Public perceptions of air quality and quality of life in urban and suburban areas of London

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A comparative study was undertaken at two different sites (one urban, one suburban) in Greater London in order to examine whether there was a relationship between publicly available air quality data and the public's perception of air quality. Perceptions of air quality and its role as a potential quality of life indicator was also investigated. A total of 200 people were interviewed in Wood Green and Wimbledon in 1999 and air quality data were obtained simultaneously from the nearest appropriate monitoring station. The study has enabled a comparison between the public's perception of air quality and the actual monitored concentration values. The survey results reveal how seriously the public regards air pollution from road traffic in terms of their quality of life and identifies the attitudes of the public to nuisance from road traffic. The results reveal that the public's perception of air quality is not a reliable indicator of the actual levels of air pollution in their area. The results also revealed that air pollution issues generated as a result of road traffic are of high importance in terms of people's quality of life when compared to other aspects of their quality of life. The study revealed that residents in the urban area (Wood Green) were more disturbed by road traffic than residents in the suburban area (Wimbledon). Out of all the disturbances listed, it was found that residents were more disturbed by vehicle-derived fumes, dust and dirt than other aspects of road traffic related nuisance. The TELETEXT/CEEFAX service on air quality was little used by the public as a means of obtaining information on air pollution.

1. Introduction

Road traffic has an enormous impact on the quality of life in European towns and cities. Its benefits to European industry, economy, culture and society are immense and almost immeasurable. However, as the number of road vehicles has increased, the negative effects of road traffic have become more noticeable. The adverse environmental effects of road traffic include air pollution, noise, vibrations, visual intrusion, danger, severance, visibility reduction, building soiling and physical irritation. These effects impact on large numbers of people, causing significant annoyance, adjustments to lifestyle in the form of reducing outdoor and recreational activities, and contribute to a range of detrimental health effects.

The impacts of road traffic on the public, particularly environmental and nuisance effects, have been reviewed by several research teams.[1–14] These studies have highlighted that although the public are more concerned about social issues such as health/social services, law and order, education and employment than issues relating to their local environment, traffic related nuisances are the most important local environmental issues. In particular, most respondents were concerned about the effects of fumes upon their health, with adverse effects widely assumed.[6] In addition, research has shown significant public concern about the subjective effects of air pollution, effects that are not covered by legislation but do impact significantly upon people's quality of life.[1,2,6,7,10] Whilst it is desirable that members of society are comfortable with their local environment in terms of physical measures of air pollution and noise, people's quality of life is also affected by less easily measured impacts such as annoyance, disturbance and fear.

As the requirement for mobility (both personal and institutional) and quality of life increases, the conflict between the positive and negative effects of road traffic is likely to sharpen. This will require a reaction from industry and legislators, who in turn will require advice from specialists from a broad range of disciplines in order to respond to public demands. As part of the Local Agenda 21 initiative,[15] the development of sustainability indicators is a key element in the production of national sustainable development strategies. There are over 20,000 communities in the UK, represented by thousands of local government institutions (local authorities, councils) and community groups which are developing indicators to tell them and local people whether a strategy is working or not.[16] The Local Government Management Board[17] has defined indicators as:

"a measure, generally numeric in form, and typically presented in a graphic way. Indicators are primarily intended to contribute to an assessment of the attainment of sustainable development in a community... Some will help to galvanise political commitment; some are useful in monitoring and managing change; while others may be best at simulating public participation."

In other words, indicators are signals used to simplify, measure and communicate important information. This information is an essential part of the decision-making process; indicators are used every day in personal lives.[18,19] In fact, the public's opinion is becoming more important: whether with regard to quality of life, sustainability, social inclusion or community development, people are interested in finding answers to the questions that affect them all. Across the UK, communities of all shapes and sizes are developing sets of indicators to measure the local trends that really matter to them. Many are co-ordinated by the local authority; some are led by community activists.[20]

Mitchell[21] compared a large number of studies and found a remarkable consistency in components of quality of life

Table 1 Commonly cited components of quality of life (adapted from Mitchell[21])

Issue	Number of citations
Crime and safety	24
Housing	20
Physical health	15
Individual development through learning	15
Individual development through recreation and leisure	15
Personal economic security and standard of living	13
Pollution	13
Visual perception of environment	11
Quality and availability of appropriate health care	10
Access to goods and services	10

(see Table 1). However, which of these (or others) are most important will vary from individual to individual and over time. Calibration and interpretation of indicators is also problematic; should all indicators be treated equally? Whilst the inclusion of quality of life considerations within sustainability may be desirable, the practice appears to raise many difficult questions.[22]

Although the approach of including quality of life within sustainability has been broadly accepted, there is not so much unanimity or consensus about what it is and how it should be included.[23] Pollution and erosion may be measured and there are numerous ways to quantify "well-being" *via* established indicators such as employment, income, crime, travel, health, *etc*.[22] It is clearly more difficult to assess the impact of pollution upon quality of life, particularly if we use the public's subjective views on pollution rather than established indicators such as hospital admissions *etc*. However, addressing commonly held views on environmental issues is important; as Eden argues,[24] behaviour is dependent upon public interpretation of these issues.

In this study, we set out to examine whether there was a relationship between publicly available air quality data and the public's perception of air quality in order to investigate the possibility of developing a quality of life indicator. The aims of this research were to: (i) compare the public's self-reported perception of air quality with published air quality data for urban and suburban areas; (ii) investigate the existence of a relationship between air quality and people's perceived quality of life in an urban and a suburban area; (iii) assess the relative importance of air pollution from road traffic to the public when compared to other social issues; (iv) investigate the public's utilization of readily accessible air quality data; (v) compare the existing attitudes related to public nuisance generated from road traffic in urban and suburban areas and how the public is affected during their daily activities.

The results of this study are presented and discussed in the following Sections.

2. Experimental methods

Two locations were selected for the study; the urban area of Wood Green in the London Borough of Haringey, and the suburban area of Wimbledon in the London Borough of Merton.

Haringey is home to a multi-cultural community of 216,000 people. The interviews took place throughout Wood Green, a densely populated area to the south of the busy North Circular Road that has rail and underground links with Central London. Wood Green has a comparatively poor socio-economic profile when compared to Wimbledon, although its central avenue contains a large number of high street shops, supermarkets, cafes and pubs, and a large indoor shopping complex. The retail area is surrounded by terraced housing and council estates, with pockets of industrial sites in between.

Wimbledon is situated to the South of Central London and has an affluent population containing a significant proportion of commuters. The interviews took place in Wimbledon Village, which has a main high street containing fashionable shops, expensive restaurants and a few pubs. The majority of its surrounding area is developed with a large detached, semi-detached and terraced housing whilst its inhabitants have the large green open public space of Wimbledon common for recreational use. Merton's population is 182,300. Although both sites have a number of residential houses, Wimbledon represents a more open, greener, leafy area with less densely populated dwelling homes. By comparison, Wood Green has the feel of an urban environment with more densely populated dwellings and a more congested traffic system and less open green spaces.

2.1 Questionnaire survey

The questionnaire was designed and piloted in June/July 1999. One hundred respondents were interviewed at each location between August 16th and October 15th 1999 by a trained, professional market researcher. Households in the two areas of the study were visited and an interview was requested if the householder was at home. Other interviews were carried out in the streets at both sites outside the houses visited. Saturdays and Sundays proved to be the most successful days particularly for interviewing men in the households. In order to obtain a representative sample of the population at each location, data from the 1991 National Census was used to generate quotas by age group and sex.

2.2 Air quality data

Air quality data (NO, NO_2, NO_x, O_3) for the dates that the interviews took place was obtained from automatic monitoring sites close to Wimbledon and Wood Green respectively; both sites form part of the Automatic Monitoring Network for Greater London. Data from Wimbledon was obtained from the Wandsworth Local Authority suburban background monitoring site at Roehampton. Roehampton is just to the north of Wimbledon Common and shares many of Wimbledon's characteristics.

A monitoring site at Priory Park was used to provide data for Wood Green. The Priory Park site is owned by the Local Authority of Haringey and is classified as an urban background site. The site is approximately 2 miles south-west from Wood Green and measures NO_2, O_3, and PM_{10}.

3. Results and discussion

3.1 Characteristics of the study areas

A total of 200 people were interviewed; 100 each in Wimbledon and Wood Green, respectively. Wimbledon is a more affluent area than Wood Green and this is apparent from the data shown in Table 2; over 70% of the Wimbledon respondents represent occupational class groups C1 and C2, whilst only 50% of the respondents in Wood Green represent these two occupational class groupings. Over 45% of the respondents interviewed in Wood Green represent occupational class groups D and E, whilst less than 20% of Wimbledon respondents represent these two groups. The percentage of people without a car was higher in Wood Green than in Wimbledon, with 51% of the respondents falling into this category compared to 24% in Wimbledon. In addition, 30 interviewees were current smokers in Wood Green compared to 19 in Wimbledon, and 29 households out of 100 in Wimbledon had children of school age living in their household, compared to 18 out of 100 in Wood Green.

Table 2 Classification data by sex, age group and smoking habits for each location

Number of respondents	Wimbledon	Wood Green	Overall
All (number)	100	100	200
Male respondents	46	46	92
Female respondents	54	54	108
Age group 18 to 24	12	14	26
Age group 25 to 44	50	44	94
Age group 45 to 64	21	23	44
Age group >65	17	19	36
Current smokers	19	30	49
Ex-smokers	27	24	51
Non smokers	54	46	100
Occupational class (%)			
A	0.0	0.0	0.0
B	8.0	0.0	4.0
C1	49.0	40.0	44.5
C2	22.0	12.0	17.0
D	12.0	21.0	16.5
E	7.0	27.0	17.0
U[a]	2.0	0.0	1.0
Number of cars per household (%)			
0	24.0	51.0	37.5
1	48.0	36.0	42.0
2	20.0	10.0	15.0
3	6.0	3.0	4.5
>4	2.0	0.0	1.0

[a]Unable to classify.

3.2 Public perceptions of air quality

Interviewees were asked how they perceived the air quality in Wimbledon and Wood Green on the day of their interview and how frequently they used the public information services provided freely on television *via* the TELETEXT and CEEFAX services. The data shown in Figs. 1 and 2 indicate that 56% of the respondents thought that the air quality in Wimbledon was 'moderate' on the interview day compared to only 32% in Wood Green. Only 6% of respondents in Wimbledon perceived the air quality in their area as ''very high'' compared to 29% in Wood Green, and 10% and 11% respectively regarded the air quality as being 'low'.

Overall, 44% of the total respondents perceived the air quality as 'moderate', 28% as 'high', 17.5% as 'very high' and only 10.5% as 'low'. The data in Table 3 shows the actual air quality classifications from the sites in Haringey and Roehampton on the days the interviews took place expressed as percentages. Quite clearly, the air pollution was predominantly 'low' at both sites. At Wimbledon, the air pollution level was 'low' on 97% of the days when interviews were carried out and 'moderate' on 3% of interview days. However, only 10% of the respondents actually thought that the air pollution was 'low', whereas 56% of respondents thought it was 'moderate'. There were no days when the air pollution levels reached the 'high' or

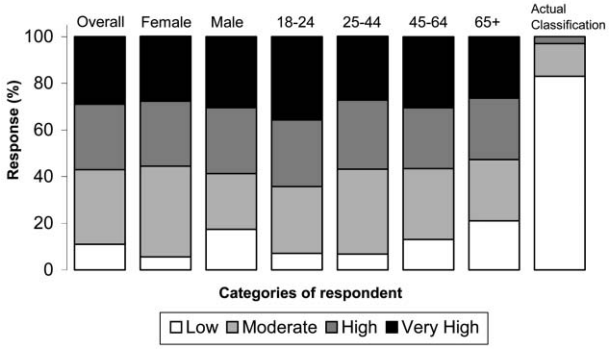

Fig. 1 The public's perception of air pollution in Wood Green during 1999.

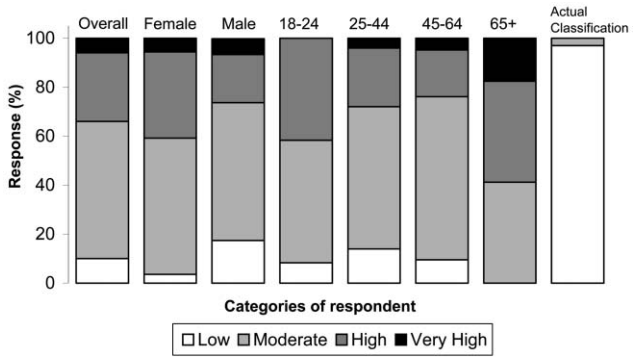

Fig. 2 The public's perception of air pollution in Wimbledon during 1999.

Table 3 Classification of air pollution on the days the interviews took place

	% of days in each category			
	Low	Moderate	High	Very high
Haringey—Priory Park	83	14	3	0
Wandsworth—Roehampton	97	3	0	0

'very high' bands, although 28% and 6% of the respondents respectively, thought the air pollution justified these descriptors. At Wood Green, the air pollution level was 'low' on 83% of the days when interviews were carried out and 'moderate' on 14% of interview days. However, 11% and 32% of the respondents actually thought that the air pollution was 'low' and 'moderate', respectively. The air pollution was 'high' on only 3% of interview days but 28% of respondents perceived the air pollution as 'high'. Although there were no days when the air pollution levels reached the 'very high' band, 29% of respondents in Wood Green felt this to be the case.

Quite clearly, there is a striking difference between the actual air pollution recorded on a daily basis and the public's perception of air pollution. Whilst the public's perception of the air quality at any given point in time is subjective, it may be argued that their instincts would broadly follow what the data reveals in reality. However, it is possible that people make the presumption that because they live in a large, busy city such as London, where there are continually high volumes of road traffic, air pollution levels must be constantly high. As the results in Table 3 show, in a location such as Wimbledon, the air pollution is predominantly low. It may have been expected that respondents in Wimbledon, given their higher average occupational class, would have been generally more informed about air quality than the respondents in Wood Green, but this does not appear to be the case.

Figs. 1 and 2 show the perception of air quality by sex in Wimbledon and Wood Green. Seventeen percent of the men interviewed in Wimbledon perceived the air pollution as 'low' compared to only 4% of women. The percentage of women who perceived the air pollution as 'high' was 35% compare to 19% of men. Both sexes are very close within the categories perceiving the air pollution as being 'moderate' and 'very high'. A similar picture emerges at Wood Green, where 39% of women perceived the air pollution as 'moderate' compared to 24% of men. Nearly 28% of men and women perceive the air pollution as 'high', whilst considerably more men than women perceived the air pollution in Wood Green as being 'low'; 17% compared to 5.5%, respectively. These results suggest that women are generally more concerned about air pollution issues than men, a trend that has been identified previously.[6,7,10]

Figs. 1 and 2 also present the public perception of air pollution by age groups at both sites. There are clearly some differences; for example in Wimbledon, there are no respondents

in age group 18 to 24 that perceive air pollution as 'very high', whilst the corresponding figure in Wood Green is 35%. Overall, fewer people in all age groups considered the air pollution to be "low" than the other three levels; since the measured air pollution was predominantly 'low', it seems that all age groups are roughly equally unaware of this reality.

More of the over 65 age group regarded the air pollution as being 'very high' than any of the other age groups, suggesting they are less informed and perhaps, less interested in this subject than younger people. These findings are consistent with previous other studies[6,7,10] although it is somewhat surprising given the elderly are generally more affected by pollution in terms of their health. Finally, more respondents in both the age groups of 25 to 44 and 45 to 64 regarded the air quality as being 'moderate' than the other two age groups, which may reflect the possibility that these two age groups are more conservative in their opinions than the younger and older age groups.

3.3 Public utilization of readily accessible air quality data

The respondents' utilization of air quality data provided by the TELETEXT and CEEFAX services on publicly available television is shown in Table 4. The data clearly shows that most of the public does not use the TELETEXT/CEEFAX service regularly; only 0.5% check the air quality information on a daily basis; 3% check levels weekly; 3.5% monthly; and 7% less than monthly. Eighty-six percent of respondents never use the TELETEXT/CEEFAX service at all as a means of obtaining air pollution information; this figure is consistent with previous research.[12] These findings may suggest that the public does not think of TELETEXT/CEEFAX as a medium for air quality information, that they do not realise such information exists on this service, that this method of displaying and disseminating information to the public is not effective or that the public do not trust this information. However, it is more likely that only a small percentage of the public are interested in accessing air quality bulletins on a regular basis.

3.4 Quality of life

The respondents were asked to rank lists of aspects of life regarded as unpleasant/pleasant. The question listed 12 aspects of life that may be considered to be unpleasant and 12 aspects of life may be considered to be pleasant. The aspects of life selected are listed in Tables 5 and 6. The aim of this part of the questionnaire was to gauge the comparative importance of traffic to the respondent's quality of life when compared to other issues. The results for 'unpleasant' aspects of life indicated a high level of concern at each location about many of the listed subjects. Over 89% of all respondents stated that 'a serious illness' was 'very' important in terms of their quality of life, clearly making it the number one issue at each location. Over 70% of the total respondents in Wood Green and Wimbledon stated that they regarded as 'losing your job' as 'very important' or 'important'. In addition, 65% of the total respondents found 'dirt and fumes from traffic' and 'local shops and facilities closing' as being 'very important' or 'important' with at least half of all respondents finding 'high levels of noise', 'fear of burglary', 'litter' and 'dog mess' as being 'very important' or 'important'. Few respondents regarded 'graffiti' and 'dog barking' as being 'very important'.

The results for 'pleasant' aspects of life indicated that over 95% of total respondents regarded 'good health' as 'very important' or 'important'. Over 90% of the total interviewees in both locations stated that 'happy personal relationships' was 'very important' or 'important'. A 'good public transport system' scored well at both locations, with 88% of respondents regarding it as 'very important' or 'important'. Over 65% of all respondents stated that 'a good secure job' was very important or important. In addition, over 70% of the total respondents in Wimbledon and Wood Green stated that they regard 'clean, well kept local streets' and 'good local shops and facilities' as 'very important' or 'important'. The issue of 'financial security' seems to have a greater importance in Wimbledon than in Wood Green, with 90% of the Wimbledon respondents regarding this aspect as 'very important' or 'important' compared to 76% for the same category in Wood Green. In contrast, only 40% of all respondents found 'access to a good school', 'access to parks' and 'access to local recreation' as 'very important' or 'important'. The issue of least importance was 'access to a private car', with only 34% of all respondents regarding this as 'very important' or 'important'.

The aspects of life regarded as unpleasant and pleasant were ranked in order of importance to each other at each location, as shown in Tables 5 and 6. Although the magnitude of concern

Table 4 Response to questions about use of Teletext/Ceefax?

Response	Wimbledon (%)	Wood Green (%)	Overall (%)
Response to the question, 'have you ever looked at the air quality index on Teletext/Ceefax?'			
Yes	16	12	14
No	84	88	86
Response to the question, 'how often do you check the air quality index in Teletext/Ceefax?'			
Daily	1.0	0.0	0.5
Weekly	3.0	3.0	3.0
Monthly	4.0	3.0	3.5
Less than monthly	8.0	6.0	7.0
Never	84.0	88.0	86.0

Table 5 Rank order of respondent concern about "unpleasant" aspects of life[a]

Unpleasant aspects of life	Wimbledon	Wood Green	Overall
Serious illness	1.3	1.5	1.4
Losing your job	4.2	4.5	4.3
Dirt and fumes from traffic	4.5	5.7	5.1
High levels of traffic noise	5.5	6.1	5.8
Local shops and facilities closing	7.0	5.9	6.4
Litter	6.9	6.8	6.8
Attack in the street	7.1	6.7	6.9
Dog mess	7.2	6.6	6.9
Fear of burglary	7.4	7.2	7.3
Fear of traffic accidents	7.9	8.1	8.0
Graffiti	9.3	9.3	9.3
Dog barking	10.0	9.5	9.7

[a]The ranking are averages and run from 1 to 12, 1 representing the highest level of concern and 12 the lowest.

Table 6 Rank order of respondent concern about "pleasant" aspects of life[a]

Pleasant aspects of life	Wimbledon	Wood Green	Overall
Good health	1.4	1.4	1.4
Happy personal relationships	1.9	2.1	1.9
Financial security	4.0	5.2	4.6
A good secure job	5.4	5.8	5.6
Good public transport system	5.7	5.6	5.7
Clean, well kept local streets	7.6	6.7	7.1
Good local shops and facilities	7.7	7.3	7.5
Access to parks	8.8	8.0	8.4
Access to a good school	8.2	8.8	8.5
Choice of travel option	9.0	8.7	8.8
Access to local recreation	9.3	8.8	9.1
Access to a private car	9.2	9.6	9.4

[a]The ranking are averages and run from 1 to 12, 1 representing the highest level of concern and 12 the lowest.

about each aspect of life varied, the relative rankings are very consistent, with the position of each aspect of life showing little variance between the two locations.

The survey results clearly indicate that air pollution issues such as 'dirt and fumes from traffic' and 'high levels of traffic noise' were issues of high importance to the public at both sites when compared to other issues. Unsolicited comments made to the researcher demonstrated that respondents understood that 'dirt and fumes from traffic' can be detrimental to human health and 'high levels of traffic noise' were regarded as a nuisance; it can be argued that both could have a very direct (negative) effect on quality of life. These findings are in agreement with previous studies.[1–8,10,13,14] Health was central to many of the respondent's perception of what constituted a better, or worse quality of their life, a finding in agreement with another survey carried out on behalf of the DETR.[25] In general, respondents seem to rate good health as being more important than economic well-being.

Overall, the results regarding pleasant and unpleasant aspects of quality of life are very consistent at both locations, with health being the issue that concerns the public most. Economic well-being and personal relationships are also given greater importance to the respondent's quality of life at both locations than compared to the majority of other issues presented. These findings are in accordance with a previous study carried out in the north of England[26] and suggest that once people have satisfied their basic needs (food and shelter) and social priorities, aesthetic and environmental issues become more important.

Work, employment and financial security were central concerns for almost everyone in all the age groups at both locations with the exception of the over 65 age group. Loss of local amenities appeared to be of concern to all respondents at both locations, suggesting that the loss of local amenities would have an important effect on people's quality of life. This is particularly evident in less affluent Wood Green, where a high proportion of respondents considered the loss of local amenities to be of comparatively high concern.

Although crime-related issues such as attack in the street and fear of burglary were a source of anxiety at both locations, they were not ranked as one of the highest issues to generate concern. Access to a good school was also ranked relatively lowly; the most likely explanation for this is that out of all respondents, only 23.5% had children of school age living in their households. Issues such as litter, dog mess, dog barking and graffiti, which can be considered as environmental irritants, were of least concern amongst all respondents although litter and dog mess appear to be of higher concern than dog barking and graffiti. This finding reinforces the earlier discussion about the importance of perceived health effects; whilst graffiti can be unpleasant to look at and dog barking might cause some degree of annoyance, they do not present a health hazard to the public.

In addition, the results clearly show that the respondents found a good public transport system to be of importance in terms of their quality of life. This issue closely followed issues such as health, employment and personal relationships in the rank order of the most important issues. This suggests that people living in the two areas of the study both rely quite heavily on public transport as a mode of transport. This is supported by the observation that access to a private car was ranked last out of all the ''pleasant'' aspects of quality of life. This may seem unexpected given the perceived popularity and desirability of cars within the UK, particularly in more affluent areas of the country such as London. However, given the demographic statistics of Wood Green—51% of respondents not having a car, and over 45% of the respondents being in occupational classes D and E (semi skilled and unskilled manual workers, casual workers and those with no regular income, unemployed, and students)—the reliance upon and consequent importance of public transport is unsurprising.

Table 7 Response to the question, 'have you ever been diagnosed by a doctor as having any of the following illnesses whilst living at your current address?'

Illness	Wimbledon (%) Yes (No)	Wood Green (%) Yes (No)	All (%) Yes (No)
Asthma	6.0 (94.0)	7.0 (93.0)	6.5 (86.5)
Hayfever	16.0 (84.0)	19.0 (81.0)	17.5 (82.5)
Eczema	9.0 (91.0)	8.0 (92.0)	8.5 (91.5)
Bronchitis	9.0 (91.0)	12.0 (88.0)	10.5 (89.5)

3.5 Sensitivity to air pollution

The study aimed to identify whether the respondents suffering from asthma, hayfever, eczema or bronchitis were more sensitive to air pollution. The results are displayed in Table 7. No obvious differences between locations were found amongst respondents suffering from illnesses such as asthma, hayfever, eczema or bronchitis. The results show that 6.5% of all respondents are asthma sufferers, which is slightly over the national average of 4–5%, depending on the source (ONS, 1998[27]). 8.5% of all respondents stated that they suffer from eczema; this is in line with the national average which stands at approximately 9%.[28] It was not possible to obtain comparable national statistical data for bronchitis and hayfever.

3.6 Nuisance from road traffic

The respondents were asked to indicate their level of annoyance with some aspects of traffic that are regarded as nuisance. The data shown in Table 5 indicate that many of the traffic aspects listed as nuisance disturb members of the public at both locations. It was noticeable that respondents in Wood Green in particular had stronger concerns on a number of the categories than those in Wimbledon. For example, in the case of 'fumes' and 'dust and dirt', over 70% of the respondents in Wood Green were very annoyed or annoyed with 'fumes' compared to only 44% in Wimbledon and 60% were very annoyed or annoyed with 'dust and dirt' compared with only 40% in Wimbledon. Similar trends were evident for 'congestion', 'danger', 'traffic speeds', 'inconsiderate parking', 'the number of heavy goods vehicles', 'severance' and 'looks unpleasant'.

Of less concern to both Wood Green and Wimbledon respondents was 'vibration' with 18% and 11% of respondents being very annoyed or annoyed in this category, respectively. Conversely, respondents in Wimbledon showed a slightly higher degree of annoyance with respect to 'car alarms' than those in Wood Green, with 54% being very annoyed or annoyed compared to 50% in Wood Green.

Table 8 shows the results when the respondents were asked if the usual levels of traffic noise interfere with a list of activities when they are in their households. 57% of the respondents in Wood Green said that traffic noise interfered with relaxation and 55% with sleeping. However, in Wimbledon, only 23% and 16% of the respondents stated that traffic noise interfered

Table 8 Response to the question, 'do the usual levels of noise from traffic interfere with any of the following in your home?'

Action	Wimbledon (%) Yes (No)	Wood Green (%) Yes (No)	All (%) Yes (No)
Relaxing	23.0 (77.0)	57.0 (43.0)	40.0 (60.0)
Watching television	18.0 (82.0)	45.0 (55.0)	31.5 (68.5)
Listening to music	13.0 (87.0)	34.0 (66.0)	23.5 (76.5)
Conversation	13.0 (87.0)	36.0 (64.0)	24.5 (75.5)
Sleeping	16.0 (84.0)	55.0 (45.0)	35.5 (64.5)

Table 9 Response to the question, 'have you ever done any of these things as a response to traffic noise in your neighbourhood?'

Action	Wimbledon (%) Yes (No)	Wood Green (%) Yes (No)	All (%) Yes (No)
Close the window	32.0 (68.0)	75.0 (25.0)	53.5 (46.5)
Install double glazing	4.0 (96.0)	24.0 (76.0)	14.0 (86.0)
Shift activities to a quieter room	11.0 (89.0)	44.0 (56.0)	27.5 (72.5)
Take sleeping pills	0.0 (100.0)	7.0 (93.0)	3.5 (96.5)
Consider moving house	7.0 (93.0)	20.0 (80.0)	13.5 (86.5)
Other response	3.0 (97.0)	2.0 (98.0)	2.5 (97.5)

with relaxation and sleeping respectively. Over 45% of the respondents interviewed in Wood Green claimed some interference with watching television whilst only 18% claimed this in Wimbledon. Traffic noise interfered with the respondents in Wood Green in relation to listening to music represented by 34% and conversation represented by 36%, but only 13% of the Wimbledon respondents found traffic noise interfered with these last two issues. Although noise is generally accepted to be a good predictor of the average annoyance response of a community, the full extent of the relationship between noise exposure and nuisance is far from being fully understood.

When the respondents were asked about their reactions to traffic noise (see Table 9), 75% of respondents in Wood Green had closed their windows, 24% had installed double-glazing, 44% had shifted activities to a quieter room, 7% had taken sleeping pills and 20% had considered moving house. In Wimbledon, markedly less people had taken similar actions to eliminate road noise. Only a small number of respondents at both locations had admitted doing other things as a response to traffic noise, such as using earplugs or contacting local authorities.

The results indicate that the public was disturbed by many of the nuisance aspects generated by road traffic at both locations. However, these data plainly show considerable differences between Wood Green and Wimbledon, with Wood Green respondents claiming greater disturbance than those in Wimbledon. The only nuisance that appears to be of more concern to respondents in Wimbledon than those in Wood Green is 'car alarms'—this is probably attributable to the fact that there are statistically more cars per household in Wimbledon than in Wood Green. 'Fumes' and 'dust and dirt' were the two issues that most concerned the public; this is consistent with previous studies.[4,10] Wood Green is a busier, more urbanised area than Wimbledon, with more cars and traffic directly outside respondents' residences. Wimbledon is a suburban, more residential and leafy area with larger numbers of detached houses with gardens and more parks, commons and open spaces. In addition, there are less industrial sites and far fewer high-rise residential blocks in the area giving a greater feeling of space and openness. These data may suggest that the residents of a busy urban area do not become resistant to constant noise, dirt and fumes but merely tolerate them.

4. Conclusions

This study has clearly identified that the public's self-reported perception of air quality is not consistent with published air quality data for urban and suburban areas. Although Wimbledon had slightly better air quality than Wood Green, the ambient concentrations were not significantly different. However, the public of Wood Green generally perceived that the air quality was lower in their area than the public in Wimbledon. This suggests that the public's perception of air quality may not be used as a reliable indicator of current levels of air pollution in urban and suburban areas because no quantifiable relationship between perception and air quality was apparent. The study also shows that some trends in the perception of air quality can be identified, with women and older people perceiving higher levels of air pollution than other groups. There is some evidence to suggest that personal actions (or inactions), habits, socio-economic factors and the media as well as pollutant levels affect perceptions of air quality.[6,29] For example, this study shows that very few people made use of the TELETEXT/CEEFAX service to find information on air quality levels, which either implies that the public are unconcerned about general levels of air pollution or that this medium is not an effective means of disseminating air quality information. These findings support and reinforce the conclusions of previous research.[29]

However, the study also suggests that there would appear to be a non-quantifiable relationship between air quality and people's quality of life. The research has highlighted the high relative importance of air pollution derived from road traffic on the public's perceived quality of life when compared to other social issues. Overall, respondents in the urban area (Wood Green) were more disturbed by road traffic related pollution than the residents in the suburban area (Wimbledon). For example, respondents from Wood Green were more disturbed by the identified nuisance effects when they were relaxing, watching TV or sleeping in their homes than the respondents from Wimbledon. In addition, the Wood Green respondents revealed that they take more action to minimise the interference of traffic noise in their homes than those respondents living in Wimbledon. Further detailed studies of the links between road traffic, air pollution, socio-economic factors and personal actions are necessary before public perceptions may be used to assess the influence of air pollution on quality of life.

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References

1 J. Morton-Williams and P. Prescott-Clark, *Assessment of Environmental Disturbance in Areas Affected by Urban Road Schemes*, Social and Community Planning Research, London, 1971.
2 G. Hoinville and P. Prescott-Clark, *Traffic Disturbance and Amenity Values*, Social and Community Planning Research, London, 1972.
3 J. Morton-Williams, B. Hedges and E. Fernando, *Road Traffic and the Environment*. Social and Community Planning Research, London, 1978.
4 A. M. Mackie and C. H. Davies, *Environmental Effects of Traffic Changes*, Department of the Environment, Department of Transport TRRL Report LR1015. Transport Research Laboratory, Crowthorne, 1981.
5 I. D. Williams, *Clean Air*, 1991, **21**(3), 123–131.
6 J. Clench-Aas, S. Larssen, A. Bartonova, M. J. Aarnes, K. Myhre, C. C. Christensen, I. L. Neslein, Y. Thomassen and F. Levy, *The Health Effects of Traffic Pollution as Measured in the Valerenga Area of Oslo*, Norwegian Institute for Air Research, Lillestrom, 1991.
7 I. S. McCrae and I. D. Williams, *Sci. Total Environ.*, 1994, **146**(47), 81–91.
8 H. Bendtsen and S Jensen, Nuisance from Road Traffic. Comprehensive Evaluation of Traffic Safety and the Environment (Danish with English summary), The Road Directorate, Note 16, Copenhagen, 1994.
9 P. Lercher, R. Schmitzberger and W. Kofler, *Sci. Total Environ.*, 1995, **169**, 71–74.
10 I. D. Williams and I. S. McCrae, *Sci. Total Environ.*, 1995, **169**, 75–82.

11 Committee on the Medical Effects of Air Pollutants (COMEAP), *Quantification of the Effects of Air Pollution on Health in the United Kingdom*, ed. S. Holgate, The Stationary Office, London, 1998, ISBN 0113221029.
12 R. Beaumont, R. S. Hamilton, N. Machin, J. Perks and I. D. Williams, *Sci. Total Environ.*, 1999, **235**, 319–329.
13 B. Lane, *Public Understand. Sci.*, 2000, **9**, 165–174.
14 J. Bush, S. Moffatt and C. E. Dunn, *Health Place*, 2001, **7**(1), 47–56.
15 R. Levett, *Local Agenda 21—A Guide for Local Authorities in the UK, Earth Summit: Rio'92*, Supplement No 2, Local Government Management Board (LGMB), 76–86 Turnbull St, London, EC1M 5QU, 1992.
16 A. MacGillivray, C. Weston and C. Unsworth, *Communities Count! A Step-by-step Guide to Community Sustainability Indicators*, New Economics Foundation, Cinnamon House, 6–8 Cole St, London, SE1 4YH, 1998.
17 Local Government Management Board (LGMB), *Sustainability Indicators Research Project: Final Report from the Consultant*, LGMB, 76–86 Turnbull St, London, EC1M 5QU, 1995.
18 *Environmental Measures: Indicators for the UK Environment*, ed. A. MacGillivray, Environment Challenge Group (Friends of the Earth, IIED, New Economics Foundation, Royal Society for Nature Conservation, RSPB, WWF, Wildlife and Countryside Link), London, 1994.
19 J. R. E. Harger and F. M. Meyer, *Chemosphere*, 1996, **33**(9), 1749–1755.
20 A. MacGillivray and S. Zadek, *Accounting for Change: Indicators for Sustainable Development*, New Economics Foundation, Cinnamon House, 6–8 Cole St, London, SE1 4YH, 1995.
21 G. Mitchell, *Modelling Sustainable Development: a Consultation Document for the Quantifiable City Project. Stage II.*, University of Leeds, Leeds, 1994.
22 S. Bell and S. Morse, *Sustainability Indicators, Measuring the Immeasurable*, Earthscan Publications Ltd, London, 1999.
23 A. Hammond, A. Adriaanse, E. Rodenburg, D. Bryant and R. Woodward, *Environmental Indicators: A Systematic Approach to Measuring and Reporting on Environmental Policy Performance in the Contexts of Sustainable Development*, World Resource Institute, Washington, USA, 1995.
24 S. Eden, *Public Understand. Sci.*, 1996, **5**, 183–204.
25 Department of Environment, Transport and the Regions (DETR), *Air Pollution—What it Means for your Health*, DETR, London, 1998.
26 *A Green Audit. A First State of the Environment Report*, Lancashire County Council, Preston, Lancashire, 1991.
27 ONS, Office of Environmental Statistics, London.
28 Schering–Plough Ltd, *Understanding Eczema*, Hawker Publications Ltd, 1998.
29 I. D. Williams, PhD Thesis, Middlesex University, London, 1995.