



Individuals' Interpretation of Air Quality Information

Follow up investigation into the proposed air
quality health advice

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Executive Summary

The need for high quality, accessible and understandable health advice linked to air pollution has been demonstrated by numerous researchers (Payne-Sturges *et al.*, 2004, Semenza *et al.*, 2008, Shooter and Brimblecoomb 2008, Smallbone 2009). The current health advice, developed in 1988 by the Committee of the Medical Effects of Air Pollution (COMEAP), does not now fulfil the needs and requirements of the public (Smallbone 2010). COMEAP's Standards Advisory Subgroup (CSAS) has developed a revised air quality banding system. New health advice linked to the revised air quality bandings was devised and passed before a series of focus groups for comment. The following recommendations have been developed in light of the findings from this piece of qualitative research.

The research participants considered that the new health message advice, developed to sit alongside the new banding system, was clear and informative. It is suggested, however, that the word '*susceptible*' should be replaced by the term '*at-risk*'.

Two 'accompanying information' documents were also developed by CSAS. The first (Example 1, see Appendix A) was more formal in style, longer and contained a section that broke down advice by population/health status groupings. The second set of accompanying information (Example B) was shorter, written less formally and contained no subheadings. Both sets of accompanying information contained suggested actions that could be taken to limit exposure. In all focus groups the shorter, less formal accompanying information was preferred but suggested changes to it included: (i) using subheadings and bullet points to make reading easier, (ii) avoid words considered as jargon and (iii) develop a section of advice for children without heart or respiratory conditions.

Ozone, mentioned in the more formal accompanying information (Example 1) was a particularly confusing term and was not considered as a pollutant by the research participants. The accompanying information should therefore either, explain clearly that the ozone referred to in the information is at ground level, a pollutant and not connected to the 'ozone layer'. Alternatively, it could be referred to simply as a pollutant without mentioning it by name. This would be consistent with the approach taken for traffic-related pollution such as particulate matter (PM₁₀), which is also not mentioned by name in either set of accompanying information.

In terms of the lexicon and format of the scale used to describe the level of air pollution, a block colour scale (from 1 to 10) and either the terms 'air pollution' or 'air quality' were considered suitable. The use of triggers to provide additional 'real-time' health information was considered useful. A level of confidence in the occurrence of a pollution event, similar to that used in weather forecasting was considered acceptable.

Consequently, it is hoped that the provision of the new, easily understandable air quality health advice and the accompanying information will provide positive and usable information on direct actions that can be taken by all sectors of the general public to reduce or avoid exposure where relevant. It is also hoped that it will enable people who are considered vulnerable to take control of their exposure and feel more confident about their understanding of the link between air pollution and their own health.

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1. Introduction

Air quality is a key issue affecting vulnerable peoples' health. It has been widely recognised as a factor in the exacerbation of cardiovascular and respiratory conditions such as asthma, chronic obstructive pulmonary disease (COPD) and heart conditions (Holgate and Polosa 2006, Niedell and Kinney 2008, Grineski *et al.*, 2010, Silverman and Ito, 2010). Furthermore, active members of the general public, not considered susceptible under normal circumstances, may be affected at higher concentrations (COMEAP 2009, WHO 2006). As the UK is unlikely to achieve the European Union air quality standard for NO_x in the near future (EEA 2009), combined with the fact that for some pollutants there is no safe level, the provision of accurate and understandable information concerning the spatial and temporal distribution of air pollution at a local scale, is necessary to allow individuals to make behavioural choices.

Previous studies have indicated that there is a lack of awareness amongst individuals regarding the impact of air quality on health (Bickerstaff and Walker 2001, Wakefield *et al.*, 2001); that individuals with relevant medical conditions (*e.g.* asthma, COPD) are unsure of how to access relevant information and that they cannot relate such information to their own health conditions (Bickerstaff *et al.*, 2001, Howell *et al.*, 2003, Hussein and Partridge 2002, Smallbone 2010). There is also the issue of whether the existing provision of air quality information is accessible and understandable to the general public (Shooter and Brimblecombe 2008, Bickerstaff *et al.*, 2001).

Previous research, funded by DEFRA in conjunction with CSAS, examined the public's awareness and comprehension of the existing air quality health advice, and assessed the opportunities and challenges to understanding and interpreting such material (Smallbone 2010). Based on the findings of that research, CSAS developed new air quality health advice to link with the revised bandings, due to be published shortly. This research will review the new air quality health advice and accompanying information to identify if it has met the information needs of the general public and those with cardio-respiratory illnesses.

A qualitative approach was chosen for this study as it allowed an in-depth exploration of the key issues within the time and budgetary constraints of this project.

1.1 AIM

The aim of this piece of follow-on research was to identify if the proposed new health advice and accompanying information fulfilled the needs and requirements of a sub-sample of the population.

Information that was examined as part of this piece of research, included;

- The proposed health advice linked to the air quality index.
- Two sets of explanatory information (Example 1 and 2) to accompany the health advice and the air quality index (see Appendix A).
- Preferences regarding the format of the colour scale and wording for the air quality index.
- Understanding of the concept and operation of 'triggers'.

1.2 STRUCTURE OF THE REPORT

The following section briefly details the methodology used in this research and explains the ethical considerations that were adhered to. Section 3 examines the reception of the health advice while Section 4 explores the themes that arose from the analysis of the discourse surrounding the accompanying information. Section 5 and Section 6 describe the preferences for the scale presentation and lexicon, and concept of triggers respectively. Finally, Section 7 summarises the recommendations from this research.

2 Methodology

In order to reach an in-depth understanding of the way the proposed health advice and accompanying information would be received, a qualitative methodology was undertaken. It would have been useful to undertake a quantitative survey to gain the views of a wider cross-section of the population, however the research was conducted under significant time pressures and therefore the research team decided to concentrate on a qualitative approach to ensure that a sufficient depth of understanding was achieved (Gibbson 2007).

A series of four focus groups were undertaken at locations in Leicestershire, East Midlands. Focus groups were held at a variety of times, during the day and in the evening to ensure that a cross-section of society could attend. All venues had disabled access. The location of the focus groups was to ensure that the research participants were not members of either the airTEXT (which operates in London) or airALERT (which operates in Sussex, Hertfordshire and Bedfordshire) services, and would therefore be more representative of the general public in terms of their understanding of air quality and air quality information.

Each focus group had between six and seven participants, recruited from the range of demographic, socio-economic, cultural and ethnic backgrounds using recruitment agencies. Although not necessarily representative of the general public, the focus groups were designed to ensure that the view of those who would be most likely to use the 'health advice' and the new air quality index, and those who are traditionally hard to reach in qualitative research (e.g. the elderly, the young) were obtained (Gibbson 2007). All participants were screened in accordance with industry standards to ensure that they had not previously taken part in a focus group in the last six months and had not taken part in more than four focus groups in their lifetime.

The focus groups were recorded, with the participants' permission, and transcribed for analysis. The data was then coded and a combination of discourse analysis and

content analysis were undertaken. All of the focus groups had a diversity of attitudinal and behavioural positions, which made for insightful and interesting results.

2.1 RESEARCH ETHICS

The operation of the focus groups were undertaken in accordance with the University of Brighton's code of conduct for research and ethics. Informed consent was obtained from all participants in the focus groups prior to the start of the sessions. The information collected on the participants will remain anonymous and any names that appear in quotes have been changed to protect the identity of the participants.

3. The proposed health advice linked to the air quality index

One of the challenges of this research was to explore the focus group participants understanding of the revised air quality health advice developed by CSAS, a subgroup of COMEAP. During previous research the existing health advice, which currently accompanies the air quality index (AQI), was considered insufficient (see Table 3.1) (Smallbone 2010).

The revised air quality health advice proposed by CSAS, provided separate information for those who are vulnerable to air pollution (e.g. the young, the elderly and those with cardio-respiratory diseases) and the general public. Based on the Canadian air quality health advice, the revised text provided specific advice tailored to the UK population. The new air quality health advice is shown in Table 3.2.

Table 3.1 Current health advice accompanying the air quality index. (Source: <http://www.airquality.co.uk/standards.php>)

Banding	Index	Health Descriptor
Low	1, 2, or 3	Effects are unlikely to be noticed even by individuals who know they are sensitive to air pollutants.
Moderate	4, 5, or 6	Mild effects, unlikely to require action, may be noticed amongst sensitive individuals.
High	7, 8, or 9	Significant effects may be noticed by sensitive individuals and action to avoid or reduce these effects may be needed (e.g. reducing exposure by spending less time in polluted areas outdoors). Asthmatics will find that their 'reliever' inhaler is likely to reverse the effects on the lung.
Very High	10	The effects on sensitive individuals described for 'High' levels of pollution may worsen.

The proposed health advice, shown in Table 3.2, was presented to the focus group participants and the various taxonomic classes, terminology and advice was discussed.

Table 3.2 Proposed new health advice to accompany the air quality index.

Air Pollution Banding	Value	Accompanying Health Messages for Susceptible Groups and the General Population	
		Susceptible individuals *	General Population
Low	1 – 3	Enjoy your usual outdoor activities.	Enjoy your usual outdoor activities.
Moderate	4 – 6	If you or your child has heart or lung problems, and experience(s) symptoms, consider reducing strenuous physical activity, particularly outdoors.	Enjoy your usual outdoor activities.
High	7 - 9	Adults and children with heart or lung problems should reduce strenuous physical exertion, particularly outdoors, and particularly if they experience symptoms. People with asthma may find they need to use their reliever inhaler more often. Older people should also reduce physical exertion	Anyone experiencing discomfort such as sore eyes, cough or sore throat should consider reducing activity, particularly outdoors.
Very High	10	Adults and children with heart or lung problems, and older people, should avoid strenuous physical activity. People with asthma may find they need to use their reliever inhaler more often.	Reduce physical exertion, particularly outdoors, especially if you experience symptoms such as cough or sore throat.

3.1 POSITIVE THEMES SURROUNDING THE NEW HEALTH ADVICE

Positive themes that arose from the focus groups concerning the proposed health advice, included its straightforward sensible precautions, its clarity and the fact it provided useful information that was easily understandable.

“Yeah, I think it’s good advise really, if you were worried or not worried, it’s Everything’s there that needs to be there I think. There’s bold letters, ‘reduce’, ‘avoid’, you know, it’s not telling you to stop life altogether, you know. It’s pretty straightforward, easy to understand so it works good” (Male, Rheumatic lung disorder, 55-64).

"They are not staying 'stop going out and don't get fresh air' because everyone knows you are supposed to go out and get fresh air; but they are just saying on the days when it is high, just be aware of what could happen" (Female, No health condition, 25-34).

"I don't think anyone would think really this is scaremongering, I think far from it, to be honest" (Male, No health condition, 55-64).

"It's all very clear" (Male, Heart condition/angina, 45-54).

3.2 NEGATIVE THEMES SURROUNDING THE NEW HEALTH ADVICE

The main issues that arose from the focus groups in relative to the proposed health advice was the use of the word 'susceptible' to describe the vulnerable group. The word '*susceptible*' was discussed and disliked by all members of all of the focus groups.

"This word right at the top, Subs..., Supt..." (Male, Heart condition, 45-54).

"Susceptible?" (Researcher).

"Yeah, I'm having problems just pronouncing it, and I wouldn't even know what that means" (Male, Heart condition, 45-54).

Other comments included;

"Just that the word susceptible, to some people, they may not understand it, I don't know. That's the only thing I can see" (Female, No health condition, 35-44).

"Yeah, that word is too difficult for people who don't have a good level of literacy" (Female, Asthma, 25-34).

"I think the rest of it I'm happy with; it's just that word at the top" (Male, No health condition, 25-34).

Words that were suggested to replace susceptible included '*vulnerable*' and '*prone*', but the preferred choice by all focus groups was '*at-risk*'. The extract below is representative of the discussions that took place in all of the groups.

"I think vulnerable people would be better, is it?" (Female, No health condition, 25-34).

"Even that's quite a long word in somebodys' vocabulary; do you know what I mean? It's not as word you come across very often is it?" (Male, No health condition, Under 24).

"No, no, at-risk?" (Male, COPD, 55-64).

"At-risk is shorter, yeah" (Male, No health condition, Under 25).

"It's perfect" (Male, COPD, 55-64).

"Do you think 'at-risk' is better?" (Male, COPD, 55-64).

"I do, it simplifies it" (Female, Asthma, 45-54).

3.3 SUMMARY AND RECOMMENDATIONS

Consequently, analysis of the information gathered through the focus groups suggested that the proposed health advice was clear, easy to read, understandable and useful. The separation of the health advice into two groups (susceptible and general public) was thought useful, however, the use of the word '*susceptible*' to describe the vulnerable population was not received well.

A recommendation is therefore to replace the word '*susceptible*' with the words '*at-risk*' in the health advice.

4. Additional information to accompany the health advice

Additional text was devised to sit alongside the health advice shown in Table 3.2 to enable the general public to have a better understanding of those considered vulnerable to air pollution. It also provided information on, how to use the proposed 'health advice', the effects of air pollution on health and provided practical actions that could be taken to reduce exposure. Two forms of accompanying information were produced by CSAS. Example 1 was more formally written and contained more detailed information broken up by subheadings, while Example 2 was written in a less formal style and shorter (See Appendix 1). Both forms of accompanying information were explored within the focus groups.

4.1 LANGUAGE, LAYOUT AND PREFERENCE

Key issues that related to both sets of accompanying information included the dislike of jargon within the explanations and the use of complex language.

"I think its jargoney,..... Well not particularly jargoney, but like the 'susceptible' and you know, the longer words might be confusing for some people" (Female, No health condition, 45-54). (Example 1)

"I think I prefer Example 2 because the language is a little bit easier" (Male, No health condition, Under 25) (Example 2).

The word 'susceptible' was again unpopular, as was the word 'predisposed'. Suggestions for alternative words to susceptible in the accompanying information included 'prone', 'suffer from' and 'at-risk'. The following extract from a discussion concerning Example 1 is typical of the

"I think susceptible is quite a difficult word" (Female , Asthma & Angina in family, 25-35).

'Well what does it mean? Does it mean 'might happen to' or 'could happen to'? What exactly is susceptible? You know, it might happen to you, you could suffer from this or you could suffer from that" (Female, No health condition 45-54).

There were suggestions that the level of language in Example 1 should be reduced to enable people in the general public with a moderate level of literacy to understand the text.

"It's [Example 1] written in fairly high level English to be honest. I find that ok, but I think that people who have another language [as their first language] might look at some of those words and wonder what they mean" (Male, No health condition, 45-54).

"I initially felt it [Example 1] was too jargoney for me. It just felt; it was, the terminology was just too much and I just thought, 'ok, well look let me pick out the bits that I do get, and make my version of it'. That's why I felt it needed to be condensed a little bit more and a bit easier to read" (Female, Asthma, 25-34).

Focus group participants commented on the readability of the text in Example 2, and all agreed that Example 2, was easier to read than Example 1.

"The more I read it [Example 2] the more I wanted to keep reading. That's good, I can understand it and even though everyone's mixed up in there, the adults the children the older people, it's just there... reading this, it allows me to read on, or it encourages me to read on unlike the other one" (Male, No health condition, Under 24).

"I liked Example 2, it's easier reading than that one [Example 1]" (Female, no health condition, 55-64).

"Yeah you feel you can relate to this one [Example 2] a little bit more. That one [Example 1], ..., seems a little bit more 'sciencey' than this one". (Female, Asthma, 25-34).

"I preferred that [Example 2] actually. I found it a lot more readable, and it actually seems to almost answer some of the queries we raised on the other one [Example 1] actually; so I prefer that" (Male, No health condition (55-64).

Research participants also preferred the shorter information on the 'effects of air pollution' contained in Example 2, but welcomed the layout of Example 1. In particular, the inclusion of bullet points in Example 1 to enable the text to be more accessible was a feature most research participants found useful.

"I just think there is a lot to read there [Example 2]. I think it would be better bullet pointed" (Female, No health condition, 45-54).

"I liked the way this [Example 2] is written and worded, but I think it would be better presented within these categories [Example 1] and bullet pointed, but I like this because it seems less formal than the other one and also there is a bit of advice as well, erm, you know the bit about the children, at the end, 'need not be kept form school or prevented from taking part in games'. It sort of, helps to alleviate any anxiety" (Female, No health condition, 45-54).

The findings from the focus groups suggested that the wording and language level used in Example 2 is preferred, while the layout of Example 1 was helpful. Suggested improvements to the text of Example 2 included the replacement of the word 'susceptible' by a simpler phrase such as 'at-risk' and that the text should be broken up with bullet points and subheadings.

4.2 THE USE OF SUBGROUPS IN EXAMPLE 1

As has already been stated, Example 1 contained an additional section of information for users entitled '*People susceptible to the effects of air pollution*' which listed the groups of individuals whose health would be most at risk from air pollution. Such information was embedded within Example 2, but less instantly visible. As this was an issue that was raised in all of the focus groups, each of the subgroups, used in Example 1, was explored further and the findings briefly discussed in this section.

- *People who may be susceptible* – again, all groups disliked the word susceptible. Most of the comments were positive and the only suggestion for improvement would be that it was not clear if children would be included in this group.

"Yeah I think that's fairly self-explanatory" (Male, Asthma, 45-54).

"If you were suffering you'd put yourself in that category, wouldn't you?" (Male, No health condition, 55-64).

- *Older people* – there was a discussion focused on the need for an age group banding on this heading, especially amongst those who were retired/ had retired early. It was also felt that the term '*less reserve*' was a little ambiguous.

"How old would you class as old?" (Female, Heart condition, Over 65)

"But surely you should point out to people, and we all know it, but some people might not realise that the older you get, the worst you get in terms of your resistance, you know" (Male, No health condition, 55-64).

"Very ambiguous, reserve I mean 'you put something by' in reserve don't you?" (Male, Angina, over 65)

- *Others* – there was less clarity concerning whom this referred too. Many felt it was '*all of those not mentioned above*' and a suggestion would be to either dispense with this group and combine the group in with the general public, or alter the title to accurately reflect those the advice is aimed at.

" I think basically the way they have worded it its good, but maybe they should have some more explanation of what the 'others' are" (Female, No health condition, 35-44)

"You'd be wondering 'am I in those others' or what? (Female, No health condition, 25-34).

- *General public* – This was considered useful and informative. The only suggestion was to remove the final sentence, which was universally disliked and seen as detracting from the message.

“It’s a bit strange that it mentions, right at the end of it, that these effects are not really relevant” (Male, No health condition, under 25).

“You almost, kind of, don’t understand that last sentence, well I didn’t understand. Like, you can see it – these effects are unlikely to occur...” (Female, No health condition, 25-34).

- *Children* - An additional group for *children* was suggested by a number of the focus groups. Children were perceived to be more vulnerable to air pollution due to their growth status and there was a wish for clarification on the actions that could be taken for this specific group. This was in addition to the clarification of children in the subheading for people who are susceptible.

“Where would you put a 5 year old kid or a 50 year old bloke? I mean would a 5-year-old kid be in the general population? I’d have thought not because they would be a bit weaker because they’d still be developing, so would they go in as others? I don’t know” (Male, No health condition, 25-34).

“Do you need a children’s section then to reassure people if nothing else?” (Female, No health condition 35-44).

“ I think you would, I would say so” (Male, No health condition, 25-34).

The addition of subgroups was considered, by these research participants, as a useful way of conveying specific information to vulnerable groups of the population and to the general public.

A recommendation would be to rename the ‘*people susceptible to air pollution*’ group as ‘*adults and children at-risk from air pollution*’ or some such similar terminology. Clarification on the use of the term ‘others’ was suggested and an additional group for children could be considered.

4.3 INFORMATION ON ACTIONS TO TAKE IN LIGHT OF AN AIR POLLUTION WARNING

The ‘*actions that can be taken*’ to reduce exposure at the end of each of the accompanying information were discussed separately within the focus groups (see Appendix 1). Generally Example 2 was again preferred by this group of research participants.

“Ok, I like the readability of Example 2. I know it’s a bit longer, but I like the way it reads and I think there’s a bit more explanation of people who might be affected. I don’t like Example 1” (Female, Asthma, 35-44).

“I prefer Example 2.... I think it just reads a lot easier; it’s a lot easier to read than the first one [Example 1]” (Female, No health condition 25-34).

In particular, the level of detail and positivity in the advice on actions that could be taken in Example 2 was welcomed.

“Even though it’s a bit longer [Example 2], all the information in there is what you need, it’s not repeating itself in any way and it’s not telling you something that you don’t need to know” (Male, No health condition, 25-34).

“It’s more detailed isn’t it Example 2? Example 1 is probably just generalising isn’t it, whereas example 2 breaks it down a little bit into more detail” (Male, No health condition 45-54).

4.4 A QUESTION OF OZONE WITHIN EXAMPLE 1

There was confusion over the inclusion of ozone specifically within the additional information of Example 1. Focus group members who were aware of ozone believed this referred to stratospheric ozone relating to the ‘hole in the ozone layer’ rather than tropospheric ‘ground-level’ ozone.

“I think this thing on the ozone layer – Everyone knows about the ozone layer, but I can’t think that many people can explain it fully, what it actually is, so that would need to be explained before you put it in” (Male, Angina, Over 64).

“To be honest, when I read it first off, I was thinking, maybe you might need to explain what ozone is, what sort of thing? Because as I was reading it I was like, ‘humm, I haven’t done this since geography’, and that’s a few years ago for me, and probably a lot more years ago for some of the people here” (Male, Asthma, Under 25).

The alternative theme that emerged from the research participants, who were not aware of stratospheric ozone, was that ozone was something found at the seaside, that it was not a pollutant and was generally good for your health.

“I always understood ozone was high level oxygen, you know, a better oxygenated air than air. But are we talking about polluted ozone, or ozone with pollutants?” (Female, Asthma, 35-44).

“I would never have had that down as a pollutant. I always thought you got high levels of ozone at the seaside” (Male, No health condition, 55-64).

In light of these research findings, It is suggested that the accompanying information, either explains tropospheric ozone as a pollutant in very simple terms, or that the name of the pollutant is removed and it is referred to as a pollutant.

4.5 SUMMARY

The key themes to emerge from this research concerning the information developed to accompany the revised health advice included;

- The substitution of the word susceptible with one that was easier to understand.
- 'Simple' language and a less formal writing style should be used in developing the accompanying information.
- The use of subheadings within the text to enable the research participants to easily identify relevant sections was helpful.
- Longer, more detailed information is acceptable as long as it is easy to read and relevant.
- The use of the term ozone (Example 1) should be reconsidered as it was not generally well understood by the research participants.

5. Preferences regarding scale colours and wording for the air quality index

As part of previous research (Smallbone 2010), the scale, words, and the colours used to describe air quality concentration bands were investigated. Feedback suggested that certain colours would be suitable for representing high (red) and low (blue/white) air pollution; and that the banding scale, which is normally displayed as a four-band scale' should be expanded to allow more gradation.

This research explored the presentation of the colour scale (block colours or a spectrum display), and the choice of wording for the banding, (*i.e.* whether the bands should be referred to as 'air quality', 'air pollution' or 'health risk').

5.1 COLOUR SCALE FORMAT

In order to identify whether there was a preference for a graduated or block colour scale, focus group participants were shown two scales which both used similar colours. One was presented as a spectrum (Figure 5.1) and one as a series of blocks of colours (Figure 5.2).

Figure 5.1 Example of a spectrum graduated scale



Figure 5.2 Example of a block colour scale



Initially, there was no strong preference either way amongst the research participants. Comments regarding the graduated colour scale included,

“It’s too rigid [block colour scale], I can’t see air pollution behaving like that, and it would probably be on a more gradual increase as it phases in the different levels” (Male, Angina, 45-54).

“That one looks like litmus paper, that one you know, that you dip into things, that’s a bit smoother” (Female, No health condition, 25-34).

The block colour scale, however, was liked for its clarity and perceived accuracy.

“Well I like the accuracy of it. I think this is probably a bit more definitive in accuracy terms, cause that one seems to have a long bad of green to blue” (Male, Asthma, 45-54).

“It just blends better, it looks nicer” (Female, No health condition, 25-34).

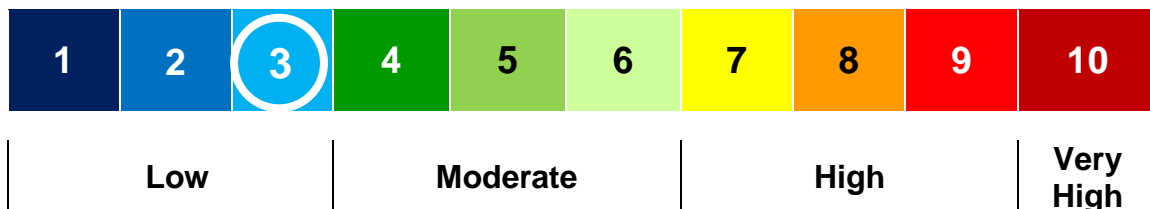
“That’s more clear-cut isn’t it, you’ve got a better idea of where about you are” (Female, No health condition, 35-44).

Participants were re-shown both scales, annotated to demonstrate the way they may be used to display air quality information (See Figure 5.3 and 5.4).

Figure 5.3 Example of how a spectrum graduated scale may appear.



Figure 5.4 Example of how a block colour scale may appear.



The majority of the focus group participants preferred the block scale colour. Comments related to the ease of use, perceived accuracy and clarity of the ‘block colour scale’.

“You’re not having to work it out where it is” (Male, Asthma, 45-54).

“Yes, just cause its explained better on that one [block colour], whereas on that one [graduated colours], you’re thinking, “oh I wonder which one I’d be” whereas you turn it over and it’s there, it answers your question” (Female, No health condition, 25-34).

“It’s more clear cut isn’t it, but that one’s not [graduated]” (Female, No health condition, 45-54).

“To me It’s more accurate, having the block of colours, than the other one, so I like example 1” (Female, Shortness of breath, 45-54)

The most frequently expressed preference was for a block colour scale, with a number in each block for those who are colour blind, (an issue also raised in the previous research (Smallbone 2010)). Such a scale was perceived as easier to use, although many participants acknowledged that air pollution would not behave in such a clear-cut manner.

5.2 AIR QUALITY LEXICON

The lexicon scale to accompany the air quality index banding was also investigated. Participants were shown three sets of words to describe the air quality index and the subsequent words which would be used to divide up the bandings (see Table 5.1).

Table 5.1 Air quality index banding descriptions

Air quality	Good	Fair	Poor	Very poor
Air Pollution:	Low	Moderate	High	Very high
Health Risk:	Low health risk	Moderate health risk	High health risk	Very high health risk

5.2.1 HEALTH RISK

Generally the research participants were uncomfortable with the term '*health-risk*'. They were concerned that such a scale may cause worry, even at the low-risk category.

"I think it is because 'health risk' – It's low health risk but its still a risk, whereas on the other one, air quality is good" (Female, No health condition, 25-34).

"They might think that even on a good day, there's still a risk and they shouldn't go out, because it's bad for your health" (Female, No health condition 55-64).

Links were drawn with the 'health-risk' on cigarette packaging, but the debate indicated that air quality was perceived as a more definite risk that would affect everyone, rather than a risk which was accepted through choice (*i.e.* as with smoking).

"I mean they have health risk on packaging don't they? And it's classed as a health risk because the packaging or contents are dangerous" (Male, Lung disease, 65+).

"Like smoking" (Male, No health condition, 55-64).

"But that's to encourage people to stop smoking, you know when you see packaging label, you can't stop air pollution" (Female, No health condition, 55-64).

5.2.2 AIR QUALITY VERSUS AIR POLLUTION

Preference for the term 'air quality' or 'air pollution' related to the way the research participants perceived the topic. Air quality was seen as a positive encouraging word, while air pollution was understood as a negative term.

"Well it's [air quality] a positive isn't it, whereas air pollution is a negative word. Air quality is more positive I think" (Female, No health condition, 55-64).

"I like the word 'quality' because it's like a more positive word for me, but pollution is all about polluted air and you don't immediately think that well the air is; you know, there's pollution. I like the positive angle to it"(Female, No health condition, 25-34).

"I think air quality is a far better way of describing it. I mean air pollution is a bit the other way, thinking, 'ooh it's polluted' and that might frighten people, and health risk would, but air quality I think that far better" (Male, Angina, 45-55).

Again individual preference related to the meaning that the words were given.

"I think air quality is good, it tells you exactly where you are and then you can take your own actions. But I'd just like to ask a question. What do we mean by air quality? I mean what is that? What does it mean?" (Male, No health condition, 55-64).

"I think air pollution to me means pollution coming from cars or chimney's or that type of thing, but I'm not quite sure what air quality means" (Male, Asthma, 45-54).

Finally, there was no strong preference expressed in the groups as to the individual terms used to describe air pollution.

" I'm still sticking with good to very poor. No I like good. Air quality is good everyone is very happy; air quality is very poor, well there is something wrong here?" (Male, No health condition, 55-64).

"One thing I would like to add, I prefer the low, moderate, high, and very high. It's easier to just use things like that" (Male, Angina, 45-55).

"Moderate, average; they are all the same sort of things aren't they, middle of the road" (Male, No health condition, 25-34).

Consequently, there was a dislike of the term '*health risk*' in the focus groups. No strong preference was expressed for either '*air pollution*' or '*air quality*', and the terms used to describe the levels of air quality/air pollution levels were considered acceptable.

5.3 SUMMARY

Within the focus groups, there was a preference for the block colour scale over the graduated spectrum colour scale. It was felt that although not exactly representative

of the way that air quality works, it would be easier for the general public to understand and use to identify the level of pollution. In terms of the words used to describe air pollution, either air quality or air pollution was acceptable. A dislike was expressed for the term health risk as it was felt this may scare individuals or that a risk may be perceived even at the lowest category.

6. Understanding of the concept and operation of 'triggers'

Concern has been expressed that the system of issuing air quality alerts based on the current bandings does not provide real-time information on air quality. The current banding system is based on an accumulation of exposures over twenty four hours for PM₁₀ and PM_{2.5} and over eight hours for ozone. Consequently it is not possible to issue an alert until an air pollution episode is well under way. To allow the provision of real-time information to the general public, a series of triggers were devised by COMEAP. Triggers are based on hourly concentrations and relate to the proposed new air quality index. The concept of triggers, and the level at which they should be issued was explored within this research project.

One of the main concerns expressed by the research participants related to the accuracy of the forecasting.

"Can you be that accurate? They are pretty accurate with the weather now, they are about 80-90% accurate with the weather now, but can you be that accurate with air quality? Can you be say 60-70% accurate?" (Male, Heart condition, 45-54).

"Surely it depends on how good they are at forecasting, but isn't it up to them to decide?" (Male, No health condition, 25-34).

There was also varying opinions on the level of certainty required before issuing a 'trigger alert'. The extract below is representative of the discussions that took place in the focus groups.

"I'd like 100 % certainty" (Female, Asthma, 55-64).

"Can they be that accurate though? If they are saying 70-80% accurate, I'd sooner go with that one, just to be on the safe side." (Male, No health condition, 55-64).

"I'd except a level of certainty, because if it was certain, you would probably panic people" (Female, Shortness of breath, 45-54).

Most participants agreed that trigger was a good way to describe the concept, and that words such as 'possible' could be used to describe the level of certainty.

"It would be nice to use words, like, erm, 'there's the possibility of...'" (Female, Shortness of breath, 45-54)

"Like the weather forecast, you know, like 'there's the possibility of rain in the south'" (Female, No health condition, 45-54).

Overall, focus group participants liked the concept of triggers, and would accept a level of certainty which would be similar to that used in a weather forecast, but were unable to specify an actual level of certainty that they would be happy with.

7 Recommendations

The need for high quality, accessible and understandable health advice linked to air pollution has been clearly demonstrated by a number of researchers (Shooter and Brimblecoomb 2008, Bickerstaff *et al.*, 2001, Howell *et al.*, 2003, Hussein and Partridge 2002). The previous health advice developed by COMEAP over twenty years ago was found to be difficult to understand by a cross section of the population (Smallbone 2010). New health advice, linked to the revised bandings was devised by CSAS. The new health advice and the accompanying information was passed before a series of focus groups and the following recommendations made in light of the outcomes of this research.

- The research participants considered that the health advice, developed to sit alongside the new air quality banding system, was clear and informative.
- The word '*susceptible*' should be replaced by a word or phrase that was easier to understand in both the health advice and the accompanying information. The term '*at-risk*' was a reoccurring and popular alternative to susceptible.
- The shorter accompanying information (Example 2) was considered easier to read and more useful than the longer, more formally written information contained in Example 1. Nevertheless, it was felt by the research participants that the information in both Example 1 and Example 2 should be combined and rewritten to avoid the use of jargon, and to include bullet points / sub-headings to enable the reader to be directed to the relevant sections.
- The accompanying information should also consider including a sub-heading for children and clarifying who is included under the term '*others*' and '*people who are susceptible to air pollution*'.
- The 'actions that can be taken' to reduce or avoid exposure to air pollution section in Example 1 was detailed and informative but rather formally written, while the same section in Example 2 was considered too brief. A reasonable level of detail was therefore considered acceptable by the research participants.
- Ozone was found to be a particularly confusing term and was not perceived as a pollutant amongst the research participants. The accompanying information should, therefore either, explain clearly that the ozone referred to in the

information is ground level and not connected to the 'ozone layer' or refer to it simply as a pollutant without mentioning it by name. This would also be consistent with the approach taken for other pollutants such as particulate matter (PM₁₀).

- In terms of the words and format of the scale used to describe the level of air pollution, a block colour scale (from 1 to 10) and either the terms air pollution or air quality were considered suitable. Similarly the terms 'low to very high' or 'very poor to good' were both acceptable with no strong preferences expressed either way.
- The use of triggers to provide additional 'real-time' health advice was considered useful. The research participants considered that a level of confidence in the occurrence of a forecasted pollution event, similar to that used in the weather forecast would be acceptable.

It is hoped that the provision of the new air quality health advice, with the accompanying information and actions to be taken will prove useful to both those with and without a relevant health condition. The author has found that in undertaking this and the previous linked research (Smallbone 2010), there has been a dearth of prior knowledge concerning air quality amongst the research participants. Nevertheless there has been a great interest in the subject of air quality and health, especially amongst those with relevant health conditions.

The provision of new, easily understandable air quality health advice and accompanying information which provides a positive message and includes actions that can be taken to reduce or avoid exposure where relevant, will enable people to take control of their exposure and feel more confident about their understanding of the link between air pollution and their own health.

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Appendix 1

Accompanying information

Example 1

INITIAL INSTRUCTIONS

- Step 1. Determine whether you (or your children) are likely to be susceptible to air pollution. Information on groups who may be affected is on the “information on those at risk from the effects of air pollution” page. Your doctor may also be able to give you advice.
- Step 2. If you may be susceptible, and are planning strenuous activity, particularly outdoors, check the air pollution forecast.
- Step 3. Use the health messages corresponding to the highest forecast level of pollution as a guide.

ADDITIONAL INFORMATION - Information on those susceptible to the effects of air pollution

Some people are more susceptible to the effects of air pollution than the general population. Adults and children with lung or heart conditions might experience a worsening of their symptoms at levels of pollution which would go un-noticed by most people. But only a minority of people with such diseases will experience symptoms when air pollution is high – people respond differently to air pollution.

Levels of many pollutants tend to be higher in towns and cities, particularly close to busy roads. An exception is ozone: when levels of ozone are raised this tends to be over a large area and levels are often higher in rural and suburban areas than next to busy roads. Some adults and children who do not have lung or heart disease might find that they are susceptible to the effects of ozone, experiencing discomfort when breathing, particularly if they undertake strenuous activity outdoors. Ozone levels are generally higher in the afternoons and evenings than in the mornings.

As well as susceptible individuals, some people may be more at risk from adverse effects of air pollution because they breathe in more outdoor air – for example those undertaking strenuous manual work outdoors for significant amounts of time, or those participating in sports outdoors.

People susceptible to air pollution

People with lung or heart conditions

Adults and children who have lung conditions such as asthma or chronic obstructive pulmonary disease (COPD), which includes chronic bronchitis and emphysema, and those with heart conditions such as angina, previous heart attack, heart failure or heart rhythm problems are more susceptible to the health effects of air pollution. Air pollution can trigger or worsen the symptoms of these diseases and some people might need treatment. (Adults predisposed to heart disease, such as those with diabetes mellitus or high blood pressure, may also be susceptible because they are more likely to have heart and circulation problems.)

Older people

Older people also are more likely to be affected by air pollution, because their lungs, heart and defence systems have less reserve, or because of undiagnosed lung or heart conditions.

Others

Some people with no underlying respiratory disease might find they experience discomfort and difficulty breathing when ozone levels are raised, though this is only likely during heavy exercise.

Symptoms in the general population

At significantly raised levels of pollution, air pollution can produce irritant symptoms such as sore or dry throat, sore eyes or, in some cases, a tickly cough even in healthy individuals. These effects are unlikely to occur at the concentrations experienced in the UK today.

Actions that can be taken

When air pollution is elevated, susceptible individuals can reduce their risk of symptoms by avoiding strenuous physical activity, particularly outdoors. They could also consider changing their behaviour to avoid high levels of air pollution – for example choosing a less polluted route.

When ozone is elevated, large areas tend to be affected; in this case rescheduling strenuous physical activity for the morning, when ozone levels tend to be lower, might be considered.

Example 2

ADDITIONAL INFORMATION - Information on those susceptible to the effects of air pollution

The air quality index (AQI) has been developed to provide advice on expected levels of air pollution. In addition, information on the effects on health that might be expected to occur at the different bands of the index (Low, moderate, high, very high) is provided.

Effects of air pollution on health

Air pollution has a range of effects on health. Some of these effects can be detected by individuals: high concentrations can cause sore eyes and a cough. It is also known that, when levels of air pollutants rise, adults and children suffering from heart and lung conditions are at increased risk of becoming ill and needing treatment. Only a minority of those who suffer from these conditions are likely to be affected and it is not possible to predict in advance who will be affected.

Some people are aware that air pollution affects their health: adults and children who suffer from asthma may notice that they need to increase their use of reliever medication on days when levels of air pollution are higher than average. Older people are more likely to suffer from heart and lung conditions than young people and so it makes good sense for them to be aware of current air pollution conditions.

Air pollution in the UK does not rise to levels at which people need to make major changes to their habits to avoid exposure. Children need not be kept from school or prevented from taking part in games, nobody need fear going outdoors.

Action that can be taken

When levels of air pollution increase it would be sensible for those who have noticed that they are affected to limit their exposure to air pollutants. This does not mean staying indoors, but reducing levels of exercise outdoors would be sensible.

Older people, especially those with heart and lung conditions, might sensibly avoid exertion on high pollution days, and those suffering from asthma would be sensible to check that they are taking their medication as advised by their doctors. Athletes may notice that they find their performance less good than expected when levels of air pollution are high and they may notice that they find deep breathing causes some pain in the chest: this might be expected in summer on days when ozone levels are raised. This does not mean that they are in danger but it would be sensible for them to limit their activities on such days.

Adults who suffer from heart and circulation conditions should not modify their treatment schedules on the basis of advice provided by the banding system: such modification should only be made on a doctor's advice.