

Air pollution in a chemical fertilizer complex in Nigeria: The impact on the health of the workers

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Abstract

A study was carried out on the nature and levels of air pollution in a chemical fertilizer complex at Onne, near Port Harcourt in the eastern part of Nigeria. The fertilizer complex, with a work force of about 3,000, produces per day, a total of around 3,500 tonnes of ammonia, urea and NPK (Nitrogen, Phosphorus, Potassium) formulations to meet the fertilizer needs of the country.

Air samples were collected at periodic intervals from selected sections in the industrial complex. Ammonia and particulate emissions constituted the major air pollutants. Among the various sections in the industrial complex, the urea plant produced the highest ammonia emissions with a mean value of 459.1 ± 64.5 mg/m³, while the bulk blending plant where NPK formulations are made produced the highest total suspended particulates (TSP) with a mean value, $26,085.7 \pm 11,966.9$ µg/m³. Other sections in the complex emitted relatively low levels of ammonia and TSP.

A health survey by questionnaire involving 384 randomly selected plant workers and an equivalent number of controls living away from the industry revealed that the industrial complex workers complained more ($p < 0.05$) of respiratory problems (66.1%) and eye problems (22.6%) besides skin irritation and other common complaints. The populations living further away from the complex reported relatively low levels of these ailments as compared to the exposed populations ($p < 0.05$). These figures agreed with hospital records where the populations attend for their treatment.

Keywords: Air pollution, environmental health, communities, fertilizer industry, health risks, Nigeria, workplace.

Introduction

Globally, fertilizer consumption has, over the past few decades increasingly shifted towards developing regions. The main forces responsible for this shift are

the introduction of environmental legislation restricting the use of fertilizers in many developed countries and a significant growth in fertilizer demand in developing regions as a result of an unprecedented growth in population in most of these regions, particularly in Asia (UNU/INTECH, 1999).

In China for instance, nitrogen fertilizer produced in small-scale plants dominate the structure of the chemical industry (UNU/INTECH, 1999). The main pollutants of the chemical fertilizer industry in China are described mainly as wastewater and air emissions in addition to limited solid waste (Agro-chemicals report, 2002). Another Asian example is Turkey, which has a well developed fertilizer industry. It has six major fertilizer producers on the local market, including two private manufacturers. Nitrogen consumption constitutes 64% of the total NPK (Nitrogen, Phosphorus, Potassium) fertilizer consumption (Ejupoola, 1992).

In Africa, Morocco is the leading producer and the world's largest exporter of phosphate rock and phosphoric acid. Over the last two decades, trade in processed phosphates has increasingly replaced the phosphate rock trade. The main destination for phosphoric acid exports is Western Europe. The main exporters of phosphoric acid are the United States, Tunisia and Morocco (Louis, 1997). According to recent estimates, the phosphate industry sells approximately 200,000 tons of silicofluorides (hydrofluorosilic acid and sodium silicofluoride) to US communities each year for use as a water fluoridation agent (Coplan and Masters, 2001). The health effects associated with the phosphate fertilizer industry include poisoning of domestic animals caused by fluorine in smoke; industrial fluorosis in livestock is a disorder known by veterinarians in all industrialized countries (Connet, 2003).

The chemical fertiliser industry in Nigeria is at an infant stage. Of the two existing companies, the National Fertilizer Company of Nigeria (NAFCON) described here is a major one and is located at Onne (4.49° and 4.5° N and 6.59° and 7.0° East of Greenwich

Meridian), 30 Km away from Port Harcourt in the eastern part of Nigeria. It utilises a variety of raw materials such as natural or synthetic gas (methane), atmospheric nitrogen, steam and sand as filler material in the production of various formulations. The major products (per day) are ammonia (1,000 tonnes), urea (1,500 tonnes), and NPK formulations (1,000 tonnes).

The main sections where gaseous and particulate emissions are reported are the ammonia plant, urea plant, NPK plant, bulk blending plant, bulk storage plant, and the bagging area. Potential sources for leaks in the ammonia plant are the refrigeration loop, storage areas, flanges, valve packing, and the pump and compressor seals. The gaseous emissions from the ammonia plant include reformer and boiler flue gases, excess carbon dioxide, condenser stripper vapour and ammonia discharge. The gases coming from the reformer are vented into the atmosphere with a mixture of CO₂ (20%) and O₂ (3-4%). Most of the CO₂ is recovered and recycled in the process.

The condensate of the process water contained some CO₂, methanol and other dissolved gases, which are usually stripped. In the urea plant there are two possible sources of emissions, viz. the high-pressure scrubber and the granular stack. Some amounts of methane, hydrogen, ammonia and CO₂ are released. The wet scrubbers also release some particulate urea through the vent. In the NPK plant the tail gas scrubber is the only source of emission of ammonia, particulates and small quantity of fluoride. In various operations, e.g. granulation, drying, mixing and cooling, some amounts of dust and fumes are generated.

While the company has installed the recommended air pollution control devices for dust collection and fume scrubbing, the air is still laden with pollutants and people complain of a pungent smell and irritation of eyes and skin. A large volume of literature is available on the health effects of ammonia and particulate matter from industrial emissions. Hall *et al* (1995) reported that in a total of 263 events studied involving ammonia, 600 people were injured while 4 died. The major health effects were respiratory, eye irritation and skin irritation (Wieslander *et al*, 1994; Hall *et al*, 1995). Tabakova *et al* (1993) from Bulgaria, referring to air pollution due to ammonia at Vrata, reported that ammonia and hydrogen sulphide have direct effects on acute respiratory morbidity among children. Total Suspended Particulates (TSP) and health effects are well documented and most of the reports centred on respiratory problems (Abbey *et al*, 1993), and mortality (Schwartz and Dockery, 1995).

There has been no documentation of the fertilizer industry emissions and the associated health effects from Nigeria. The objective of this study was to assess the nature and levels of air pollutants characteristic of the fertilizer complex at Onne, and to elicit information from the plant workers concerning their health problems.

Materials and Methods

Study Location

The study was carried out in and around the industrial complex of the National Fertilizer Company of Nigeria (NAFCON) and extended to a 5km radius around the complex. The major sections of the complex used in the study were: the ammonia plant, the urea synthesis plant, the bulk blending plant, the bulk storage plant and the two control areas viz. control(1), located about 1 km away from the processing area and control (2), located in the corporate building 2km away from the factory premises.

At the ammonia plant, ammonia is produced through the Haber process, which involves a reaction between hydrogen and nitrogen in the presence of steam and temperature over 800°C. This process involves the following stages: desulfurisation, reforming, carbon dioxide purification, synthesis, and refrigeration. At the urea plant, the major raw materials used as feed are ammonia and carbon dioxide and urea is produced through the combination of exothermic and endothermic processes that are divided into the urea synthesis and granulation. Usually there is more ammonia from this plant arising from leakages and periodic venting.

At the NPK plant, ammonia, phosphoric acid, urea, potash, and sand (filler material) are the basic raw materials used in the production of the different formulations of NPK fertilizers. This plant and the bulk blending plant (where other complex fertilizers are produced) and the bulk storage plant are characterized by dusty premises.

Materials

Air samples were collected cross sectionally from 7 points located at the ammonia plant, urea synthesis plant, NPK formulation plant, bulk blending plant, the bagging area and control areas (1) and (2).

For ammonia determination, all points were sampled except for the bulk blending and bulk storage plants. A wet test meter (model 63115, Precision Scientific Inc, USA) was used to draw air into a double-orifice-fitted glass bottle containing a specially prepared medium of weakly bonded boric acid, known to loosely trap free ammonia molecules. This medium was then transferred to the laboratory for ammonia determination.

For TSP determination, all the points were sampled except for the ammonia plant. A high volume sampler (model GL 2000 HX, Fisher Scientific Company) was used to draw air through a glass fibre filter of pore size 0.45µ by means of a blower/pump with a flow rate between 1.13 and 1.70 m³/min. This arrangement enabled collection of particles with a size range of

Table 1.0 Ambient Ammonia Levels in the Atmosphere

Sampling points	Sample 1	Sample 2	Sample 3	Mean \pm SD
Control Area 1	12.6	18.90	10.80	14.10 \pm 4.25
Control Area 2	6.24	10.63	4.98	7.28 \pm 2.97
Ammonia Plant	24.00	16.60	60.20	33.60 \pm 23.33
Urea Synthesis plant	528.9	401.8	446.7	459.13 \pm 64.46
NPK Plant	171.05	169.46	142.33	160.95 \pm 16.14

(Results Expressed as Ammonia, mg/m³)

100 – 0.1 μ diameters. Prior to the collection of samples, the equipment was standardized after adjusting for atmospheric temperature and pressure using recommended standard procedures (Fertilizer Association of India, 1987).

Methods

The ammonia, which was trapped into the boric acid medium, was determined by volumetric analysis through back titration against hydrochloric acid using phenolphthalein and bromo cresol green as indicators and appropriate standards. The TSP was determined gravimetrically after proper conditioning of the filter, which involved exposure to a light source, inspection for pinholes, particles, and other imperfections, followed by equilibration of the filter papers for 24 hours under regulated oven temperatures (filter environment). The data were computed for mean 4 hour weighted average and statistically analysed. Owing to similarities in technology adopted, the methods followed were those recommended by the Fertilizer Association of India (1987).

The assessment of perceived health effects on the plant workers was undertaken by a health survey using a questionnaire. A sample size of 384 plant workers selected randomly with 50% proportion at 95% confidence interval was used for the survey. The questionnaire addressed demographic features, occupational history, level of education, awareness of pollution effects and other relevant information. The perceived health effects such as eye irritations, skin and respiratory disorders were compared with those from the hospital records in the area where the workers get their treatment. Similarly, information was also obtained from control populations near the industry. In addition, to validate the results, hospital records were collected from clinics, both within and outside the industrial complex, for the exposed population (plant workers) as well as outside clinics in Port Harcourt city for the non-exposed population (non-plant workers).

Results

Ammonia and Total Suspended Particulates (TSP) levels in the air

The ammonia levels in the air at various sections of the industry are given in Table 1.0. The results indicate that the urea plant emits the highest level of ammonia followed by the NPK formulation plant. Using the Mann-Whitney u test, no significant differences were found between the ammonia concentrations at the ammonia, urea, and NPK plants and the control areas ($p > 0.05$). As would be expected the ammonia levels were higher in the control area (1) within the complex, than at the control area (2) located about 2km away from the industrial operations.

TSP levels (Table 2.0) were found to be highest in the bulk blending plant followed by bulk storage plant, the NPK formulation plant and the urea granulation plant. There was no significant variation between the controls and the various plant units ($p > 0.05$) (Mann-Whitney u test).

Health Impacts of the Emissions

Analysis of the questionnaire responses from 384 plant workers indicated that the majority of the workforce in the operations were male (91.0%), 32.4% were in the age group of 26-30 years, 70.5% spend 8 hours per day at work. 222 workers (57.9%) reported general health problems since they began work and 146 (37.9%) reported to be suffering for more than a year.

Among the more striking complaints by the workers since they commenced work were: respiratory disorders as reported by 254 (66.1%), skin disorders reported by 94 workers (24.4%), and eye disorders reported by 87 workers (22.6%). The other common health problems reported were: malaria, cold and headache (29.3%), chest pain and respiratory disorders (15.9%), chest pains, and eye and skin disorders (10.2%) (Figure 1.0). The Mann-Whitney u test indicated that there were

Table 2.0: Total Suspended Particulates (TSP) in the Atmosphere

Sampling points	Sample 1	Sample 2	Sample 3	Mean ±SD
Control Area 1	115.65	101.87	125.01	114.18 ± 11.64
Control Area 2	110.35	124.15	104.23	112.91 ± 10.20
Urea Granulation Plant	665.46	533.11	498.34	565.64 ± 88.18
NPK Plant	2954.44	954.44	11684.23	1864.37 ± 1012.1
Bulk Blending Plant	14987.0	38764.0	24506.0	260875.7 ± 11966.9
Bulk Storage Plant	2342.05	5133.06	3684.25	3720.09 ± 1396.3

(Results Expressed as µg/m³)

significant differences between the exposed (cases from clinical records) and the control groups (p<0.05) as well as between the perceived exposed (cases from interviews) and the control groups (p<0.05) for all the reported morbidity cases. There were strong associations (p <0.05) between eye and respiratory disorders and the industrial operations the workers performed.

the periodic venting of the plant. These levels, though lower than the Federal Environmental Protection Agency's (FEPA'S) recommended limits of 3000 mg/m³ (from stationary sources), could still produce deleterious health effects on the staff working within this plant owing to persistent nature of their exposure.

Discussion

The study reported here is the first of its kind in Nigeria.

Most of the ammonia affecting the workers in this area arises from the urea plant due to leakages and

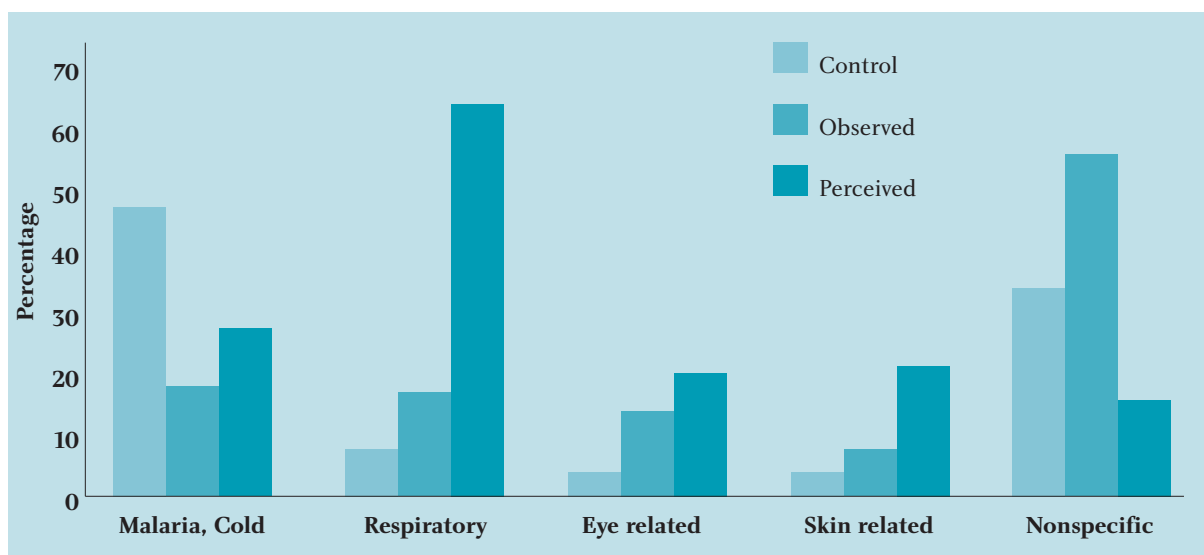
The high values of Total Suspended Particulates (TSP) recorded at the bulk blending plant was consistent with visual observations made at the premises of the plant, which indicated very dusty conditions. The values recorded were higher than the National Air Pollution Standards set by the FEPA in 1991, which sets a limit of 0.15-0.5 mg/m³ (Table 3.0).

Table 3.0. Air Quality Standards in Nigeria

Pollutants	Ambient Limits	Limit from stationary sources (For 24 hrs)
Particulates	250 µg/m ³ (Daily average of daily values 1 hour)	0.15-0.5 mg/ m ³
Sulphate Oxides (SO ₂)	0.01 ppm (26µg/m ³) 0.1 ppm (260 µg/m ³) (Daily average of hourly values 1 hour)	0.05 – 0.5 mg/ m ³
Non-methane hydrocarbon	160µg/m ³ (Daily average of 3-hourly values)	2.0 – 5.0 mg/ m ³
Carbon monoxide	10 ppm (11.4 µg/m ³) 20 ppm (22.8µg/m ³) (Daily average of hourly values 8-hours)	1.0 – 5.0 mg/ m ³
Nitrogen Oxides (NO ₂)	0.04 ppm - 0.06 ppm (75.0–113 µg/m ³) Daily average of 1-hourly values (range)	0.004 – 0.1 mg/ m ³
Photochemical Oxidant	0.06 ppm (Hourly values)	5133.0

(Source: Federal Environmental Protection Agency, 1991)

Figure 1.0: Health Disorders Observed and Perceived among the Workers



The control groups, especially control (2) which is about 2 Km away from the industrial complex, are at low risk.

The health implications, particularly at the urea and bulk blending plants, are very significant and precarious as the workers in these plants were not in the habit of using protective devices even though these were provided. This study also revealed that while workers reported always using the protective devices, in reality they seldom wear them at work.

The findings from this study are of both epidemiological and toxicological importance. There was an indication that the health effects such as skin disorders and respiratory tract infections were associated with exposure to high concentrations of the atmospheric pollutants, viz. ammonia and total suspended particles. This was found to be in agreement with the findings of Abbey *et al* (1993), Wieslander *et al* (1994) and Hall *et al* (1995) which focused on the health effects associated with exposure to atmospheric emissions and particulates. It was also discovered that there were strong associations between eye and respiratory disorders and the nature of work performed by the plant workers, especially for those who were not in the habit of wearing the protective devices. This is in addition to the fact that the degree of the health problem could be more severe at plant locations with higher concentrations of ammonia and suspended particulate matter.

Based on this, certain mitigation measures were suggested which include health education to plant workers, routine inspection of plant staff safety habits, regular auditing of the air pollution control devices and periodic monitoring of the air quality to ensure continued compliance with recommended limits.

Conclusions

- Most of the ammonia affecting the workers in the fertilizer industrial complex was from the urea plant arising from leakages and the periodic venting of the plant.
- The observed levels of ammonia, though lower than FEPA'S recommended limits of 3,000 mg/m³ (from stationary sources), could still produce deleterious health effects on the staff working within this plant because of the persistent nature of their exposure.
- The bulk blending plant, which recorded the highest TSP levels (26,085.7 ± 11,966.9 µg/m³), was mainly responsible for the dusty conditions commonly observed in the industrial environment.
- Health effects, such as skin disorders and respiratory tract infections, were associated with exposure to high concentrations of the atmospheric pollutants, viz. ammonia and total suspended particles.
- Significant associations were observed between eye disorders, respiratory disorders and the nature of the work performed by the workers especially for those who were not in the habit of wearing the protective devices provided.
- Significant differences were observed between the degrees of morbidity cases among the exposed workers compared to the non-exposed controls.
- To safeguard the health of the plant workers, there must be regular occupational health monitoring, health education of workers, routine equipment auditing/maintenance and/or periodic production process review.

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Variation in the usage of NHS Direct by age, gender and deprivation level

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Abstract

NHS Direct is a free national service available in England and Wales to provide health care advice via telephone help lines. It has also the potential to be a source of surveillance data.

This study aimed to compare the profile of NHS Direct users with the profile of the general population to identify patterns of usage among different age, gender and deprivation-level groups which would facilitate promotion of the service to under-represented groups.

The study population comprised all individuals residing in the City of Preston, Lancashire, UK who had used NHS Direct between 01 September 2001 – 31 August 2002. For each call received by NHS Direct during this period, age, gender and partial postcode data were gathered. Callers were assigned to their respective electoral wards by means of postcode.

United Kingdom census information (1991) was analysed to determine the population profile and the 'Index of Multiple Deprivation 2000' was used to determine levels of deprivation in each study ward. Expected and actual usage of NHS Direct was determined and a Chi-square analysis performed.

The introduction of NHS Direct has a number of implications for the surveillance of communicable diseases. The current reporting mechanisms through general practitioners and hospitals may be by-passed by patients who use NHS Direct, thus creating a false picture of national disease patterns and emerging diseases, exacerbating problems already associated with the current surveillance systems. On the other hand, NHS Direct is itself a potential source of surveillance data, although if used for this purpose it would be valuable if all sections of the population had access to it and made use of it to the same extent.

This study showed that younger people, older people and males used the NHS Direct significantly less than other groups of the study population. There was no significant difference in usage among socio-economic groups. There is a need to determine why these sectors

of the population do not use NHS Direct to inform focused efforts to increase their usage.

Key words: Deprivation level, environmental health, health care, NHS Direct, telephone-triage, disease surveillance.

Introduction

The use of telephone help lines to provide healthcare advice originated in the United States of America, where they were used to facilitate a reduction in increasing healthcare costs (Turner *et al*, 2002). The development of technology and the continuing need to relieve pressure from primary healthcare providers caused countries such as Scandinavia, Australia, Canada, United Kingdom and New Zealand (Donaldson, 2000) to develop schemes which incorporated telephone triage into their existing health care services.

The UK Government proposed to modernise the National Health Service in 1997 (Calman, 1997). A key element of the modernisation was the introduction of NHS Direct (DOH, 1997) providing round-the-clock, confidential health care advice by trained staff. In 1998, pilot sites were launched in Lancashire, Milton Keynes and Northumbria (Munro *et al*, 1998). By November 2000, NHS Direct was available throughout England and Wales. At the current time NHS Direct is the largest provider of telephone healthcare advice in the world (The Controller and Auditor General, 2002). The main aim of NHS Direct is to provide health care advice enabling patients to make informed healthcare decisions for themselves and their families and to facilitate access to NHS services in England and Wales.

NHS Direct is a free national service and aims to be accessible to all members of the population. The implication of this is that the service should be available equally to all population groups regardless of age, gender, socio-economic group, disability or ethnicity (Department of Health, 2000). Social disparities in health are an ongoing problem in the

Table 1.0 The local electoral ward number and name of all the wards in Preston, Lancashire based on the 1991 Census and their corresponding ranked Index of Multiple Deprivation.

Ward Number	Ward Name	Ranked Index of Multiple Deprivation
1	Fishwick	192
2	Ribbleton	226
3	Deepdale	299
4	St. Matthew's	387
5	Brookfield	428
6	Avenham	494
7	Central	911
8	Larches	1469
9	Ingol	1487
10	Moor Park	1848
11	Riversway	2052
12	Tulketh	3380
13	Ashton	4317
14	Preston Rural West	4833
15	Sharoe Green	4976
16	Sherwood	5092
17	Cadley	5837
18	Preston Rural East	6213
19	Greyfriars	6783

covers the geographical area of Cumbria, Lancashire and North Merseyside and handled in excess of 400,000 calls in 2001-2002 (Lancashire Ambulance Service, 2003).

The aim of this study was to determine which, if any, population sub-groups showed the greatest potential for increased use of NHS Direct. This was achieved by determination of the relationship between the profile of NHS Direct users in the City of Preston and the profile of the actual population in the study area. The study determined patterns of usage by different sections of the population by age, gender and socio-economic groups.

Methods

Data were collected from NHS Direct North West Coast, Clinical Assessment System for the period 01 September 2001 – 31 August 2002, for all users of NHS Direct with a City of Preston postcode. Data collected included the age and gender of the caller (n=24,973) and the first part of the caller's home postcode.

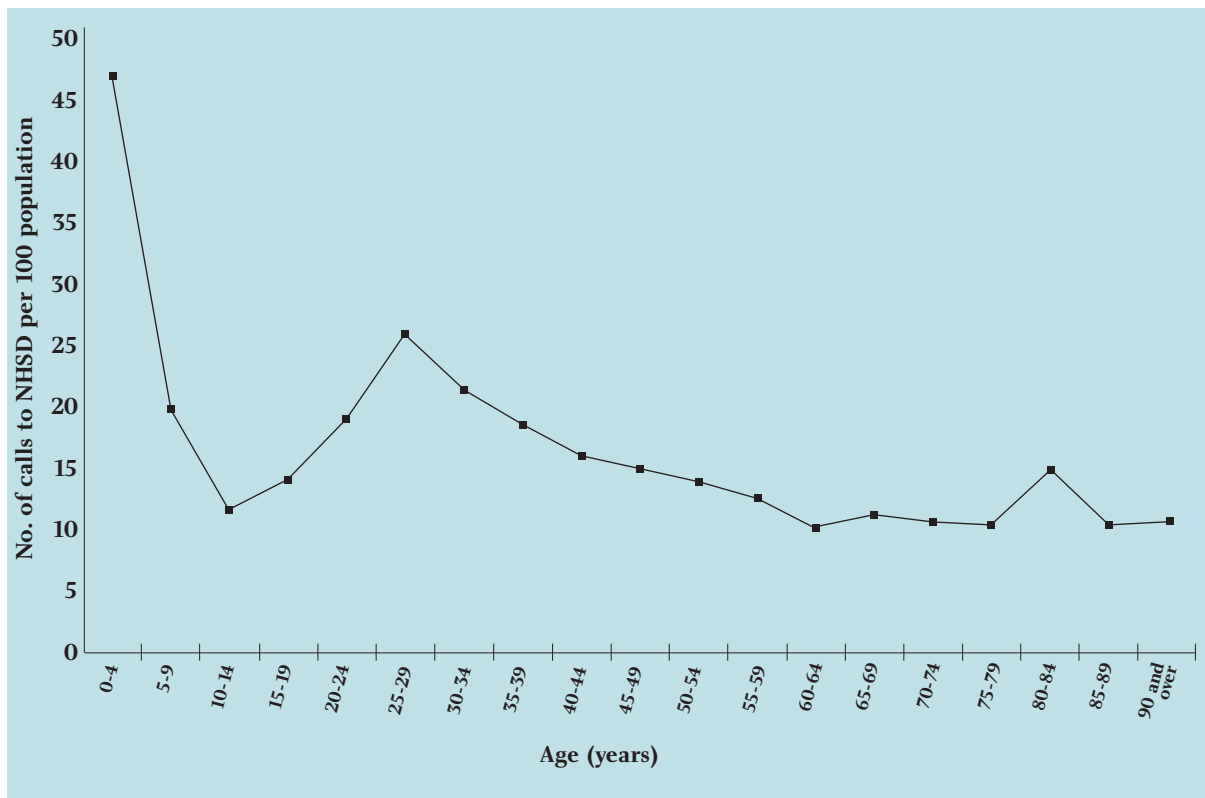
Age data were grouped into sub-groups to correspond with census data grouping. Caller deprivation level was determined by the use of local electoral ward analysis. The caller postcodes retrieved from the NHS Direct North West Coast Clinical Assessment System database between 01 September 2001 – 31 August 2002 were used to determine how many calls were made to NHS Direct from each local electoral ward in the Preston, Lancashire area. The postcodes (n=17,562) were grouped into their respective wards. In 1991, Preston, Lancashire, UK comprised 19 local electoral wards. Local electoral wards represent local political constituencies (Tickle *et al*, 1999). Although electoral wards vary in geographical size, the boundaries are set so that the population size in each ward is between 6,000-7,000 (Preston City Council, 1991). For planning purposes local electoral wards are used by local government and health authorities (Tickle *et al*, 1991). The Indices of Deprivation 2000 (DETR, 2000) were used as an indicator of deprivation in each ward. Each local electoral ward was assigned its rank in the Index of Multiple Deprivation displayed in Table 1.0. Index of Multiple Deprivation 2000 scores were used as they are a broad indicator of deprivation at local electoral ward level in the UK (DETR, 2000). The Index of Multiple Deprivation 2000 includes a range of factors that contribute to deprivation in local authority wards (DETR, 2000; Townsend *et al*, 1998; Jarman, 1983).

UK (Acheson,1999) as well as across many European countries (Vescio, 2003). Inequalities in health still exist within the UK between men and women, socially disadvantaged and wealthy sections of the population and between different ethnic groups (Department of Health, 2002). It has been shown that in the UK, individuals from a lower socio-economic group are more likely to suffer from infectious diseases, pneumonia and violence (Whitehead *et al*, 1992). Also individuals from lower socio-economic groups are at a greater risk of suffering from cancer, heart disease and respiratory disease (Whitehead *et al*, 1992). Men are less likely to consult a doctor when they are ill and are less likely to report the symptoms of disease or illness (Cooper, 2000). All these factors contribute to the growing inequalities in health (Acheson, 1999).

The setting of this study was the City of Preston in Lancashire, UK. The population of the city at the 1991 Census was 126,082 (Preston City Council, 1991). Preston, Lancashire is part of the NHS Direct North West Coast, which was one of the 'first wave' sites launched in March 1998. NHS Direct Northwest Coast

The Chi-Square goodness of fit test was used to compare the NHS Direct North West Coast call data with general population data from the 1991 Census survey of Preston, Lancashire (Office of National Statistics, 1991). Observed frequencies of callers from different groups were compared with expected frequencies based on the known percentage of each

Figure 1.0: Number of calls by age made to NHS Direct per 100 population between 01 September 2001 – 31 August 2002.



group within the general population based on census data. The Chi-Square goodness of fit test was carried out for: age, gender, and index of deprivation in Preston, Lancashire, UK.

Results

Figure 1.0 displays the number of calls by age made to NHS Direct per 100 population in the period of 01 September 2001 – 31 August 2002. The call pattern varied considerably in the lower age groups. The highest number of calls were made for patients in the age group 0-4 years (46 per 100 population). There was a marked reduction in use for the 5-9 and 10-14 age groups (20 and 12 per 100 population respectively). Call numbers increased steadily through age groups 15-19, 20-24, and 25-29 years and then decreased further with age. At age groups 60-64, 65-69, 70-74, 75-79 years, the call rate plateaued to 10-11 calls per 100 population. A small increase was observed for age group 80-84 years to 15 calls per 100 population but the volume of calls dropped to 10 per 100 population for age groups 85-89 and over.

The actual and expected number of calls for male and female patients in each age group numbers is displayed in Table 2.0. For male patients aged 0-4, 5-9, 20-24, 25-29 and 30-34 years, the observed number was higher than the expected. Age range 0-4 years showed the largest difference between observed (n=2017), expected (n=670) values. The frequency of use by males in different age groups was not representative of the

population structure of males grouped by age in the study area (Chi-Square = 3416, degrees of Freedom (df) = 18, P<0.001).

The number of calls made was higher than expected for females in age ranges 0-4, 20-24, 25-29, 30-34 and 35-39. Age range 0-4 shows the largest difference between observed value (n = 1879) and expected (n=821) values. The frequency of use by females in different age groups was not representative of the population structure of females grouped by age in the study area (Chi-Square = 3135, degrees of Freedom (df) = 18, P<0.001).

Table 2.0 shows that male and female patients in age groups 20-24, 25-29 and 30-34 use NHS Direct more than expected the usage for females than males in these age groups.

Table 3.0 shows the observed number of calls to NHS Direct made by/for patients in each local electoral ward of the City of Preston and the corresponding expected values. Most calls were made from patients in local electoral ward 16 (n=1246) and the smallest number from local electoral ward number 18 (n=279). Local electoral wards 2, 4, 5, 7, 8, 10, 11, 14 and 16 have a higher observed number of calls than expected. Local electoral ward 16 shows the largest difference where the observed value was 1246 and the expected value was 900. The frequency of patients using NHS Direct from different local electoral wards is not representative of the local community. (Chi-Square = 1049, degrees of Freedom (df) = 18, P<0.001.)

Table 2.0: Chi-Square comparison of expected caller population and actual caller population results for the male and female population of Preston, Lancashire from 01 September 2001 – 31 August 2000.

Age	Observed (O)	Expected (E)	(O-E)2/E
Male (n=10441)			
0-4	2017	670	2708
5-9	995	730	96
10-14	578	729	31
15-19	535	751	62
20-24	810	780	1
25-29	855	767	10
30-34	913	797	17
35-39	760	815	4
40-44	580	735	33
45-49	478	635	39
50-54	451	697	87
55-59	355	538	62
60-64	267	474	90
65-69	253	435	76
70-74	234	364	46
75-79	168	274	41
80-84	122	155	7
85-89	48	71	7
90+	22	24	0
Total	10441	10441	X²=3416
Female (n=14492)			
0-4	1879	821	1363
5-9	848	899	3
10-14	540	975	194
15-19	781	1101	93
20-24	1636	1165	190
25-29	1624	1037	332
30-34	1547	1073	209
35-39	1193	1071	14
40-44	913	965	3
45-49	733	814	8
50-54	623	854	62
55-59	481	674	55
60-64	345	660	150
65-69	346	621	122
70-74	283	555	133
75-79	282	517	107
80-84	244	362	38
85-89	118	202	35
90+	76	126	20
Total	14492	14492	X²=3135

Figure 2.0. shows that more calls were made for patients in local electoral ward 16, which had a high Index of Multiple Deprivation 2000, than for local electoral ward 18 which had an even higher Index of Multiple Deprivation 2000. There was no relationship between calls made to NHS Direct and Index of Multiple Deprivation 2000 score.

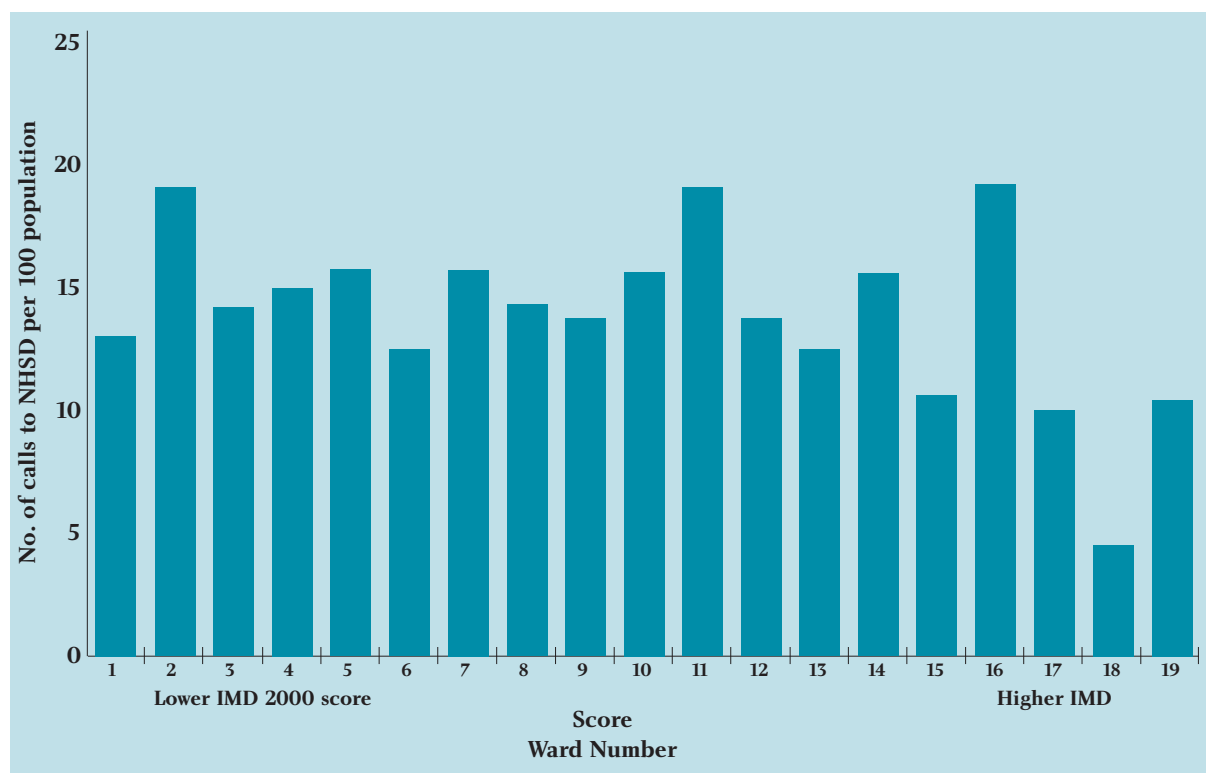
Discussion

The results demonstrated that a significantly higher proportion of calls were made for children under the age of 4 years than for any other age group. This finding is not unexpected and reflects the higher rate of usage of healthcare facilities generally for young children. Usage of NHS Direct was higher in females than males, particularly between the age groups 20-34 years. The least proportion of calls was made by teenagers and older people, both for males and females. An increased usage rate would be expected for the elderly, in particular, in view of their generally increased need for access to healthcare. The finding of lower use by older people, relative to their anticipated needs, confirms in part results published by the National Audit Office in 2002, which stated

Table 3.0: Chi-Square comparison of expected caller population and actual caller population results for the population in 19 local electoral wards of Preston, Lancashire from 01 September 2001 – 31 August 2002 based on Index of Multiple Deprivation 2000.

Ward	Observed (O)	Expected (E)	(O - E)2/E
1	830	894	5
2	1222	927	94
3	962	993	1
4	1097	1018	6
5	1095	923	32
6	834	931	10
7	1023	891	20
8	855	830	1
9	968	977	0
10	1068	929	21
11	1060	792	91
12	915	924	0
13	792	853	4
14	1104	978	16
15	746	937	39
16	1246	900	133
17	617	861	69
18	279	920	447
19	677	911	60
Total	17390	17390	X²= 1049

Figure 2.0: Number of calls made to NHSD per 100 population against ward number



that younger people and people aged 65 years or over were either less aware of the service or less likely to use it (Controller and Auditor General, 2002).

Comparison of the population size of each local electoral ward with the number of calls made by patients in the local electoral ward showed that the usage of NHS Direct was not representative of the profile of the study area. The highest proportion of calls was made from patients in local electoral ward 16 and the least number of calls were made from local electoral ward number 18. Local electoral ward 16 had a lower Index of Multiple Deprivation 2000 score than local electoral ward 18. The results showed that overall, there was no relationship between the number of calls received by NHS Direct North West Coast and the Index of Multiple Deprivation 2000 score. This does not support the findings published in the 2002 National Audit Office report on NHS Direct that lower socio-economic groups were less likely to use the service (Controller and Auditor General, 2002).

The results presented here highlight the potential for NHS Direct to be used more widely by certain groups in the study area. The government has invested heavily in NHS Direct and hopes the service will eventually become the first access point for all health care information for the NHS (DOH, 2001). However, the findings reported here indicate that certain groups of the population are not using the service to its full potential, either because they are unaware of the service, are accessing other primary care services or simply choose not to use it.

The introduction of NHS Direct has a number of implications, for example for the surveillance of communicable disease in England and Wales (Baker *et al*, 2003). Hospitals and General Practitioners have a protocol to follow in the notification and reporting of disease. These reporting points may be bypassed by patients who use NHS Direct. This could create a false picture of national disease patterns and emerging diseases, exacerbating problems already associated with the current surveillance systems (Wheeler *et al*, 1999).

However, NHS Direct is itself a potential source of surveillance data. It has the potential to be used to identify seasonal trends and detect epidemics (Baker *et al*, 2003). If the scheme is to be used in surveillance, to monitor disease patterns, it is important that all sections of the population have access to it and make use of it to the same extent. Any imbalance in accessibility among different age, gender or socio-economic groups should be taken into account; otherwise biased surveillance data may be generated. The use of NHS Direct may also draw patients away from other surveillance pathways e.g. calls on GP services.

The challenge of achieving acceptance and routine use of NHS Direct among all sectors of society may require efforts to be focused on groups that under use the service. Such efforts should aim to ensure that all groups of the population are fully aware of the service. They would also need to instil sufficient confidence in the service to move away from more traditional sources of healthcare advice (Controller and Auditor General, 2002).

Conclusions

This study showed that younger people, older people and males used the NHS Direct significantly less than other groups of the study population. However, there was no significant difference in usage among socio-economic groups. The study revealed a potential for increased usage by these groups and highlighted the need to determine why certain sectors of the population do not use NHS Direct.

A study is currently underway to determine the awareness of NHS Direct and reasons for any under usage of the system and to establish means to promote its aims. This work will also determine the usage of NHS Direct by different ethnic groups within the North West Coast area.

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A Practical Evaluation of Objective Noise Criteria used for the Assessment of Disturbance due to Entertainment Music

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Abstract

Existing methods of objectively assessing complaints regarding noise disturbance are predominantly based on A-weighted noise measurements. However, A-weighted measurements are inappropriate where the noise contains a significant proportion of energy at lower frequencies.

Noise complaints received by environmental health service providers have increased dramatically over the past 10 to 15 years. Noise arising from entertainment premises is now a common cause of disturbance to nearby residents. A-weighted measures are inappropriate for the assessment of this type of noise due to the large, low-frequency, bass-beat element contained in modern music.

The study on which this paper is based sought to evaluate the effectiveness of a number of selected noise criteria used for the assessment of disturbance caused by music from entertainment premises. The effectiveness of each was determined by how well the objective assessment result concurred with the investigating officer's subjective assessment of the noise. Additionally, the strength of the relationship between the objective and subjective measures was determined by statistical analysis.

It was found that the German criterion DIN 45680 (Deutsches Institut für Normung, 1997) performed best as a predictor of the subjective assessment of nuisance, but that the 1/3 octave bandwidth analysis of the criterion contained with the Institute of Acoustics – Good Practice Guide on the control of noise from Pubs and Clubs - Draft Annex 2 (Institute of Acoustics, 2002), resulted in the strongest statistical relationship.

Government has accepted the need for a scientifically robust criterion for the assessment of disturbance caused by entertainment music. The results of the study on which this paper is based would suggest that a 1/3 octave bandwidth analysis is essential as part of any new assessment criterion and that the German criterion DIN 45680 should be considered in further research toward the development of such a criterion.

Key words: Bass beat, Entertainment music, Low-frequency noise, Noise criteria, Noise disturbance.

Introduction

Over the last 10 to 15 years, environmental health services within local authorities have observed a sustained increase in the number of complaints received about noise. In many cases noise disturbance is now the most common reason why a member of the public has the need to make contact with their local authority (DEFRA and CIEH, 2003).

For many local authorities, weekends result in numerous complaints regarding noise from pubs and clubs. Increasingly powerful music systems, the desire for late night entertainment and the increase in leisure time have all contributed to a situation where many residents have their sleep disturbed by music being played in nearby entertainment premises.

Music consists of energy at a wide range of frequencies. Modern musical styles contain a relatively large amount of energy at low-frequency, which provides a rhythm to the music; this is sometimes referred to as bass beat.

Persons who are being disturbed by a bass beat will often say that they can both hear and feel the noise 'throbbing'. It has been suggested that the feeling associated with bass beat results from the low-frequency noise causing resonance within the chest cavity of the exposed person. Therefore, the effects of low-frequency noise differ from broadband noise and research has shown that noise containing a large amount energy at lower frequency is more annoying than the same sound pressure level without the low-frequency element (Perrson *et al*, 1990).

When investigating complaints relating to entertainment music, it is common practice for the local authority officer to gauge the level of disturbance by both subjective assessment and objective noise measurement. However, no objective noise criterion has ever been proven to be sufficiently

scientifically robust to assist in the assessment of disturbance which is specifically due to music from entertainment premises.

In the absence of a specific objective criterion, the guideline values contained in the Guidelines for Community Noise (WHO, 2002) are frequently used. These criteria are predominantly based on A-weighted, equivalent continuous measurements. A-weighting is a decibel correction applied to a sound to represent how the human response varies with frequency. It applies a large negative correction at the lower end of the frequency spectrum.

A-weighted noise levels have been shown to under-represent the annoyance caused by low-frequency noise (Perrson *et al*, 1990). Therefore, A-weighted measures should not be used for the assessment of low-frequency bass beat; indeed the WHO document itself advises that A-weighted measures are inappropriate when prominent low-frequency components are present.

Despite this advice, a 2002 survey of Chief Environmental Health Officers in UK local authorities indicated that A-weighted levels were still being frequently used by Environmental Health Practitioners when investigating complaints of low-frequency noise disturbance (Guest, 2003).

A further problem arises because the equivalent continuous sound pressure measurement is a single figure expression of a wide range of audible frequencies. As a result, the influence of an elevated sound pressure level at one specific low frequency may be under-represented in the overall single figure result. Perrson *et al* (2001) support this point by suggesting that the human annoyance response is directly related to the sound pressure levels of the dominant low-frequencies rather than a broad spectrum measure.

It has become widely accepted that a more representative objective criterion is needed to assist in the determination of whether the noise due to entertainment music is giving rise to a statutory nuisance or not.

The study on which this paper is based sought to evaluate the effectiveness of various objective noise criteria when they are used to assess the disturbance caused by music emanating from entertainment premises.

The need for a new assessment criterion

The presence of a nuisance due to noise affecting residential premises is commonly assessed by comparing the equivalent continuous, A-weighted, sound pressure level to the measured background noise level (in the absence of the noise) and to

some objective criterion such as the WHO guideline values.

However, assessments of entertainment music conducted in this manner tend to under-estimate the disturbing effect of the noise and therefore the likelihood that a nuisance exists. The problem is exacerbated by the fact that it is the low-frequency energy in the music that is more transmissible over distance and through building structures. Furthermore, as low-frequency noise tends not to be present in the background noise environment, the introduction of a low-frequency bass-beat will be more noticeable to nearby residents, particularly late at night.

In a research report on low-frequency noise DEFRA acknowledged the difficulties experienced by environmental health practitioners in measuring and assessing the impact of noise of this type (DEFRA, 2001). Following on from the research report DEFRA published a review of published research into low-frequency noise and its effects (DEFRA, 2003a). Referring in general terms to the deficiencies in the assessment criteria that were commonly used, the review stated, "A not uncommon occurrence is that there is clearly a low frequency noise present at a complaint location, but existing U.K. assessment methods are not able to determine its nuisance value, leading to the conclusion of 'Not a Statutory Nuisance,'" (DEFRA, 2003a, pg 7). The review acknowledges that further research into the development of appropriate criteria is required.

The UK Government suggests areas of environmental research that it will consider supporting in the annual DEFRA Environmental Protection Research Newsletters. The 2003-2004 edition suggests that research is required into suitable low-frequency noise assessment criteria (DEFRA, 2003b). Furthermore, the 2004-2005 edition (DEFRA, 2004) details a specific research project to assess the validity of the criteria contained in the Institute of Acoustics – Good Practice Guide on the control of noise from Pubs and Clubs – Draft Annex 2.

Criteria selected for study

The problems in assessing low-frequency noise are not new and have been known to acoustics practitioners for many years. Numerous assessment criteria have been proposed, some in relation to specific applications, others more general; yet none has become widely accepted for use in assessing noise from entertainment music.

One common method of objective assessment currently used by Environmental Health Practitioners considers that a noise nuisance is present where the measured noise level exceeds the WHO guideline value of LAeq (equivalent continuous sound pressure level) 30dB within a dwelling at night and is also at least 10dB in excess of the measured L90 (90% percentile of the equivalent continuous sound

pressure level) background noise level.

In the study on which this paper is based, an extensive literature search was conducted to identify noise criteria (in addition to the WHO guideline value) which could potentially be applied to the assessment of disturbance due to entertainment music. In total twelve 'alternative' methods were identified and the five most relevant and practical were selected for study. A number of criteria such as those in the Noise Act 1996 were excluded because existing studies had shown that they performed poorly as a predictor of annoyance when the noise contained significant low frequency elements (Morrissey, 2003). Others such as the Dutch method contained in 'NSG - Richtlin Laagfrequent Geluid, 1999' (cited in DEFRA, 2003a) were excluded as they sought to assess whether the noise was audible or not rather than the annoyance caused.

The criteria selected for further study were:

Institute of Acoustics - Good Practice Guide on the control of noise from Pubs and Clubs - Draft Annex 2 (Institute of Acoustics, 2002).

Of the selected criteria, this was the only one that specifically applied to entertainment music. This document contained a range of different criteria that became more stringent as the frequency and duration of the entertainment music increased. The criterion in relation to entertainment music that continues beyond 23:00hrs has two parts. If the limit values in each of the parts are exceeded then the noise is considered to be a nuisance. The first part of the criterion states that the LAeq (music on) should not exceed the L90 (music absent). The second part states that the L10 (10% percentile equivalent continuous sound pressure level) with the music on should not exceed the L90 with the music absent in any 1/3 octave bandwidth between 40Hz and 160Hz, (I.O.A., 2002). The objective criteria were subsequently withdrawn from the draft and are not contained in the final version of the document (I.O.A., 2003).

The loading of A-weighted measurements to take account of low-frequency energy.

This method was the authors' adaptation of a study reported by Kjellberg (1997) which utilised the A-weighting and C-weighting networks available on most sound level meters. The C-weighting network does not apply as large a negative correction at low frequency as the A-weighting network, therefore C-weighted measures take more account of the low-frequency energy in a noise. In this criterion a loading of 6dB is arithmetically added to the measured A-weighted level where the difference between the A and C-weighted levels exceeds 15dB. The resulting rating level was deemed to represent a noise nuisance if it was 10dB or more in excess of the measured background noise level.

Danish criterion - Low frequency A-weighted noise level.

This criterion was taken from the Danish national guidelines contained in Information No.9/1997 for the Danish Environmental Protection Agency reported

on by Jakobsen (2001). The criterion uses a logarithmic summation of the 1/3 octave bandwidth measurements between 10 and 160Hz to give a parameter known as the Low-frequency A-weighted Level (LpA,LF). A limit value of 15dB (impulsive / rhythmic) is set for inside dwellings at night.

German criterion - DIN 45680 (Deutsches Institut für Normung, 1997).

The German criterion for non-tonal noise uses a logarithmic summation of only those measured 1/3 octave bandwidths between 10Hz and 80Hz which exceed the specified threshold of hearing. A limit value of 25dB is applied for night-time noise. The criterion is based upon studies of low-frequency noise annoyance from industry and its use in UK nuisance investigations has been reported on by Rushforth *et al* (2002).

Polish criterion - Recommendation No.358/98 of the Building Research Institute (Poland).

This criterion has been reported on by Mirowska (2001). There are two elements in the assessment: first the measured 1/3 octave levels must exceed a reference curve representing 'comfortable' acoustic conditions. Second, the measured levels must exceed the measured background noise by more than 6dB. The noise is considered to be annoying if both elements are met in any one of the 1/3 octave bandwidths between 10 and 250Hz.

Methodology

The study on which this paper is based sought to evaluate the effectiveness of a number of objective noise criteria when used to assess the disturbance caused by music from entertainment premises. It was conducted within the context of statutory noise nuisance investigations carried out by Environmental Health Practitioners in the UK.

Typically, these investigations will consist of a subjective assessment of the disturbance caused by the noise supported by an objective noise measurement and assessment. The effectiveness of each of the assessment criteria was determined from how frequently the objective assessment concurred with the subjective assessment and from a correlation and regression analysis of the objective and subjective values.

Fieldwork was conducted over a seven-month period and each of the 28 samples obtained related to an actual complaint of noise disturbance due to entertainment music.

One five-minute noise measurement was applied to each of the assessment criteria. Some of the criteria specified different measurement techniques. In order to ensure that the same noise was being assessed by each criterion, it was necessary to adopt a single measurement procedure for obtaining data. It was decided to follow the specified procedure in the Institute of Acoustics - Good Practice Guide on the

Table 1.0: Subjective assessment scale.

Subjective level 1 = entertainment music noise is very faint and barely audible; concentration is required to distinguish the entertainment music noise over the background noise; the absence of the entertainment music noise is more noticeable when it stops than its presence when it is on.

Subjective level 2 = entertainment music noise is distinguishable but at a low level; specific lyrics are not identifiable; entertainment music noise would be masked by normal speech or television volume.

Subjective level 3 = entertainment music noise is clear and distinct; lyrics may be identifiable; audible over normal speech or television volume; sleep would prove difficult in this climate; noise would constitute a statutory nuisance if regular and prolonged.

Subjective level 4 = entertainment music noise is dominant over all other noise; sleep would prove impossible; individual incident would constitute a statutory nuisance if prolonged.

Subjective level 5 = entertainment music noise pervades entire premises where measurement is taking place; sensation of vibration may be felt; entertainment music noise audible throughout general external area.

control of noise from Pubs and Clubs – Draft Annex 2 (IOA, 2002), as this was the only criterion that directly related to entertainment music. It was noted that the Danish criterion specified that measurements were carried out at three positions to account for the spatial variation within a room. In order to minimise the effect of room nodes, measurements were not taken in the corners of the room and reflections were avoided where possible.

The assessments were all conducted within the bedrooms of affected residential premises. In common with established monitoring practice, the doors of the bedroom were closed during measurement. The windows were either open for normal ventilation or closed dependant upon the occupier's preference when using the room. Background measurements were conducted in the same location at a representative time when the music was absent.

Objective noise measurements were taken using a calibrated and field-verified sound level meter with real-time 1/3 octave bandwidth analysis capabilities. Measurements were taken over a five-minute averaging period typical for night-time noise assessments.

The subjective assessment was conducted simultaneously during the five-minute measurement period. The subjective level was quantified using a five-point scale ranging from level one, where the music was faint and barely audible, to level five where the music could be heard over a wide area. Subjective level three, where the music was clear and distinct, the lyrics may have been identifiable and sleep would have proven difficult, was deemed to represent a noise nuisance. Table 1.0 shows the subjective assessment scale used.

The subjective level was directly related to the effect that the noise might be having upon the occupiers of the affected residential premises. This is the basis of the assessment of statutory noise nuisance as the noise must be more than just present – it must result in a material interference with the occupier's use and enjoyment of their premises. A five-point scale was chosen as it was considered that there were insufficient stages of human annoyance response to allow a larger range.

All persons taking part in the study were professional officers with experience of noise assessment. To further aid consistency, all were given specific training in the objective measurement and subjective assessment methods and guidance documents were provided detailing the measurement method and subjective assessment scale.

The majority of entertainment music complaints in the study related to night-clubs, pubs and social clubs; additionally a number of complaints related to noise from an indoor dance-music concert.

None of the residential premises in which assessments were conducted structurally adjoined the entertainment premises. The distance between the residential premises and the entertainment premises ranged from 1m to 285m. The majority of complaints related to entertainment premises over 100m away.

Discussion of results

Table 2.0 shows the results of the statistical analysis between the subjective and objective levels and the percentage concurrence with the subjective assessment.

It was found that the existing method, based on WHO guideline values and an increase of 10dB or more on the background noise, concurred with the subjective assessment of nuisance in 57% of the sample. The regression and correlation analysis showed a moderate to weak relationship between the objective and subjective levels. Regression analysis of the sample indicated that an increase of 16dB on the background level would have better represented the level at or above which a noise nuisance existed.

The first element of the IOA Good Practice Guide on the control of noise from Pubs and Clubs – Draft

Table 2.0: Comparison of the Effectiveness of each of the Objective Criteria in the Assessment of Subjective Noise Nuisance.

Assessment Criterion	Correlation Coefficient	Degree of Explanation	Limit Value Specified	Limit Value From Regression	Percentage Concurrence with Subjective
WHO and background	0.54	0.29	+10dB	+16dB	57%
Pubs & Clubs (1st part)	0.54	0.29	+1dB	+16dB	29%
Pubs & Clubs (2nd part)	0.74	0.54	+1dB	+32dB	29%
Loaded A-weighted	0.61	0.37	+10dB	+20dB	43%
German	0.69	0.48	25dB	26dB	82%
Danish	0.66	0.43	15dB	64dB	29%
Polish (1st part)	0.69	0.48	+1dB	+26dB	29%
Polish (2nd part)	0.71	0.51	+6dB	+23dB	43%

Annex 2 is similar to the existing method; however, the limit is 'no exceedance of the background level' rather than 10dB or more. This element predicted nuisance in all of the samples, whereas only 29% were subjectively assessed to be noise nuisances.

The second element of the IOA Good Practice Guide on the control of noise from Pubs and Clubs – Draft Annex 2, which is based on 1/3 octave bandwidth analysis, produced the strongest statistical relationship between the subjective and objective levels (a correlation coefficient of 0.74 and degree of explanation of 0.54). Regression analysis of the sample indicated that the limit value of no exceedance of the background was set too low and that an increase of 32dB better represented nuisance conditions. Accordingly it was not surprising to find that this element of the criteria also predicted nuisance in every sample, thereby concurring with the subjective assessment only 29% of the time.

The loaded A-weighted assessment method resulted in a slightly stronger statistical relationship with the subjective level but performed less effectively as a predictor of nuisance.

The assessment using the German criterion DIN 45680 was found to concur with the subjective assessment in 82% of the sample, significantly more than any other criterion. This criterion's effectiveness was due, in part, to the limit value of 25dB which accurately described

the level above which nuisance occurred. A regression analysis of the sample produced a limit value of 26dB thereby confirming the accuracy of specified limit value. Using the German criterion, the objective levels were found to have a moderately strong statistical relationship with the subjective levels.

The Danish criterion predicted nuisance in all of the samples as the limit value was too low.

The first element of the Polish criterion similarly predicted nuisance in all of the samples; the second element performed slightly better resulting in a 43% concurrence with the subjective assessment. Use of both elements resulted in moderate to strong statistical relationships with the subjective assessment.

Conclusions

Of the selected criteria, it was found that the German criterion, DIN 45680, performed best as a predictor of noise nuisance due to entertainment music. The strongest statistical relationship between the objective and subjective assessment levels was found when using the 1/3 octave bandwidth analysis element of the IOA Good Practice Guide on the control of noise from Pubs and Clubs – Draft Annex 2.

It was recognised that the statistical validity of the results may be limited due to a relatively small sample

size. Nevertheless the results indicated likely trends and may contribute to further research toward the development of a scientifically robust assessment criterion for entertainment music.

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'Personal responsibility' in funding private sector housing renewal: Lessons from Edinburgh's good practice

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Abstract

England and Scotland are at different stages of their private sector housing renewal policies. Scotland has devolved powers in housing and public health, and legislation and practice is quite distinct from other parts of the UK. English policy documents tend to emphasise needs and area-based interventions set within a wider range of other public health policies, while Scotland's approach tends to mobilise around property management and maintenance.

As grants are in decline, there is a renewed emphasis on personal responsibility for private sector housing condition. The Regulatory Reform (Housing Assistance) (England and Wales) Order 2002 subsumed earlier grant legislation and provided a new power for assistance, requiring increased private sector funds to be levered into the sector. Research into how this is being implemented at local level and examples of good practice are continually being evaluated. At the time of writing, the Scottish Housing Improvement Task Force is still considering how to best implement personal responsibility and the forms of assistance that will be necessary. There is a growing evidence base of good practice (i.e. at practitioner/implementation level), in private sector funding opportunities that may help promote housing conditions. It is becoming increasingly important to demonstrate accountability and increased use of private funding in private sector housing renewal.

This paper reports on issues around personal responsibility in Scottish and English private sector housing renewal policy. Its content is based on a literature review and interviews with the Scottish Executive, the Scottish Federation of Housing Association and the City of Edinburgh Council's Private Sector Services, where innovative local approaches have – and continue to be – developed. Notably, the Edinburgh Stair Partnership, launched in 1991, offers residents technical and administrative support as a form of Property Management Service Scheme. It seeks to motivate owners to maintain their homes cost effectively, using decent, guaranteed builders. All targets have been exceeded without having to fund any grant assistance. Such evidence-based practice offers useful lessons at implementation level that can be appropriately adapted elsewhere.

Key Words: Evidence and housing, Edinburgh Stair Partnership, Housing and public health, Housing Improvement Task Force, Regulatory Reform, Private sector housing renewal.

Introduction

As levels of home ownership continue to rise, both England and Scotland are currently undergoing sweeping changes in policy development and implementation in respect of private sector housing stock. Following decades of interventionist housing grant policy funded by the state, home owners are now required to take more personal responsibility for funding maintenance, repairs and improvements in their own houses. The drive toward personal responsibility for private sector housing has been made explicit in key documents about private sector housing in both England (DoE, 1996; DETR, 2000; ODPM, 2003a; ODPM, 2003b) and Scotland (HITF, 2003). This process really began with the New Right from 1979 as the role of the state became one of enabler rather than provider of services delivered through a range of new organisations such as Home Improvement Agencies (HIAs). The New Left since 1997 has continued to favour home ownership and personal responsibility for the sector's condition. This seeks to empower individuals to make choices in meeting their needs by accessing appropriate goods and services based on information from professional experts (Nettleton, 1997; Petersen, 1997).

Scotland already had its own housing powers prior to devolution, and different intervention standards, enforcement protocol and grants regimes. However, there is now a shared emphasis on personal responsibility for private sector housing conditions in the form of private finance rather than grants for housing renewal. The Regulatory Reform (Housing Assistance) (England and Wales) Order 2002 subsumed earlier grant legislation and encouraged greater use of private funding opportunities. At the time of this study, the Scottish Housing Improvement Task Force (HITF) was considering how to develop and implement similar proposals locally in providing 'Schemes of Assistance' to owners.

Most households in England and Scotland are homeowners. Many are in a position to take responsibility to

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maintain, repair and improve their homes. However, many low-income home owners are not. Indeed, most occupying poor housing in England are low-income groups, particularly lone parent and ethnic minorities (ODPM, 2003b). The Scottish House Condition Survey (Scottish Executive, 2003) reports that it is mainly households on low incomes who suffer substantially higher incidences of dampness and condensation in their housing (across tenures). Herein lies the problem of personal responsibility for housing conditions: how can lower-income groups, who are already disproportionately represented in poor housing and suffering health inequality, afford necessary works?

Despite the sweeping changes currently underway in private sector housing renewal, there remains little published literature about evidence-based practitioner involvement in implementing private sector housing renewal policy. Historically, success in private sector housing renewal has been measured quantitatively (e.g. number of houses with internal amenities or meeting the fitness standards of tolerable standard following grant or enforcement activity etc. – see for example Leather and Morrison, 1997; ODPM, 2003c; Scottish Executive, 2003). While this provides valid indicators of housing quality, it does little to illustrate the qualitative benefits of policy intervention, or indeed to attempt to 'measure' whether, and to what extent, wider health benefits have been achieved.

Sharing practitioner knowledge of what works well, within a sound strategic process that is routinely monitored and evaluated, is becoming more important. Many working at practitioner level already share innovative, good practice routinely, yet often this 'expert knowledge' – based on research – is disseminated informally and the current calls for evidence-based practice represent an opportunity to ensure that such practice is disseminated through nationally recognised structures. One purpose in writing this paper is to present Edinburgh's good practice – which responds to ideals of personal responsibility – within its wider context as a basis for learning lessons intra UK. Such good practice is set to become more important in the context of evidence-based practice within a rapidly evolving public health agenda in England (see for example Health Development Agency, 2004).

New strategies in England and Wales

The Regulatory Reform (Housing Assistance) (England and Wales) Order 2002 required local authorities to provide new means of assistance to address local needs and priorities through enhanced access to private funding opportunities and to publish their policy by July 2003. ODPM Circular 5/2003, 'Housing Renewal' (ODPM, 2003b) reiterated the Government's view that home maintenance remains the owners' responsibility. However, the Circular also pointed to the impact of poor housing and health and local quality of life and that appropriately targeted local authority strategic,

partnership-based approaches were essential. The Order is therefore also seen as an opportunity to contribute to wider housing and public health government objectives of poverty, social exclusion, health inequalities and neighbourhood decline based on local needs assessment and other policy priorities.

There has been more of a focus on client based group approaches to improving energy efficiency, health etc, emphasis on Renewal Areas and continued use of HIAs. The policy tools put forward to encourage personal responsibility include grant assistance; loan assistance (interest bearing repayment loans, interest-only loans, and zero-interest loans); Income Support for loan interest payment; Equity Release Schemes; providing loan finance with others; packages of grants and loans; and other forms of non-financial, technical and social assistance. It also raised the training and culture change necessary for authorities in administering loans. The Circular set out requirements for drafting, adopting and monitoring the new policies (including drawing from good practice) and ensuring public consultation.

Results from a recent postal questionnaire (ODPM, 2003d) suggests that this has proven more challenging than anticipated, but some examples of good practice are now emerging from local authorities and their partners (ODPM, 2003e). The Centre for Urban and Regional Studies at the University of Birmingham undertook research into the success of this Order (see www.curs.bham.ac.uk). The report of the initial survey found variation in how the new strategies have been researched and developed. Some have consulted with other housing and health organisations, although less so with potential lenders to supplement public resource, or with residents or builders. Of the responses received, some 92 per cent were considering a new policy, and 8 per cent intended to retain their existing policy. Overall there has been more of an emphasis on preventative interventions and a more client-centred approach (OPDM, 2003e).

Although the 2002 Order has been in place for some time, there is still a lot to be done to develop new and innovative policies, targeted to greatest need and to maximise private investment. The research also investigated innovative developments emerging from the Order, with 78% of local authorities planning to develop new packages and 65% of these (mainly London Boroughs and Metropolitan Districts) intending to fund another organisation to assist in delivering this. Results indicate considerable diversity in local implementation, but mainly a mixture of grants and loans. An increasing number of local authorities were working with the Home Improvement Trust (HIT) to access the Houseproud scheme. However, the main emphasis was found to be a modified grants system rather than other assistance, particularly in Wales (OPDM, 2003e).

In addition, a recent Briefing Note overviews some good practice adopted to date, offers lessons to other

Table 1.0: Summary of private funding initiatives

Organisation(s)	Brief overview of scheme
The Home Improvement Trust (HIT), Nottingham. <i>(At time of writing, the only national home loans service for repair, adaptations and maintenance)</i>	Established in 1997 and operates nationally to provide advice and access to affordable home repair and improvement for equity rich home-owners, normally aged over 60, except where the applicant is disabled. HIT and Houseproud work with lenders, LAs and HIAs, offering a range of products and loan types. Some 80 LAs work with Houseproud in England and Wales, at a fee.
ART (Aston Reinvestment Trust) Homes Ltd, Birmingham (not for profit, subsidiary of RSL)	Established in 2000 to provide affordable loans to meet the needs of low income home-owners, working in close cooperation with LAs. Costs are spread across LAs and helps bring in private sector finance to assist in wider private sector regeneration. By January 2004 ART home had given £200,000 in loans and had approved some £850 in further lending, with a view to expanding its range of products longer term in the West Midland area. Now exploring new possibilities on national basis, as its Property Appreciation Loan (PAL) could be made available to all adults, not just those over 60.
The 'HomeImprove' initiative, Rochdale and Oldham Borough Council, in partnership with West Pennine Housing Association (Not for profit, partnership between RSL and LAs)	Established in 2001 to enable loans via the SRB5 scheme, further amended via Best Value review, leading to consideration of equity release schemes and grant assistance where eligible. Equity based on valuation after improvement. Implications for staff training and funds are recycled. Situation still under review as progress on uptake is monitored, and scheme could expand.
The Derby Loans Group (not for profit)	Established in 2002 to assist those without access to credit, enabling access to loans, privately funded from shareholders' equity, loans and grants. Pilot scheme for housing loans was set to begin in April 2004. Loans restricted to geographical area to complement LA scheme for RTB owners – £3,000 over 4 years maximum – secured by a land charge.
Wigan Borough Council Housing Finance Assistance (direct lending)	Established following RRO, a grant and loan package – 'capital appreciation loan' – secured against equity in the property. Grant element enabled LA to exercise some control, and flexibility built into system. Generally successful, possibly because of high grant to loan ratio at present, but still a need for more private finance. Other regional LAs interested in adopting similar approach.

Key: LA = local authority; RSL = registered social landlord; RTB = right to buy; SRB = single regeneration budget. Source: Summarised from ODPM et al (2004)

local authorities (ODPM *et al*, 2004). Five case studies from this are summarised in Table 1.0.

Key lessons from the ODPM research (ODPM, 2003e; ODPM *et al*, 2004) include:

- fundamental cultural change is required in delivering new packages of financial assistance;
- sustained funding and resourcing for new initiatives can be challenging;
- the lack of national requirements, loan products and government guidance may lead to substantial strategic development time locally; but local variations may bring advantages to communities;
- early decisions need to determine what assistance packages will be available for, e.g. healthier housing or simple repairs/maintenance etc;
- mechanisms are needed for the dissemination of good practice and to convey more widely to

communities information on the types of assistance available, and

- monitoring and evaluation remain fundamental.

This paper is concerned with the extent to which current Scottish policy development aligns with personal responsibility for private sector housing conditions in a market environment, and what evidence base exists to help measure progress and maximise policy output. There is a particular emphasis on Edinburgh City Council's approaches to private sector housing renewal, which can offer lessons in good practice, increasingly recognised as part of the need for a growing evidence-base in private sector housing renewal. Comparisons are drawn with England's approach as appropriate. Other parts of the UK are not specifically considered (except where

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otherwise stated) as they do not share completely similar housing and/or public health policies.

Methods

Following a literature review, a series of initial telephone discussions helped identify relevant personnel with responsibility for private sector housing conditions, at policy making level (Scottish Executive) and implementation level (City of Edinburgh Council). The Scottish Federation of Housing Associations was also included due to the challenges they face in maintaining mixed tenure blocks where they hold overall responsibility. The telephone discussions also helped identify relevant policy documents at local level. Semi-structured interviews were then held with representatives of each of the following organisations in Edinburgh: Scottish Executive (the devolved government of the Scottish Parliament); City of Edinburgh Council (who have their own unique legislation, and have been innovative in their private sector housing renewal policies and strategies); and the Scottish Federation of Housing Associations (SFHA) (Scotland has a high concentration of tenements (flats) and the SFHA's interest extends to private sector housing renewal to facilitate joint renewal programmes in mixed tenure blocks that have arisen from the Right to Buy policy) (see also SFHA, 2003; SFHA, 2004).

Interviews were used to enable some adaptability to probe ideas and responses as well as to explore some of the motives behind policy changes from the perspective of each organisation. Interviews were based around key themed areas. This sought to explore the nature of current housing policy and strategic changes, differences identified and why, and the extent to which an emerging evidence-base was underpinning these changes. Policy and practice issues and the wider health agenda were also investigated. Particular attention was paid to encouraging 'personal responsibility' in Edinburgh's City Council's good practice in private sector housing renewal and the extent to which the new proposals might underpin this.

Results and discussion

The starting point for this study was to explore how Scotland – which already had different housing and public health policy approaches to England – was addressing a wider policy of personal responsibility for private sector housing conditions, and find out what evidence-base exists to help measure progress and maximise policy output.

Juggling personal responsibility with better housing: proposals for assistance and property management in Scotland

Since most Scots now own their own home, the Housing Improvement Task Force (HITF) was commissioned to

explore issues in improving the quality of this sector and bring together evidence on which to develop new legislation, policies, improved working practices and better information to those in, or aspiring to, this sector. Its report and recommendations were published in 'Stewardship and Responsibility: A Policy Framework for Private Housing in Scotland' (HITE, 2003). Of particular relevance to this paper, the report proposed consideration of the level and nature of local support necessary for delivering maintenance, repair and improvement of private sector housing, with recommendations on disseminating good practice, such as in property management at local level (e.g. City of Edinburgh Council's approaches), in successfully delivering Schemes of Assistance to owners. This is part of a wider approach concerned with personal responsibility for homeowners.

The report provided the HITF's recommendations for the sector, including provision of Schemes of Assistance to owners. While much was similar to contemporary changes in England and Wales, there were also some differences, mainly due to the nature of Scottish housing stock and earlier (and continuing) differences in its legal and intervention standards. Scottish policy is seeking to achieve a balance between public policy objectives and owners' rights and responsibilities. In respect of maintaining and repairing the private sector, financial assistance is to be targeted toward those in greatest need, with other forms of support being made available, including advice, assistance with accessing finance and equity based loans. In addition, a new system of area-based powers are proposed, with new enforcement powers available (although enforcement powers are not within the scope of this paper) (HITE, 2003). It seeks to deliver a wider approach to housing and health within a market-led system, whereby home owners make rational decisions about their property (Scottish Executive, Personal Communications, 2004).

The HITF proposed that Scottish local authorities should consider how to make the following forms of assistance available in their areas:

- General advice and guidance – leaflets, websites, general advice, Communities Scotland HomePoint Services for accreditation system built on national standards and good practice;
- Practical assistance, where homeowners can afford works, such as handyperson services, Care and Repair etc, assistance with neighbours;
- Loans provided by local authorities, as conventional or equity based;
- Subsidised loans; and
- Subsidy through grant.

While most dwellings in Scotland are houses, the proportion of tenements (flats) in Scotland is significantly higher than in other parts of the UK (HITE, 2003; Scottish Executive, 2003). This clearly has important policy implications for maintenance, which is primarily technical, but also organisational, social and financial. Where there are common parts

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home-owners also have responsibility to others for carrying out and funding works. For this reason, the technical and administrative practicalities about enabling maintenance and repair – i.e. property management – become key issues (Scottish Executive, Personal Communications, 2004; City of Edinburgh Council, Personal Communications, 2004).

Property management arrangements (including mediation on disputes etc) are seen as paramount to ensure that works are carried out uniformly and that everyone acts fairly towards one another in the tenement. The SFHA are keenly interested in ensuring that new proposals for personal responsibility are able to dovetail into their own capital renovation programmes in mixed-tenure tenements (Scottish Federation of Housing Associations, Personal Communications, 2004; SFHA, 2003; SFHA, 2004). This is also backed up by (proposed) statutory powers for maintenance plans by giving local authorities the power to require owners to establish arrangements for property management and a maintenance plan, including a professional property manager (HITF, 2003). There are many lessons here that may prove good practice elsewhere for group repair/enveloping type schemes.

Funding private sector housing renewal: the home-owners' responsibility in Scotland

Currently, grants are still being administered in Scotland under the Housing (Scotland) Acts 1987 and 2001. Various grants are available, including Improvement Grant and Repairs Grant, which are means tested. Issue-based grants are also available, including for adaptations for people with disabilities, replacement of lead pipes and works to reduce radon gas. Housing grants are seen to have been effective as a policy instrument, in as much as there are now fewer properties failing the Tolerable Standard where grants have been targeted here, including in area based schemes (City of Edinburgh Council, Personal Communications, 2004). However, within the new local strategies, there is a shift of emphasis from grants to other forms of assistance as it is increasingly felt that home owners should factor in costs when buying and managing their property (Scottish Executive, Personal Communications, 2004). The Scottish Executive are keen to 'recycle' finance through loans rather than grants, and are seeking to leave grants wholly to local authority discretion (Scottish Executive, Personal Communications, 2004).

Following the HITF's recommendations, funding for Private Sector Housing Grants (PSHG) paid to local authorities will total more than £140 million in the next two years, a more than 40 per cent increase since the previous year (Scottish Executive, 2004). PSHG is delivered according to need and circumstances based on agreements between local authorities and Communities Scotland, which governs the grant. Priorities for assistance are proposed to be – houses failing the tolerable standard and adaptation of

houses for specific needs (HITF, 2003). PSHG is specifically ring fenced, applicable to capital costs of providing assistance, but also to revenue costs including initially piloting and establishing new schemes (City of Edinburgh Council, Personal Communications, 2004; Scottish Executive, 2004). Examples of how the City of Edinburgh have maximised this grant are included later in this paper.

Scottish Local Housing Strategies (managed by Communities Scotland) are set to be strengthened. The HITF (2003) argue that strategic planning should include a comprehensive scope; clear purpose and objectives; have established and appropriate targets nationally and locally; be responsive to local needs, conditions and priorities; and be linked to effective delivery mechanisms. In addition, the Scottish Executive (Personal Communication, 2004) advise that local housing strategies should be set in a community planning context, engaging with health agencies. For example, they would like to see Care and Repair Agencies operating in all local authority areas.

In England, this process is already well established, and indeed it is an annual requirement of all local authorities. In addition, it has become linked to the wider public health agenda through partnership based working. There has also been an increased emphasis – although not a statutory requirement - for Health Needs Assessment and Health Impact Assessment in England, but this is not currently the case in Scotland (Scottish Executive, Personal Communications, 2004). Indeed, from discussions with each of the three Scottish organisations in this study, there was no apparent integration with a wider public health agenda identified, as successful property management in itself appears to be priority.

City of Edinburgh Council: Good practice in private sector housing renewal

Discussions were held with Edinburgh City Council to assess how national policy is being interpreted and delivered locally. Edinburgh has several unique features and innovative approaches to private sector housing renewal (see City of Edinburgh Council, 2002). Edinburgh has 222,813 properties of which 5,500 are traditional pre-1919 tenements. For the City of Edinburgh as a whole, 153,724 (69 per cent) are owner-occupiers. There are significant repair problems in the private sector, particularly among pre-1919 tenements, which can require works costing up to £200,000. Edinburgh overall has 80 per cent private sector tenements (City of Edinburgh Council, Personal Communications, 2004) and therefore a history of property management.

The Edinburgh Stair Partnership (ESP) was launched in 1991. It responds to tenements already in disrepair (i.e. outside of the Tolerable Standard) and provides technical and administrative support as a form of Property Management Service Scheme. It seeks to motivate owners to address maintenance issues

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through a participative approach using decent, guaranteed builders. For £50 per annum, participating homeowners are able to have an annual inspection, a comprehensive report on condition (including photographs), and a meeting convened to discuss joint decisions and agreements on costed repairs.

The owners pay the local authority their proportion (and factor-in costs) and the local authority then arrange for the works and pay the builders, representing a win-win situation for all. Edinburgh City Council has found that it has exceeded all targets for progress without having to fund any grant assistance. In 2003-4 for example, £0.5 million works were achieved at no capital cost to the council, with £1 million since the start of the ESP. The ESP is now in its 'service testing' stage, so is not recovering full revenue costs and will need to be self-funding in the future, but is nevertheless already cited as evidence-based good practice (City of Edinburgh Council, Personal Communications, 2004). It has the advantage of being able to respond to levels of disrepair in a proactive and cost-effective manner. A key emphasis of the ESP is on property management and making home-owners meet their obligations to others.

In addition, the City of Edinburgh has been able to access funding from the PSHG to investigate other opportunities to assist home-owners in arranging and funding PSHR. These approaches seek to be an increasingly proactive approach to addressing maintenance and for necessary repairs, and have been successful in securing PSHG. For example, the proposed Home Works scheme seeks to offer a variety of proactive techniques to require owner-occupiers to repair their properties. This is based around the Scottish Housing Quality Standard, so that houses are wind and watertight and increasingly energy efficient. Leaflets and brochures have been produced and a website established (see www.edinburgh.gov.uk/yourhome). This website offers guidance and advice on how to get joint agreement and make progress on joint works, suggestions on funding and links to relevant organisations such as property managers (who will soon have an accreditation scheme in Scotland). The Council is now looking to bolster secondary services that can also be successful, such as Building Maintenance Log Books.

The City of Edinburgh Council has some unique features that affect private sector housing renewal. Edinburgh is a World Heritage Site, although there are no real mechanisms to ensure that owners spend the available resource on housing (City of Edinburgh Council, Personal Communications, 2004). However, the City Council has its own special powers for private sector housing for property conservation, the City of Edinburgh District Council Order Confirmation Act 1991 and the Civic Government (Scotland) Act 1982. This enables the Council to issue statutory notices for (serious) disrepair, including in mixed tenure tenements, where other routes taken by the Council's housing managers have been unsuccessful. It is the owners' responsibility to do the works, although City of Edinburgh Council can on formal request. This is cited

by HITF as good practice, although it is reactive rather than proactive as the property would already have to be in disrepair. While this would ensure the works were done, the Council may end up with a long-term debt before all monies were repaid.

There is a variety of other strategic approaches. For example, the Lothian Educational Environmental Partnership (LEEP) encourages solar panels and is jointly funded by the council and utilities. For fuel poverty, the Warm Tenements Project fits neatly with those already in the Stair arrangements, with no charge to owners, and the Energy Action Grant Agency support domestic energy improvements. Many Listed Buildings have undergone Energy Audits. In addition, Care and Repair help target resources more closely (City of Edinburgh Council, Personal Communications, 2004).

City of Edinburgh's strategy to establish a culture of personal responsibility

Following the HITF Report (2003), the City of Edinburgh Council has been able to successfully use the Strategic and Development Programme PSHG Baseline and Bid Element to support the development of new initiatives for home-owners within their private sector housing strategy. This has included, for example, assisting further owners in Property Management Services through the ESP, as well as assistance through Core Housing Grants, Lead Replacement Grants, Adaptation for Special Needs (City of Edinburgh Council, Personal Communications, 2004; City of Edinburgh Council, 2004). For 2004/5-2005/6, the Council will seek further resource to:

- Develop advice and information on financial options for owners for those not currently eligible for grants, including loans, factoring services etc;
- Further develop the ESP (e.g. an interactive website); and
- Commission other research into new initiatives and projects.

The City of Edinburgh Council Private Sector Services have held public meetings with joint owners in exploring what they would find helpful as grants are reduced in favour of other schemes of assistance. The Council is working with groups of owners on pilot projects to help firm up ideas about proposed schemes, including personal responsibility for funding. Some of these would need to be arranged by individual owners, some by an independent financial adviser and some may need to be initially developed from scratch. As the system moves from grant-assisted to increasingly market led 'Schemes of Assistance', options presented to home-owners to help them arrange and fund repairs and improvements would include:

- Use of savings;
- Borrowing from within the family;
- Extending mortgage, borrowing from existing lender;
- Borrow from new lender;
- Low interest repayment;
- Equity release; and
- Property appreciation loan.

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Commissioned research has included investigating Subsidised Loan Schemes to help owners afford works to their homes. Much of the focus is on mixed tenure properties for common repairs and improvements and research has helped explore preferred routes for schemes of assistance. The City of Edinburgh Council has looked at the experience of subsidised loans in England, such as ART Homes and the HIT (see Table 1.0); how effective a range of loan products might be; potential for local lenders; options for delivering loans; comparison of loans versus grants in delivering better housing; potential of local property market to deliver; extent of investment required; longer term advantages and disadvantages of proposals; and establishing appropriate time scales. Researchers have looked at a range of loan products available for home repair and improvement, how this may streamline into the ESP, issues around Edinburgh's housing market and housing stock and options available (see DTZ, 2004a; DTZ, 2004b).

At the time of this study, analysis, consultation and strategic development remains ongoing in an attempt to address the very complex nature of private sector housing renewal as part of a long-term strategy, maximising resource use, ensuring organisation and cultural change, and offering fairness in the system (see for example City of Edinburgh Council, 2003). It is too early to evaluate this.

Disseminating evidence-based good practice

An emphasis on personal responsibility and private financing raises fundamental questions on how private sector housing stock will be maintained, repaired and improved in the future. Even with grants, it has not been possible to 'get ahead' of housing conditions, or always to correlate grants to health issues. Although they have been successful in ensuring provision of standard amenities etc, the need for regular maintenance and necessary repairs continues to provide major challenges to private sector housing renewal strategies. Both countries are seeking to involve their communities more in what they are doing, and proposing to do, although the extent to which this happens varies locally.

With the withdrawal of mainstream grants as an interventionist policy option, there are differences in the Scottish and English approaches. The change of grants legislation to assist home-owners to carry out repairs, emphasis on 'personal responsibility' is well underway in both countries. In England, a range of financial, technical and social initiatives is under consideration, while in Scotland, the focus is mainly on financial initiatives (replacing grants with forms of loans). Both also deliver more specific grants that are targeted toward health issues, such as disabled facilities grants, grants to address fuel poverty, or otherwise determined by local strategy.

There are also differences in the approaches to area renewal/regeneration. England's approach sits within a

wider socio-economic model of regeneration within an established public health agenda through partnership working and wider forms of accessing and utilising resource. Scotland's approach appears to have less area emphasis, and a closer focus on property management, with technical aspects and practicalities of renovating tenements as 'joint ventures' through the ESP. Lessons can be learnt from each approach. Indeed, it could still be argued that sufficient connections are still not being made with communities in England through partnership arrangements (Hunter and Sengupta, 2004), and that Scotland's approach through the ESP is providing a valuable, evidence-based way forward in individuals themselves working together to get the job of maintenance done, with appropriate support from the Council.

Some form of nationally recognised evidence-base is essential to disseminate and share good practice intra-UK to help respond to and evaluate the sweeping changes currently underway in private sector housing renewal. Although there is currently no such formal outlet, the emerging (English) 'Learning for Effective Practice Standard System' (LEPSS) (Health Development Agency, 2004) sets out new proposals for collection, review and synthesis of effective health improvement practice. This seeks to develop and establish national standards in England to plan, evaluate, record and retrieve effective practice that links research and practice in a new way. This would help develop the evidence base further by establishing national templates to enable planning and evaluation of health impact of increasingly effective interventions. The LEPSS system would essentially comprise a good strategic process about planning for change within a given policy context, identifying and overcoming barriers (organisational, community, partnership, resource, training, communication, aims and objectives, commitment, monitoring protocol etc) and ensuring that the strategy achieved what it set out to do in the first place. The system seeks to combine research and practice within the context of the public health agenda to maximise health gain. Practitioners are seen as fundamental to understanding what works effectively at implementation level, and why in a way that can adapt according to local need. Much of this type of evidence already exists in the research base and the practitioner input of the ESP, which can offer many useful lessons. It has already proven to provide a cost effective approach to ensuring that jointly owned properties, including those of mixed tenure, can be maintained and repaired at minimum cost the Council, with a potential longer term scope for assessing health gain arising.

Conclusion

England and Scotland have different approaches to many aspects of their private sector housing renewal policies. They do, however, share a model favouring 'personal responsibility' for housing conditions, although the Scottish system gives more emphasis to

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responsibilities as well as rights of home owners, largely stemming from the nature of its housing stock as tenements. The ESP provides lessons in good practice that can help reduce costs to the public sector while simultaneously transferring them to the private sector in a viable way. Such good practice is set to become part of evidence-based protocol in helping to deliver healthier housing in the longer term. The focus on reintegrating health and housing, however, seems to be more implicit than explicit in Scotland's approach, as the technical side of housing management becomes paramount; nevertheless the ESP provides a realistic response to housing renewal.

Grants continue to be an important policy tool but new forms of financial initiatives are being developed and delivered locally. Strategies arising from the Regulatory Reform (Housing Assistance) (England and Wales) Order 2002 are now in place, and subject to early evaluation, but there remains a long way to go in implementing such a major culture change to both the organisations delivering assistance and the communities receiving it. The process is in the earlier stages in Scotland, yet the City of Edinburgh Council is already taking major steps forward to maximise its activities and outputs in this sector.

There are no easy answers in attempting to juggle personal responsibility for housing conditions with better housing stock, but examples of evidence-based good practice can be adapted locally and lessons learnt intra-UK. Whatever strategies are developed and implemented, they must be able to ensure that low-income groups are appropriately supported. There needs to be effective and accessible mechanisms to ensure that homeowners are able to afford and manage the necessary works. In England and Scotland the challenge for the future will be assisting a growing number of home-owners of varying income levels to maintain and repair their homes.

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