperature of the showers and explain the maintenance routine.

The water in the spa pool was cloudy – an effect not helped by the green lighting – while the plunge pool was very clear. There was no evidence to warrant serving a prohibition notice on the spa, but after negotiation with the owner it was agreed that the plunge and spa pools and steam rooms would be closed voluntarily for the evening.

While keen to cooperate, the spa-owner was insistent that the showers should be kept open so as to cause as little disruption as possible to the swinging venue's other activities and services. Temperatures of above 63°C are bactericidal, so the showers were turned on and allowed to run for 15 minutes by the environmental health team. This was done to maintain a high temperature over a prolonged period so that the showers could then be used during the evening.

Arrangements were made to visit the venue the following morning to test for legionella and to meet the pool-maintenance contractor. (The environmental health team's member of staff responsible for testing for legionella had been busy elsewhere on the previous day and staff from neighbouring local authorities had not been available to assist at that time). As the venue-owner was returning from abroad later the following day, the environmental health team also planned to meet him to inspect the maintenance records.

Five water samples from the spa pool were sent to the Health Protection Agency Laboratory for legionella testing and one for chemical testing. The spa pool was drained and cleaned with appropriate detergents.

As swabs for testing outlets (such as taps and shower heads) had to be pre-ordered they were not available for the day's visit. Following shot-dosing of the spa pool, it was agreed that the facilities could be reopened.

The maintenance contractor reported that he carried out maintenance on the pool monthly and annually; while the daily maintenance was carried out by the owner, which included testing the water's chlorine levels. However, it was not clear whether anyone maintained the pool during the owner's absence. The owner had already informed the environmental health team that his routine was to change the water once a week and run a daily backwash. According to the contractor, the system used at the spa was "one of the better ones".

The spa pool had not been used for 24 hours and there was no chlorine in it, according to the testing strips used for this purpose. However, it had not been tested on the previous day, so it was unknown whether the chlorine ran out in the previous 24 hours. Chlorine can evaporate if the water comes into contact with massage oils.

It was agreed that there would be inspection visits every two or three days by the EH team to examine the daily records.

Interview

The patient's partner was interviewed. She reported that the patient had a history of chronic respiratory disease. It emerged that the couple had visited another swinging club at a spa, in the North of England, on the weekend previously to visiting the other two clubs. The Health Protection Unit in this area was informed.

She reported that she had suffered flu-like symptoms. Blood tests for serology and legionella antigen testing were arranged. These were negative. No other members of the family reported illness. A local environmental health team visited the family home to investigate the hot and cold water systems and sample for legionella.

Results

Water samples from the club's spa pool were negative for legionella, but samples from the showers were positive for pseudomonas – indicating inadequate cleaning. The results from the family home were negative.

No other cases of Legionnaires' disease linked to the club were reported.

No samples were taken at the North of England club as there was no spa pool. The results from the other venue's spa were negative for legionella.

Discusssion

Spa pools have become increasingly popular in recent years and can be found in a variety of settings and environmental health teams should be aware that this may include swinging clubs. Inadequate management of spa pools has been shown to lead to illness among users or those in the vicinity and the HPA Guidance *Management of Spa Pools – Controlling the Risks of Infection* (2006) was published to help tackle this problem.

There is a probably a swinging club in most of the UK's major cities. While questions about exposure to water sources are a part of the standard questionnaire when investigating a case of legionella, it is possible that patients may not volunteer to tell investigating teams if they have been to swinging clubs.

Training on taking environmental samples for legionella has been widely taken up by environmental health teams across Greater Manchester, but if the one person in the department to have received training is away from the office, there is a risk that this will hinder the investigation. As stated, on the second visit to the Greater Manchester venue, there was no chlorine in the spa pool's water but it cannot be verified whether this simply evaporated within the previous 24 hours, as the chlorine levels were not tested. This may have been useful information during the first visit. It is precisely because of this that mutual aid arrangements have been developed by the Greater Manchester Local authorities.

Training on the maintenance of pools is essential for people who manage spas, because of the risk of illness to others.

Conclusions

No trace of legionella bacteria was found at either of the two swinging clubs' spa pools or the family home. The patient was probably susceptible to legionella because of his underlying respiratory condition. No other cases of legionella linked to these swinging clubs were identified.

However, it is likely that the source of legionella was one of the spa pools or the showers at the swinging clubs. Spa pools are a recognised source of legionella and need to be managed properly to minimise the risk of infection to users.

The learning points from this case are as follows:

- Patients may be reluctant to discuss 'unusual activities' that could contribute to their illness.
- Investigating teams should be aware of swinging clubs as a location for spa pools and thus potential sources of legionella.
- Chlorine can evaporate from spa pools because of the high temperature of the water.
- Environmental health practitioners need to be trained in taking samples for legionella from pools and showers.
- Arrangements need to be in place to cover for the absence of the trained person in any one local authority.

Ms Fiona Reynolds, Dr Rosemary McCann, Ms Natasha Franklin,
Dr Judith Chaloner, Dr Aidan Kirkpatrick, Dr Marko Petrovic

References

Bergstrand C, Williams J B (2000) Today's Alternative Marriage Styles: The Case of Swingers, *Journal of Human Sexuality*, Volume 3, Oct. 10.

Bohte R, Van Furthe R, Vad Den Broek P J (1995) Aetiology of community-acquired pneumonia: A prospective study among adults requiring admission to hospital, *Thorax*, 1995;50:543-547

Gould, T. (2000) *The Lifestyle: A Look at the Erotic Rites of Swingers* (Firefly Books: Canada)

Hawker J, Begg N, Blair I, Reintjes R, and Weinberg J, (2005) *Communicable Disease Control Handbook*, Blackwell Publishing: Oxford

Health and Safety Executive (2005) *www.hse.gov.uk/legionnaires/* [accessed: 16.01.07]

Health Protection Agency (2006) *Management of Spa Pools – Controlling the Risks of Infection*, (Available online at: *www.hpa.org.uk/publications/2006/spa_pools/default.htm)* [accessed: 16.01.2007]

Joseph C (2002) New outbreaks of Legionnaires' disease in the United Kingdom, *BMJ* 2002;325:347-348

PROFESSIONAL EVALUATION

An assessment of the slip risk presented by floor stickers in retail outlets using the HSE's Slip Assessment Tool (SAT)

Paul Lehane[1] MSc FCIEH MIOSH JP

[1] Manager Food Safety, Occupational Safety and Licensing, Environmental Health and Trading Standards, London Borough of Bromley

Correspondence: Environmental Health and Trading Standards, London Borough of Bromley, Stockwell Close, Bromley BR1 3UH, Telephone: +44 (0) 20 8313 4216, Fax: 0208 313 4450, Email paul.lehane@bromley.gov.uk

Abstract

Changes in the frictional characteristics of floor surfaces through contamination or between different floorings can present a risk of slipping. Floor stickers used to advertise or provide information have become widely used in retail outlets. To a pedestrian they present as a small area of discrete flooring against the background flooring and any differences in their frictional properties could result in slips. In this paper HSE's Slip Assessment Tool (SAT) is described and applied in a standardised way to assess the slip rating of stickers and the background flooring. The surface micro-roughness and SAT ratings of 19 stickers in eight retail premises on three generic background flooring types are compared. The results indicate that the stickers present no increased risk of slipping compared to the background floors in both dry and wet conditions. Under wet conditions however, both the background flooring and stickers were very slippery

Key words: Environmental health, floor stickers, slip assessment tool (SAT), slip risk, workplace safety.

Background

Temporary floor stickers have been increasingly used in retail outlets over the last few years for advertising and providing information. Health and safety inspectors in the London Borough of Bromley were concerned about the slip resistance of the stickers in their own right and in comparison with the floor surfaces on which they were being used (background flooring).

Changes in the frictional characteristics of floor surfaces through contamination or between different floorings can present a risk of slipping (CIRIA, 2006). The inspectors were concerned that the frictional characteristics of the floor stickers were significantly different from that of the background flooring and that their use might present an increased slipping hazard in retail outlets where both staff and public are exposed.

In England and Wales local authority health and safety inspectors have responsibility for enforcing the Health and Safety at Work etc Act 1974 and regulations in the retail and wholesale sector. In 2003/2004 slips and trips in this sector accounted for 1,502 major injuries and 3,448 injuries resulting in more than three days absence from work (HSC, 2005). Over all sectors in England and Wales, slips and trips cause 37% of major injuries and 24% of 'over three-day' injuries. Between 1996 and 2004 there has been a steady increase in the number of reported major injuries from slip and trip accidents, rising from 24,537 in 1996 to 30,499 in 2004. Similar increases are also reported for 'over three-day accidents' (HSC, 2005).

Since the Department of the Environment Transport and Regions in partnership with the Health and Safety Commission (HSC) launched its 'Revitalising Strategy' for health and safety in 2000 (DETR, 2000), the reduction in the incidence of accidents from slips and trips has been one of the priority areas for all concerned with occupational health and safety. The 'Revitalising Strategy' set a target to reduce the rate of fatal and major injury to workers by 5% by 2004/05 and 10% by 2009/10. To assist health and safety inspectors and employers to recognise and control slip hazards, the Health and Safety Executive (HSE) has produced several guidance documents and tools.

The Slip Assessment Tool (SAT)

Perhaps the most innovative of these is the 'Slip Assessment Tool' (known as SAT). This is a freely down-loadable computer software package that allows the assessment of the slip potential of pedestrian walkway surfaces (HSE, 2006a). A roughness meter is required to take measurements for the SAT software and the HSE web site gives details of commercially available meters.

The SAT provides a numerical indicator of the slip risk presented by a floor under a particular set of conditions. SAT rating values lie between 1 and 93; the higher the number the greater the predicted slip risk presented by the floor. It is important to note that the SAT rating value is not a measure of the coefficient of friction. The SAT ratings are banded as low, medium, significant and high as shown in Table 1.0 (HSE 2006a).

The SAT is used to produce an assessment of the slip risk of a floor under existing conditions and may be used to predict the slip risk under changed circumstances. For

SAT Rating	Slip Risk
0-20	Low
21-30	Medium
31-40	Significant
More than 40	High

Table 1.0
SAT ratings and slip risk

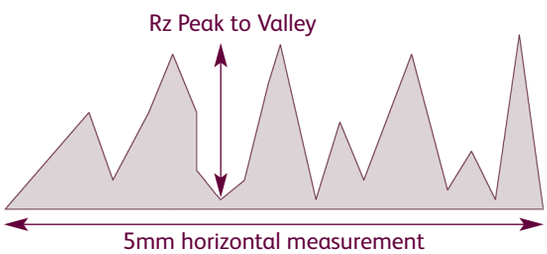


Figure 1.0
Illustration of floor surface and Rz measurements

Table 2.0
UKSRG Surface roughness and slip risk

Surface Roughness Rz – microns	Potential for slip
Below 10	High
10 or above (but below 20)	Moderate
20 or above	Low

Table 3.0
Surface roughness and contamination viscosity

Minimum roughness	Contaminant
20 microns	Clean water, coffee, soft drinks
45 microns	Soap solution, milk
60 microns	Cooking stock
70 microns	Motor oil, olive oil
above 70 microns	Gear oil, margarine

example the effect of different combinations of flooring, footwear, contamination and cleaning can be assessed and compared to existing conditions.

Selected onsite measurements and inputs are used by SAT to determine a slip rating, the most important of which is the measurement of surface micro-roughness. This measurement is made in Rz, which is the mean peak to valley roughness measurement over 5mm of floor surface (Figure 1.0). It is very important to make the distinction between surface-micro roughness and surface macro-roughness. Macro roughness describes features like profiling or textures/graining of a floor surface and is likely to be measured in millimetres where as micro-surface roughness Rz is measured in microns (thousandths of a millimetre). The SAT uses the mean of 10 Rz measurements taken in three directions on the floor. Instructions on how to take the measurements are included with the software.

The UK Slip Resistance Group (UKSRG 2005) published a classification for the potential for slipping using Rz roughness for water wet low-level pedestrian areas.

As the viscosity of contaminants increases, the surface roughness required to maintain an acceptable level of slip resistance also increases. Table 3.0 shows the recommended levels of roughness for commonly found contaminants (HSE, 2004) (see Table 2.0).

Methodology

To calculate the slip potential the SAT requires site-specific information and measurements. The software guides the operator through the data collection process in the following order.

1. Details of location, date, time and operator
2. Floor type (chosen from 16 options)
3. Calibration check for the roughness meter
4. 10 roughness readings are taken and input in to SAT
5. Contamination type (none, dust, water, oil, grease or semi solid)
6. Amount of contamination (very light, light, medium, heavy)
7. Potential sources of contamination e.g. wet shoes or leaking machinery etc.
8. Type of footwear worn by pedestrians.
9. Type of cleaning undertaken
10. Frequency of cleaning
11. Occurrence of re-contamination of the floor after cleaning
12. Identification of risks from the surface use e.g. used by people carrying loads
13. Identification of other environmental factors e.g. distractions

So that the SAT ratings could be compared across the different floor stickers and background floorings, a standardised set of parameters was used for steps 5 to 13 for wet and dry conditions. (Table 4.0). As far as possible the standard parameters were selected to represent conditions typically found in high street retail shops.

When all the necessary fields have been completed, SAT provides a numerical indicator of the slip risk (see Figure 2.0). The software also produces a histogram showing the relative contribution of the input measurements and assessments to the overall slip risk. (Figure 3.0). Where the results indicate a medium or high risk of slipping the histograms can help identify possible ways

PROFESSIONAL EVALUATION

An assessment of the slip risk presented by floor stickers in retail outlets using the HSE's Slip Assessment Tool (SAT)

Step	Standardised dry conditions	Standardised wet conditions
5 Type of contamination	None	Water
6 Amount of contamination	None	Medium
7 Sources of contamination	None	Wet shoes
8 Type of footwear	No control over footwear	No control over footwear
9 Type of cleaning	Other – effective	Wet mopping
10 Frequency of cleaning	Once a day	At regular intervals
11 Re-contamination	Very little or no re-contamination	Re-contamination soon after cleaning
12 Other risks	Pedestrians pushing and pulling, carrying loads, elderly and young persons, people with disabilities.	Pedestrians pushing and pulling, carrying loads, elderly and young persons, people with disabilities.
13 Environmental factors	Near other distractions	Near other distractions

Table 4.0
Standard parameters used with SAT

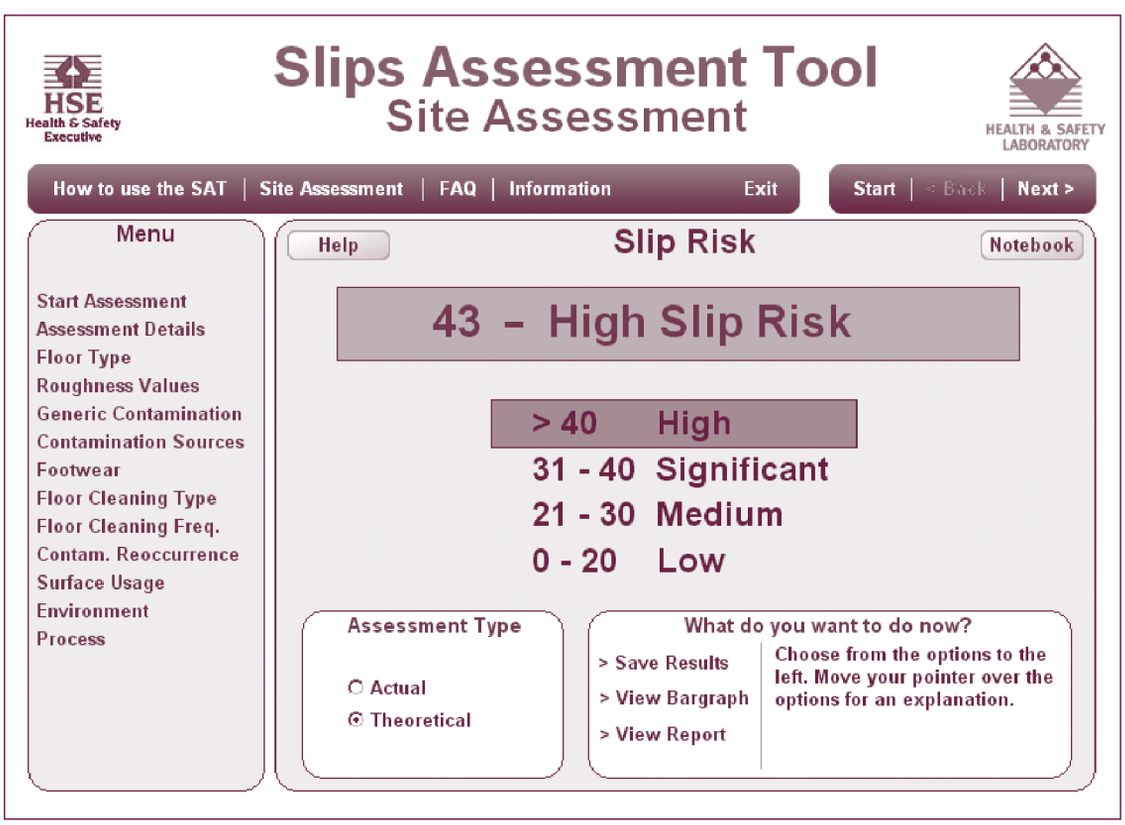


Figure 2.0
Screen shot from SAT – numerical SAT rating

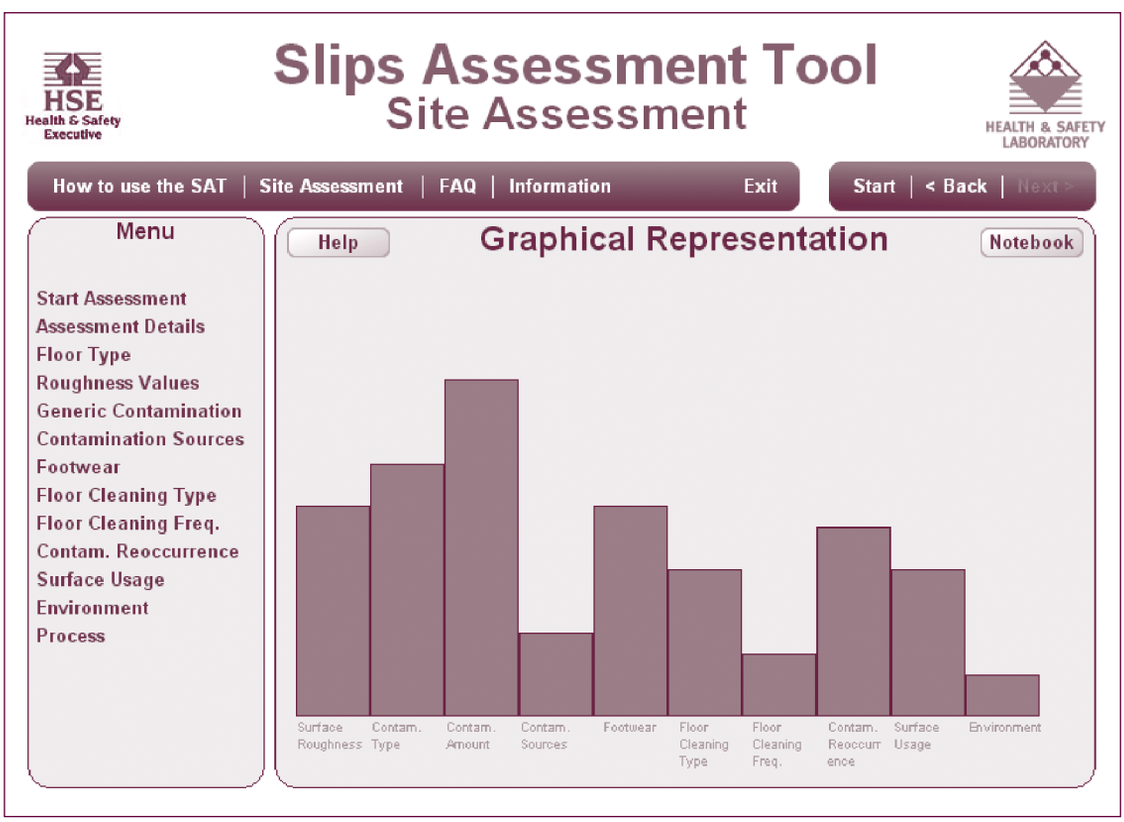


Figure 3.0
Screen shot from SAT – relative contribution of the input measurements and assessments

in which the elements could be changed to improve the slip rating.

Having identified these areas, the system permits the impact of the changed variable on the overall slip rating by re-running the calculation. The effect of altering parameters can be assessed either singly or in combination with others.

Figure 4.0
Typical flooring sticker

SAT ratings were obtained for 19 different floor stickers between March and July 2005. All measurements were taken by the researcher using a Taylor Hobson Surtronic Duo roughness meter (Taylor Hobson, 2006). The instrument was calibrated before use on each occasion using the standard roughness specimen supplied with the meter. All measurements were taken as Rz. On-site measurements and information were recorded on to a pro-forma and later input to the SAT loaded on to a PC at the researchers office. A typical sticker is shown in figure 4.0.

Results

The roughness measurements and SAT ratings for the 19 floor stickers and their respective background floorings are given in Table 5.0.

An assessment of the slip risk presented by floor stickers in retail outlets using the HSE's Slip Assessment Tool (SAT)

Floor Sticker				Background Flooring			
Sample Number	Nature of location	Name of sticker and surface roughness Rz	Floor Sticker SAT rating under Standardised dry conditions	Floor Sticker SAT rating under Standardised wet conditions	Background flooring type and surface roughness Rz	Background flooring SAT rating under Standardised dry conditions	Background flooring SAT rating under Standardised wet conditions
1	Mobile phone shop	"3G" 20.9 Rz	8 low slip risk	41 high slip risk	Vinyl /PVC 8.4 Rz	13 low slip risk	52 high slip risk
2 to 5	Clothing shop 4 stickers	Red Nose Day (charity fund raising) Rz 19,16,17.4 & 16 Mean Rz 17	9 low slip risk	43 high slip risk	Vinyl floor tiles 6.7 Rz	13 low slip risk	52 high slip risk
6 to 10	Supermarket (T) 5 stickers	Credit card Rz 19.7 Insurance Rz 17.7 Fabric conditioner Rx 15.4 Soap Rz 15.8 Cash Machine Rx 14.8 Mean Rz 16.7	9 low slip risk	43 high slip risk	Terrazzo 10 Rz	13 low slip risk	52 high slip risk
11 & 12	Supermarket (S) 2 Stickers	1. Active Kids Rz19.2 2. Red nose sticker Rz 20.9 Mean Rz 20	8 low slip risk	41 high slip risk	Terrazzo 4.3 Rz	13 low slip risk	52 high slip risk
13	Supermarket (S)	Red nose sticker Rz 24.5	8 low slip risk	41 high slip risk	Quarry tile 9.1 Rz	13 low slip risk	52 high slip risk
14 to 16	Supermarket (SW) 3 stickers	1. Detergent Rz 12.6 2. Soap 1 Rz 14.5 3. Soap 2 Rz 11.8 Mean Rz 12.9	11 low slip risk	47 high slip risk	Terrazzo 7.9 Rz	13 low slip risk	52 high slip risk
17	Bank	Cash point machine 14.3 Rz	11 low slip risk	47 high slip risk	Vinyl floor tile 4.9 Rz	14 low slip risk	54 high slip risk
18 to 19	Department Store	Cosmetics large Rz 4.8 Cosmetics small Rz 7.4 Mean Rz 6.1	13 low slip risk	52 high slip risk	Vinyl floor tile 5.9 Rz	13 low slip risk	52 high slip risk

Table 5.0
Results

Table 6.0
Descriptive statistics

	Number of samples	Minimum	Maximum	Mean	Std. Deviation
Floor Rz microns	19	4.30	10.00	7.7105	1.79316
Sticker Rz microns	19	4.80	24.50	15.9684	4.66834
Sticker dry SAT rating	19	8.00	14.00	9.7895	1.71849
Sticker wet SAT rating	19	41.00	54.00	44.7895	3.59906
Floor dry SAT rating	19	13.00	14.00	13.0526	0.22942
Floor wet SAT rating	19	52.00	54.00	52.2105	0.63060

The mean Rz roughness measurement for the stickers was 15.9 microns and that of the background flooring was 7.7 microns. (Table 6.0). The two means were compared using a one-sample T-test (using the mean Rz floor value as the test value). A significant difference was obtained between the two mean Rz scores (t = 7.720, p.000 two tailed).

The floor stickers were found to have a wider range of Rz roughness measurements than the background floors, with a mean Rz roughness of 15.96 microns and a range of 19.7 microns (Standard deviation 4.6) compared with the three types of background floors which had a mean Rz roughness of 7.7, with a range of 5.7 microns (Standard deviation of 1.79). (Table 6)

The mean SAT score under standardised dry conditions was 9.78 for the stickers and 13.05 for the floors. The two means were compared using a one-sample T test using the floor value as the test value. A significant difference was obtained between the two SAT ratings (t= -8.27, p.000 two tailed).

Similarly, the mean SAT ratings for the standardised wet slip performance (sticker 44.7 and floor 52.2 – test value) were tested using a one-sample T test. The two ratings were significantly different (t= -8.975, p.000 two tailed).

Although there were statistically significant differences in both the Rz roughness measurements and SAT ratings for the stickers and background flooring both dry and wet, it is interesting to note that all the dry floor and dry sticker ratings were categorised as "low slip risk" and all the wet floor and sticker ratings were categorised as "high slip risk" by the SAT

Discussion

It is reassuring to note that the slip risk (SAT ratings) presented by the floor stickers closely matched those of the background floorings on which they were used under both wet and dry conditions. Interestingly, the floor stickers had marginally better SAT ratings than the background flooring under both wet and dry conditions but both fell within the same broad risk categories (table 5.0).

The SAT results confirm that a smooth dry floor presents a low risk of slipping but the same floor presents a much greater risk of slipping when wet.

Although there were statistically significant differences between the Rz measurements and SAT ratings of the stickers and background floors, such differences are not sufficient to cause them to fall outside broad categories of risk used within SAT. Based on the SAT ratings the floor stickers and background flooring presented a 'low slip risk' under standardised dry conditions but a 'high slip risk' under standardised wet conditions.

Under the Health and Safety at Work etc. Act 1974 (UK Government, 1974) there is a general duty to reduce risks to a minimum level subject to it being 'reasonably practicable' to do so. Lord Justice Asquith in his judgement in the case of Edwards v National Coal Board (Edwards 1949) explained this as:

"Reasonably practicable is a narrower term than physically possible and seems to me to imply that a computation must be made by the owner in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) is placed in the other, and that, if it be shown that there is a gross disproportion between them – the risk being insignificant in relation to the sacrifice – the defendants discharge the onus on them. Moreover, this computation falls to be made by the owner at a point of time anterior to the accident".

Slip risks are subject to Regulation 12 of the Workplace (Health Safety and Welfare) Regulations 1992 (UK Government, 1992). No floor should be so slippery as to expose a person to risk to his health or safety. This is an absolute duty and relates to the construction of the floor. The regulations recognise that floors are subject to contamination and spillages and requires them, so far as is reasonably practicable, to be kept free from any article or substance that may cause a person to slip trip or fall.

It is interesting to consider which element of the regulations applies to the use of floor stickers. Although most stickers are used for relatively short periods i.e. during the life of a particular promotion/event, they form part of the 'construction' of the floor just as much as the vinyl terrazzo or quarry tiles do. In those circumstances it could be argued that there is an absolute duty to ensure the stickers are not so slippery as to expose a person to risk to his health or safety.

As the stickers in this study exhibited the same overall characteristics as the background flooring, it is suggested that they do not compromise the absolute duty under Regulation 12 (1).

As with all floorings with low surface roughness, any liquid contamination will significantly increase the slip risk, and this is confirmed by the different wet and dry SAT ratings. The wet and dry SAT ratings emphasise the need to keep floors clean and dry and control those situations under which the floor may become contaminated. While the background floors and stickers are not unsafe when dry, it would be better if such smooth floorings were not specified for areas where water contamination is foreseeable such as close to entrance doors in retail establishments. Specifying appropriate flooring will help the subsequent occupiers to manage the transient risks from contamination or spillage, and it is the occupiers that have to undertake risk assessments (see CIRIA 2006 and HSE 2006b).

Regulation 3 of the Health and Safety (Management) Regulations 1999 (UK Government, 1999) requires occupiers of premises to assess the risks presented to employees and non-employees by their work and this duty includes the risk of slipping. SAT offers a way of evaluating the risk from flooring and the effectiveness of various control options. It also offers a numerical basis for the prioritisation of remedial works where a number of floors were found to present a slip risk.

Table 5.0 indicates that stickers were being used on three different types of floors (vinyl type floors, quarry tiles and terrazzo). These are commonly found in high street retail environments and are very smooth (mean Rz roughness 7.7 microns). According to the HSE (HSE, 2004), a minimum of 20 microns Rz roughness is required for adequate slip resistance for clean water contamination and then it is only acceptable for low volume pedestrian traffic.

The mean Rz of the floor stickers was 15.96 microns. Although this is higher than the background flooring (7.7 microns) it still presents a "moderate" slip risk according to the UK Slip Resistance Group (Table 2.0) and falls short of the minimum surface roughness recommended by HSE for clean water contamination in Table 3.0.

Floor surfaces with less than 20 microns Rz roughness have a low slip risk based on the SAT rating so long as they are dry but if they become wet, they present a high risk of slipping with a mean SAT rating of 52. This highlights the critical importance of maintaining smooth floor finishes in a dry condition at all times while they are available for pedestrian use. Routine cleaning and procedures for dealing with occasional spillages need to be planned so that staff and the public are not exposed to an increased risk of slipping from wet floors.

SAT offers some assistance to duty holders on how to achieve a cost effective reduction in slip risk by producing a graphical representation of the relative contributions of the various elements to the rating. (Figure 3.0). In the example given, it can be seen that the greatest contribution toward the SAT rating is from the type and amount of contamination. By altering these parameters within the SAT and recalculating the rating, a duty holder can easily assess the effectiveness of proposed interventions. A combination of measures may be implemented which could be as effective in reducing the

risk of slipping as improving the roughness of the floor, a measure that is often expensive.

Conclusions

- The performance of the floor stickers was almost identical to that of the background floorings they were being used on. They presented a low slip risk under standardised dry conditions and high slip risk under standardised wet conditions.

- Floor stickers were not shown to present a slip risk in themselves. As with any smooth flooring finish, the floor stickers are safe under dry conditions but would not be suitable for locations where water contamination is foreseeable.

- When comparing the risk of slipping for the sticker and the background flooring, no significant difference was found. As the stickers have almost the same SAT ratings as the background flooring under dry conditions, they do not present any additional risk. Under wet conditions both the background flooring and the sticker were rated as "high" slip risk, so the use of the sticker does not appear to compound an already poor situation.

- The results indicate that floor stickers can be safely used on a range of background floorings including quarry tiles, terrazzo and vinyls under dry conditions.

- As the stickers in this study exhibited the same overall characteristics as the background flooring, it is suggested that they do not compromise the absolute duty under Regulation 12 (1) of the Workplace (Health Safety and Welfare) Regulations 1992.

Acknowledgements

The author wishes to acknowledge the helpful comments made by Kevin Hallas at HSL and an anonymous reviewer on an earlier draft of this paper.

References

CIRIA (2006) Safer surfaces to walk on – reducing the risk of slipping. London, Construction Industry Research and Information Association.

DETR (2000) Revitalising Health and Safety: Strategy Statement. London, Department of the Environment, Transport and the Regions. Available on-line at *www.hse.gov.uk/revitalising/strategy.pdf* [accessed 12/02/07].

Edwards (1949) Edwards v National Coal Board 1 AER 743 [CA]).

HSE (2004) The assessment of pedestrian slip risk: The HSE approach. Sudbury, HSE Books.

HSC (2005) Statistics of Workplace Fatalities and Injuries: Slips and Falls. London, Health and Safety Commission. Available on-line at www.hse.gov.uk/statistics/pdf/rhsslips.pdf [accessed 12/02/07].

HSE (2006a) Slip Assessment Tool. HSE, London. Available on-line at: www.hsesat.info/ [accessed 12/02/07].

HSE (2006b) The role of manufacturers and suppliers of flooring. London, Health and Safety Executive. Available on-line at: www.hse.gov.uk/slips/manufactfloor.htm [accessed 12/02/07].

UK Government (1974) Health and Safety at Work Etc Act 1974, Chapter 37. Norwich,
The Stationery Office.

UK Government (1992) The Workplace (Health, Safety and Welfare) Regulations 1992 SI 3004. Available on-line at: www.opsi.gov.uk/SI/si1992/Uksi_19923004_en_1.htm [accessed 12/02/07].

UK Government (1999) The Management of Health and Safety at Work Regulations 1999. SI 3242. Available on-line at: www.opsi.gov.uk/SI/si1999/19993242.htm [accessed 15/02/07].

Taylor Hobson (2006) Surface Finish and Form Measurement. Leicester, Taylor Hobson Ltd. Available on-line at: www.taylor-hobson.com/surtronicduo.htm [accessed 12/02/07].

UKSRG (2005) The assessment of floor slip resistance, The UK slip resistance group guidelines issue 3. UK Slip Resistance Group. Available on-line at www.ukslipresistance.org.uk/guidelines.php [accessed 13/02/07].

Writing for JEHR – an update and reminder for prospective authors

Dr Harold D Harvey[1] and Paul Fleming[1]

[1] Editors, Journal of Environmental Health Research

Abstract

This paper sets out the fundamentals of the peer review publication process, with particular emphasis on writing for JEHR. It is intended to encourage and advise a range of potential authors including those who wish to convert an academic dissertation into a journal paper (original research paper); environmental health and other professionals who have evaluated a professional practice issue and wish to write it up for JEHR (professional evaluation); and subject experts who wish to undertake a detailed review of the literature (review articles). The reasons for investing the time and effort to get published are examined, and the benefits to the individual and to the profession are explored.

In the main, though, the paper concentrates on the practicalities of constructing a paper for submission to the rigours of the peer review process. Advice is given on how to avoid disappointment at the first hurdle by selecting the right journal based on the published aims and scope. How to meet the challenge of converting a 20,000 or more word dissertation into a 6,000 word paper is addressed; compared with a dissertation, a journal paper requires more focus and precision in the theoretical framework, a more succinct literature review, more discriminating use of references, a more controlled description of the methodology, economical use of tables and figures and a more focused discussion of the results. The importance of constructing a paper precisely in accordance with the instructions for authors of the target journal is emphasised and practical advice given on the development of each part of the paper – Title, Abstract, Author(s) Introduction, Method, Results, Discussion, Conclusions and References.

Key words: Author, dissertation, peer review, professional, publishing, scientific, writing.

Why publish?

There are many reasons for aiming for publication.

For environmental health practitioners publishing is increasingly seen as part of professional development. 'Writing up' research, evaluating a practice issue, or carrying out a specialist literature review is a keen learning experience and is recognised as such in many continuing professional development (CPD) schemes, including those of REHIS and CIEH. With a current requirement of 30 hours CPD per year for Chartered Environmental Health Practitioners, publishing a paper can make an important contribution to this.

Publishing is also important to career development. People who can communicate well with their peers are in demand and publishing in journals is an important means of demonstrating your skills. Publishing in journals also leads to the author being recognised by a wider audience and increases the chances of being invited to speak at conferences and seminars. This establishes you within professional networks and helps promote your work and your skills.

For academics, publishing is an important part of subject and career development. Publishing in peer-reviewed journals is one of the main criteria used by Government in the Research Assessment Exercise (RAE), which assesses the quality of research undertaken in a higher education institution. The next RAE takes place in 2008. Evidence of publishing in quality journals is critical to appointment as a university lecturer and in achieving success within that career both in terms of achieving tenure and promotion.

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 the visioning document from the UK Health Development Agency and CIEH *Environmental Health 2012: A key partner in delivering the public health agenda*, there is a call for an enhanced research effort with a view to generating an evidence-base for policy, strategy and practice in environmental health (HDA, 2002). Thus, for the whole environmental profession, publishing is an important means of disseminating good practice, confirming the validity of policies, strategies and actions and publicising the profession.

Dissemination of current research via peer-reviewed publications, which carry the credibility of a rigorous quality assurance mechanism, is an essential part of developing and maintaining the authority of a profession.

Converting your dissertation into a paper for submission to JEHR

All PhD, other doctoral programmes and many masters and undergraduate courses incorporate a research

project which, typically, involves library and field or laboratory work carried out over a set period of time and written up as a dissertation (a study that is in part-fulfillment of a qualification) or a thesis (a study that is the sole component of a qualification). Such studies can generate documents comprising from 15,000 to 80,000 words wherein there often lies information of importance to a much wider community than those who will read it in dissertation format.

Converting, for example, a dissertation into a paper for publication is a challenging task! Reducing the 20,000 (or more) word dissertation to perhaps 6,000 words (the maximum for JEHR and many other journals) is not an easy task. It must be done with care and, ideally, with the collaboration of your academic supervisor who will be able to help you to decide, in the first instance, if your work is good enough for publication. In most cases it should be, provided the field and/or laboratory work has followed established research protocols.

The substance of the research methodology and findings must be preserved while reducing the extraneous detail that may be important for the academic components of the dissertation but not appropriate in a more refined journal paper. Therefore, selecting and rewriting rather than cutting and pasting is usually necessary. There is no need to try to incorporate a condensed version of every piece of information; only the most salient findings should be included. By eliminating the unnecessary, communication is improved. Seek feedback from your supervisor(s) and colleagues on what is salient and what is superfluous. In some cases there may be more than one paper in a dissertation, but here you need to be careful about duplicated and fragmented publications; a dissertation should not be the basis for more than one research publication unless each paper is substantially different.

Compared with a dissertation a journal paper requires:

- a tighter theoretical framework (don't include everything about the research topic);
- a more succinct literature review (salient);
- a more discriminating use of references (selective);
- a more controlled description of the methodology (get rid of extraneous words and avoid excessive reporting and repetition);
- a more focused discussion of the results (explicit but not overly detailed);
- care not to over-interpret the validity and significance of the data;
- a more economical use of tables and figures;
- an agreement on the authorship (dissertations are always collaborations between students and their academic supervisors and sometimes practitioners and the names should normally be included in the publication);
- careful attention to the style of the target journal.

Examples of dissertations converted to published papers are as follows:

> **Ryan, V** (2002) Condensation in dwellings. *Journal of Environmental Health Research*, 1(1), 25-30.
>
> **Majekodunmi A, Howard M T, Shah V** (2003) The perceived importance of cockroach [*Blatta orientalis (L.)* and *Blattella germanica (L.)*] infestation to social housing residents. *Journal of Environmental Health Research*, 1(2), 27-34.
>
> **McCullough P and Hetherington J O** (2005) A practical evaluation of objective noise criteria used for the assessment of disturbance due to entertainment music. *Journal of Environmental Health Research*, 4(2), 69-74.

Editors commonly receive papers that are little more than the dissertation with a few words taken out here and there and including numerous tables and appendices. These are all rejected!

Where to publish: the target journal

In terms of academic credibility and status, publication in *peer reviewed journals* (sometimes referred to as *refereed journals*) is preferable. These are scholarly periodicals which require that each manuscript submitted for publication is judged by an independent panel of experts – scholarly, scientific and/or professional peers under the guidance and arbitership of an editor, usually assisted by an editorial team. Submitted articles or papers (often referred to as manuscripts at this stage) are evaluated first by the editor and, if considered appropriate, are subjected to what is referred to as 'double blind' peer review (see below).

There is a small number of peer reviewed journals dedicated to environmental health. Many others will, however, publish papers on environmental health topics.

The 'double blind' peer review process

When a manuscript is received from the author(s), it is first read by the editor to eliminate those papers which are clearly either not within the journal's remit and those which are well below the standard required. Most papers are, however, sent to two or more specialist reviewers whose identities are not known to the author and the identity(ies) of the author(s) are not known to the reviewers – thus the 'double blind' terminology. In the case of JEHR we have a policy of selecting an academic and a practitioner peer reviewer for each paper. Only the editor knows both the identity of the author(s) and those reviewing the manuscript. This is designed to assure the independence and objectivity of the review process.

Following peer review the editor has three possible responses to the author(s):

- accept the paper as submitted (with or without minor amendments)
- request the author(s) to revise the paper based on the comments of the reviewers (with or without further peer review)
- reject the paper

The first two are fine and indicate that you have developed your paper satisfactorily. The third probably means that either you haven't achieved a high enough standard, or that you haven't targeted the right journal for the subject matter of your paper. Most commonly, the editors' response is to seek a revision of the paper with the implication that the paper will be published if it is revised in accordance with the comments of the reviewers and any additional comments from the editor(s).

JEHR administrative procedure

JEHR adopts a fully electronic procedure for the receipt, acknowledgement and peer review of manuscripts. Thus manuscripts are normally accepted only by email, as a single MsWord attachment. On receipt, each manuscript is given a unique code (e.g. JEHR 07123 [year, paper number]), which will be used to identify the paper throughout the review process. The author is sent an email acknowledgement which may also give some general comments about the manuscript. For the purposes of peer review, the author's details, and any other information that may identify the source of the paper, are removed. Two peer reviewers are selected and the manuscript is sent to each with the author's names removed and using only the unique code to identify it. Each peer reviewer has a unique ID (e.g. PR105) which is used, rather than their name, in all communications with the author(s).

When responses are received from the peer reviewers, these are emailed to the corresponding author using a file name that links the manuscript code with the peer reviewer ID (e.g. 07123_PR105). In some cases, the peer reviewer may annotate the original manuscript with the comments being highlighted in red; this is also sent to the author. The author is then expected to modify the manuscript and return it to the editors by email within a reasonable period of time, a couple of weeks perhaps, together with a brief summary of the modifications made, or reasons why some of the modifications requested are not acceptable.

Originality

Only original articles are considered for publication in JEHR. 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 similar journal. Contributions may, however, be based on a prior conference presentation. This originality rule applies to most academic journals. Professional and popular journals may not be so strict. It may be possible to publish in an academic journal and then publish a short paper based on the same material in a professional journal. It is usually possible to publish in an academic journal and then use the material as part of a textbook, but the publishers would need to be consulted in advance.

Constructing your paper

Aims and scope of the target journal/audience

It is important that you send your paper to the right journal. Thus, you need to read the aims and scope carefully, which in the case of JEHR are found on the inside front cover of each issue. JEHR has a fairly wide scope and accepts manuscripts within the diverse range of topics that relate to environmental health. Most journals now have specific web sites or pages and much of the information you need to enable you to target the right journal, follow the journal style and submission procedures, can be accessed online; the JEHR website can be accessed at *www.jehr-online.org*.

Dr Harold D Harvey and Paul Fleming

Instructions for authors

It is essential that you follow the instructions for authors for the specific journal in every respect. Having said that, scholarly articles follow a fairly standard format that commonly includes: an abstract, key words, introduction including a literature review, methods, results, discussion, conclusion and reference list. Unlike some professional and popular journals where the publishing team will make adjustments to the paper on behalf of, or indeed without the knowledge of, the author, this will not occur with a peer-reviewed journal. Thus, if you haven't included an abstract, or key words, or have too many sub-headings or haven't precisely followed the referencing protocol, the paper will be sent back to you. You are the expert and only you can make adjustments to your manuscript.

The notes for authors for JEHR are found on the inside back cover of each issue, on the web site and you can take the content of this paper as a further elaboration of the notes.

The title

The title is important! It should be specific enough to describe the contents of the paper, but not so technical that only specialists will understand. The title usually describes the subject matter of the article, for example:

> *'The effects of exposure to electromagnetic radiation from mobile phones'*.

Or you may wish to construct a title which summarises the results of your study,

> *'Residents in the vicinity of mobile phone masts show higher levels of ill health'*.

Sometimes a sub-heading may be appropriate,

> *'The effects of exposure to electromagnetic radiation from mobile phone masts: a study of 1,000 families'*.

Authors' names and other details

Each person who made a significant contribution to the paper (or the research work on which it is based) is entitled to be listed as an author. This commonly includes the academic supervisor whose name may appear as a joint author. Some journals (e.g. BMJ) require an explicit description of the contribution of each named author.

The names should be formatted exactly as instructed by the journal. Sometimes this will include post nominal letters (letters after your name), sometimes not. Mostly, authors' affiliations will be included (i.e. employer or organisation) and one author must be identified as the 'corresponding author' whose contact details will be published. For JEHR the style is:

> **The social construction of hygiene in the home: information, attitudes, behaviour and the consumer**
>
> Dr Lucy Meredith[1], Dr Mary Haslum[2], Roger Lewis[3]
>
> [1] Faculty of Applied Sciences, University of the West of England
> [2] Reader in Psychology, Faculty of Applied Sciences, University of the West of England
> [3] Visiting Researcher in Medical Microbiology, Faculty of Applied Sciences, University of the West of England
>
> *Correspondence:* Dr Lucy Meredith, Faculty of Applied Sciences, University of the West of England, Coldharbour Lane, Frenchay, Bristol. BS161QY. Telephone 0117 965 6261 ext 82519. E-mail: lucy5meredith@uwe.ac.uk

The abstract

An abstract, or summary, is published together with the paper and is usually located on the first page. The abstract has several purposes. It gives the reader an overview of the content of the paper and may determine whether your paper is read or not. Abstracts are commonly published separately in bibliographical sources, such as MEDLINE, Environmental Abstracts and DOAJ (Directory of On-line Journal). These large databases allow readers to search and scan the extensive literature-base quickly, and decide which articles they want to read in depth. They are electronic and facilitate comprehensive searching and downloading.

JEHR publishes the abstracts in a separate publication, which is distributed in printed form to all CIEH members. An abstract is typically between 100 and 350 words and you must follow the specification for your target journal. In the case of JEHR we specify a limit of 300 words.

Your abstract should summarise the purpose, methods, results and conclusions of the paper. It's not easy to include all this in just a few words. Start by writing a

summary that includes all that you think is important, and gradually edit it down to size by removing unnecessary words and phrases, while still retaining the necessary concepts, *or*, start by writing a bullet-point list of all the essential elements of each section, decide how many words you can allocate to each point and then create the abstract accordingly. Normally you shouldn't use abbreviations or citations in the abstract – it should stand alone without any reference list or bibliography.

The introduction

Experts suggest that you have about 30 seconds worth of readers' time in the introduction to confirm to them that they should continue to read your paper. The introduction should therefore be fairly concise, but its length will vary depending on the subject and the overall length of the paper. It should be well referenced in accordance with the protocol followed by the target journal (see later).

The introduction typically outlines the topic, explains to the reader why you were interested in the subject, summarises the relevant literature by means of a literature review and states how your work, which you are just about to describe, contributes to the subject. The literature review should identify the key contributions of past researchers, and identify theories or patterns or schools of thought/key debates. You could end the introduction by suggesting that the current research is needed to answer some outstanding question and/or a concise paragraph that explains the aims of your paper.

Description of the method

If you are reporting on a laboratory or field experiment, you should include enough information here to allow other experts to repeat your experiment. The same can be applied to the methods section, whatever type of research work your paper is based on. If you followed a complicated protocol, it may be helpful to include a diagram, table or flowchart to explain the methods you used. It is always necessary to provide the reader with as much confidence as possible in the way you carried out your work by explaining how the methods selected are appropriate, together with adequate reference to documented and evaluated methods. You may wish to describe several methods that you considered and explain why you chose a particular one.

Results are not usually included here although it may be appropriate to include preliminary results that were used to design or refine your method, for example, the results from a pilot procedure. The method section is usually where you outline how analysis of results was undertaken and assure your readership of the validity and reliability measures taken (trustworthiness in qualitative research) and any relevant ethical considerations. For example, if you used human subjects, did they give their consent?

Results

Obviously this is where you present your findings, but you need to think carefully about how you will present them within the constraints of a paper for publication; what would be suitable in a 20,000 word dissertation will almost certainly be beyond the scope of the average academic paper. Use tables and graphs if appropriate but it is a good idea to also summarise your main findings in the text. Many journals (including JEHR) request a minimal use of tables and graphs or suggest a maximum number allowable. If you do use tables or graphs, make sure that you include an explanatory title. If you can summarise the information in a sentence, then a table or graph is not necessary.

The results section is not the place to discuss the data; that comes in the formal discussion unless you have opted for a combined results/discussion section, which may be appropriate in some papers. It is, however, the place to record data that may prove that you 'failed' to prove your hypothesis (or 'hunch' in qualitative work). Remember, recording and discussing the research that 'didn't work' is as important as recording that which did. If you have conducted your research rigorously, then results differing from what you expected are as interesting and valid to report. You could prevent the wastage of many person-hours and considerable sums of research funds by warning others of pitfalls and unsuccessful designs.

The discussion

In this part of the paper, you discuss your findings in the light of various themes. The structure and content will vary depending on the type of work you have done but it would usually be appropriate to include:

- an analysis of your findings in relation to your main research question
- a discussion of the relationship between your findings and the existing literature
- the significance of your findings to practice.

Here you can make full use of your earlier literature review and show how your results agree, disagree or add to the existing knowledge. It is not usual to introduce new literature into the discussion which has not previously been placed in context and had its inclusion justified.

Once you have finished a first draft, you should go back and read your title, aim, objectives and research questions and then read the draft again. Does your writing reflect what the title claims the paper is focusing on? Are the aims, objectives and research questions adequately addressed? If they are, then your discussion is appropriate to the paper.

The conclusions

The characteristics of a good 'conclusions' section are simplicity, logic, ease of understanding and inclusiveness; not easy to achieve in a few words! Yet the conclusions and the abstract may be the only parts of the paper that some people read. It would be appropriate to include a brief summary of the paper's main points, including the clear answers that you have been able to come to as a result of your work. Don't be afraid to say if questions remain unanswered as it may be appropriate to suggest some further research work to provide further answers. You may also wish to ask a provocative question and/or call for some sort of action. In JEHR we commonly 'bullet point' the conclusions to make them stand out. Take a look at some of the past papers in the journal.

Referencing protocols

There are several referencing protocols and you must follow the one used by your selected journal. Harvard and Vancouver styles are common although different journals have their own style which may be a combination of documented styles, making it rather confusing for authors. Nevertheless the style required by your target journal must be followed precisely; you cannot expect the editor or the editorial team to adapt your referencing system – the paper will be returned to you for revision and could be one of a number of issues which leads to the rejection of your paper.

Fundamentally, referencing is a way of indicating your sources in the body of your paper and listing more details at the end. The purpose is to allow readers to see easily what sources you have used and to give sufficient information for them to conveniently locate the source. Whole textbooks are written on the topic of referencing (see below) and thus in this short paper we will give a brief outline of the system used by JEHR, which is based on the Harvard system.

Referencing in the body of the text

Within the system described here, there are several ways of citing (or acknowledging) the work of others in your text.

You can simply refer to the work in the course of your discussion:

> Some studies take this further and suggest issues that could be included in health promotion strategies (Griffith, 1995) or discuss the barriers to changing behaviour that need to be overcome if health promotion is to be effective (Frewer *et al.* 1994a; 1994b; 1997, Miles and Johnson, 2006).

Note the use of '*et al.*' if there are more than two authors. This applies to citing in the text only.

All authors must be included in the reference list at the end. Note also the use of a, b etc when referring to more than one paper with the same authors and the same year.

Or you can use a short quote:

> Fleming and Harvey (2002) define work-related violence as *"an action or perceived intention of a perpetrator which results in the threat of, or actual injury (physical and/or psychological) to the victim in the course of their work"*.

Note that you don't include the authors' initials here. Page numbers are not normally included in the text if you are citing a journal article, as the full details will be given in the reference list. However, if you are citing from a text book, it is usual to give the page number in the text here e.g. (Donaldson, 2007, p119).

The reference list or bibliography

This provides information on all the sources cited in the text and appears as a list at the end of your paper presented in alphabetical order of authors. The presentation is slightly different depending on where the source is to be found. In the following examples take careful note of the use of capital letter, italics, commas, periods and brackets.

Journal paper or article:

> **Wright M L and Pheby D** (2006) Risk Factors for Osteosarcoma in Young People in Cornwall: A Case-

Control Study. *Journal of Environmental Health Research*, 5(2), 61-69.

A book:

Stewart J, Bushell F and Habgood V (2004) *Environmental health as public health*. London, Chadwick House Publishing.

Chapter in an edited book:

Fleming P (1999) Health Promotion for Individuals, Families and Communities. In **Long A** (ed) (1999) *Interactions for practice in community nursing*. Basingstoke, Macmillan. pp 228-59.

Government sources:

Government of Ireland (1997) *Sustainable Development; A Strategy for Ireland*. Dublin, Government Publications.

Legislation:

Government of Great Britain (2006) *Climate Change and Sustainable Energy Act 2006*, Chapter 19. London, The Stationery Office.

Web Site (this aspect of style is still developing and there are many variations):

Trades Union Congress (2003) Union safety reps call for better health and safety training for bosses and workers [accessed 9 May 2003].

Newspaper article:

Daily Telegraph, 2007. Avian Influenza suspected in the UK. *Daily Telegraph*, 24 January, p.2a.

References

HDA (2002) *Environmental Health 2012: A key partner in delivering the public health agenda*. London, Health Development Agency.

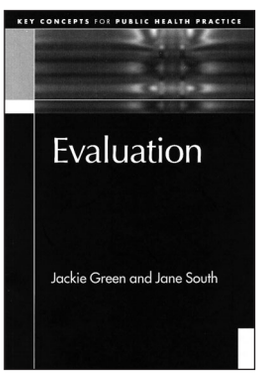
Internet resources

Additional information on referencing may be found at *www.bournemouth.ac.uk/library/citing_references/docs/Citing_Refs.pdf* [accessed 22/02/07]

The full Journal of Environmental Health Research may be accessed at *www.jehr-online.org*.

The Directory of On-line Journals (DOAJ) may be freely accessed at *www.doaj.org*. This database includes JEHR and 2584 other journals and more than 12,000 papers.

Book reviews



Evaluation

Jackie Green and Jane South

Open University Press/McGraw Hill Education, 2006, 184pp,
ISBN 0-335-21915-2 (paperback)

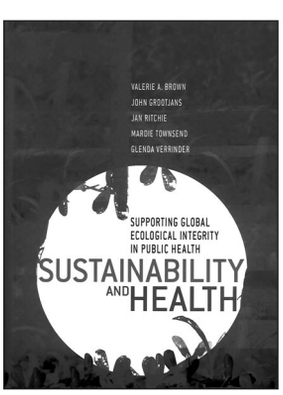
'Evaluation' is a recent addition to the Open University Press's Key Concepts for Public Health Practice series. Written by Jackie Green and Jane South from Leeds Metropolitan University's long established Centre for Health Promotion Research, this is a concise and useful addition to the existing literature on evaluation. It is particularly useful in that it addresses the spread of an evaluative perspective from health promotion into the wider sphere of public health.

This book is presented in three key sections, namely principles, practice and challenges. The principles section provides clear, focused chapters which introduce key concepts and introduce indicators and the evidence base for evaluation. The practice section is a grounded, practical offering which focuses on developing evaluation plans, evaluating community health initiatives and ethical considerations. The final section, challenges, addresses hard-to-reach groups, measuring the 'fuzzy' aspects and making evidence count. Each chapter is punctuated with helpful 'reflection points'.

Green and South, in providing an accessible, practical approach to evaluation, address head-on key issues that often challenge evaluation strategists, particularly in the evolving field of public health. One such issue is the 'paradigm wars' between those committed to positivist approaches, those committed to the constructivist view and the pragmatists who focus on 'fit-for-purpose' strategies. The authors critically evaluate not only these approaches but also lay down their own list of 10 guiding principles for evaluation.

The book is helpful not only for those new to the practice of evaluation, but as an aide memoire/reflection point for those more experienced in the field. Its length (184 pages) and its structure (short, pithy sections) mean that it can be easily read in its entirety and also used for specific reference. This book would be a useful addition to the reading list for anyone involved in implementing or commissioning evaluation interventions.

Paul Fleming
Associate Dean, Faculty of Life and Health Sciences
January 2007



Sustainability and Health – Supporting global ecological integrity in public health

Valerie A Brown, John Grootjans, Jan Ritchie, Mardie Townsend, Glenda Verrinder

Earthscan, 2006, 327pp.
ISBN 1-84407-173-1 (paperback)

This innovative text was developed to support academia in its quest to fully integrate sustainability into, and alongside, the teaching and processes that are central to the understanding and delivery of public health. Derived in Australia, it was compiled by five editors, seven universities, 10 international experts, 12 authors, involved 10 trial courses and took three years to develop what is primarily a teaching text.

The Journal of Environmental Health Research
ISSN 14760932 Volume 06 Issue 01

The book is heavily ridden with pedagogical thinking, written in task-oriented language and style and is well served by a set of appropriate conceptual processes, maps and diagrams. Central to this 'decision-making framework' approach is a theoretical framework for moving decisions into action and a set of practical strategic tools for implementation; it addresses four phases of 'What should be', 'What is', 'What could be'; and 'What can be'.

This lateral thinking is relevant to public health professionals, students, or other allied professionals in the quest to identify and integrate the key principles and practice of sustainable development and public health.

The text is cleverly structured to walk the dedicated reader through a process of living, listening, grounding, knowing, scoping, acting, innovating and managing – all to address the synergies and correlations between the aspirations of sustainability and the practical delivery of public health. This academic process is illuminated by 'Tasks for the reader' and limited reference to case studies.

There is no doubt that the impressive array of editors and authors have confirmed that the 'working together for sustainability and health' means a lot more than simple rhetoric or information transfer, as they clearly identify the need to lead in several areas, none less than social change.

The text is primarily for academics who wish to read deeper, engage with inquisitive students and address the key matter of decision making, and this latter point is applicable in the context of personal and professional lifestyles.

A valuable text, adding depth and integrity to the emerging concepts and principles of sustainability and its essential links to many activities and professions. This book is timely and impressive in its incisive appraisal of the links to basic quality of life through public health.

Alan Strong
Senior Lecturer in Sustainable Development
February 2007

Book review recommendations

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

Invitation to peer reviewers

JEHR operates the double-blind peer review process. When a manuscript is received from the author(s), it is sent to specialist reviewers whose identities are not known to the author and the identity(ies) of the author(s) are not known to the reviewers – thus the 'double blind' terminology. Only the editor knows both the identity of the author(s) and those reviewing the manuscript. This is designed to assure the independence and objectivity of the review process.

Wherever possible, we like to select one academic reviewer and one practitioner reviewer for each manuscript submitted.

As a result of the increasing number of submissions to JEHR, we would like to supplement our panel of reviewers in both categories. If you would like to be considered for the Reviewers Panel, please send a short CV and a covering email to indicate which subjects that you would feel confident about reviewing to hd.harvey@ulster.ac.uk. There is a small thank-you remuneration for each review carried out.

Letters to the editor

The editors welcome letters on the content of published papers, on general matters relating to the Journals and on environmental health research issues.

Please email your contributions to Dr H Harvey, Editor in Chief, at hd.harvey@ulster.ac.uk.