

THE HEALTH EFFECTS OF AIR POLLUTANTS: ADVICE FROM THE COMMITTEE ON THE MEDICAL EFFECTS OF AIR POLLUTANTS

Contents

Executive Summary

The sources of air pollution

The effects of air pollutants

The effects of short-term changes in levels of air pollution

The effects of long-term exposure to air pollutants

Avoiding exposure to air pollutants

Diet

Information on levels of outdoor air pollutants

Further information and useful web site addresses

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Executive Summary

Air pollution can worsen the condition of those with heart or lung disease.

Air pollution can aggravate, but does not appear to cause, asthma.

In the longer term, air pollution probably has additional effects on individuals, including some reduction in average life expectancy, though the extent of this is not fully understood at present.

People can improve the air in their homes by

not smoking;

maintaining heating appliances; and

ensuring adequate ventilation.

Information about levels of air pollution is available on CEEFAX/TELETEXT, the internet and on a freephone helpline and this allows

Asthmatics who find they are affected to adjust their medication as they would for other triggers;

People to minimise their exposure if levels are high by avoiding vigorous exercise or avoiding busy roads;

People to use their car less to reduce everyone's exposure; and

People to monitor progress of policies to reduce pollution.

People are less likely to get the diseases which would make them more susceptible to air pollution if they don't smoke, eat lots of fresh fruit and vegetables and get plenty of exercise.

As a result of international agreements, Government regulations and action by local authorities, the Environment Agencies and industry, air pollution levels in the UK are in general decline, though still a cause for concern at specific times.

1. The sources of air pollution

Outdoors

1.1 The main sources of outdoor air pollution are road traffic, manufacturing industry and non-nuclear power generation in the UK, although some pollution, from a variety of sources, comes from mainland Europe. Although the levels of air pollution are much lower now than they were in the 1950's when smogs were a major problem, they can still have effects on health. Measures therefore continue to be taken to reduce people's exposure to outdoor pollutants at a national and local level through the National Air Quality Strategy for England, Scotland, Wales and Northern Ireland, the monitoring of local air quality by local authorities and by the regulation of emissions from industry by local authorities and the Environment Agencies. Improvements are also being made to the quality of fuel and emission standards for vehicles through agreements and legislation within the European Union.

Indoors

1.2 Individuals spend approximately 90% of their time indoors and for some groups, such as the elderly and mothers with pre-school children, even more of their time is spent in the home. Indoor air pollution or, at least, indoor exposure to air pollutants that may have been generated outdoors or indoors, is very important and often overlooked. The main sources of indoor pollution are carbon monoxide (CO) and nitrogen dioxide (NO₂) from heating and cooking appliances, and environmental tobacco smoke (ETS). This is one aspect of exposure where individuals can have a direct impact on their own levels of exposure.

2. The effects of air pollutants

2.1 Air pollution can have short-term and long-term effects on health. The size of the effect will vary depending, amongst other things, on the concentration of the pollutant(s) and the period of exposure. An individual's exposure to pollutants can vary greatly. Some people will receive exposure to certain types of air pollutant whilst at work; others, such as the elderly and women with young children, will receive the majority of their exposure from pollutants inside the home; while for others, who work predominantly outdoors, exposure to outdoor pollutants will be particularly relevant. Overall, air pollution should be seen as one of a number of factors, such as respiratory infections, exposure to airborne allergens, flu and extremes of temperature that can affect our health.

3. The effects of short-term changes in levels of air pollution

Healthy Individuals

3.1 For the most part, people will not notice or suffer from any serious or lasting ill effects from

levels of pollution that are commonly experienced in the UK, even when levels are described as "high" or "very high" according to the current criteria. However, our knowledge of the effects of air pollutants on individuals as a result of their exposure both in the home and at work is incomplete.

Sensitive Individuals

3.2. There is evidence to show that some people with diseases of the airways (such as Chronic Obstructive Pulmonary Disease [COPD] and asthma) may be adversely affected by day-to-day changes in the levels of air pollutants. This is not surprising since people with asthma are especially sensitive to a range of irritant substances. Air pollutants include strong irritants such as sulphur dioxide (SO₂) and ETS. Air pollution should be regarded as one of a number of factors that may affect people with breathing disorders. They should take similar steps to prevent or reverse the effects of air pollutants as they would with other triggers of asthma, such as cold air, exercise, and exposure to allergens such as pollen. In practice, people with asthma are unlikely to know for certain whether an attack has been triggered by air pollution alone or by a combination of factors.

3.3 The number of deaths and hospital admissions that occur each day varies and both seem to go up when air pollution levels are high, particularly for those with cardiovascular and lung disorders and especially amongst the elderly. It is not possible, at the moment, to say by how much the deaths of those affected are advanced but most people studying this field believe that in general it may be a matter of weeks or months rather than years. These deaths do not occur "out of the blue": they seem to affect people who already have a serious pre-existing condition which has made them extremely susceptible to a variety of external factors of which high levels of air pollution may be one amongst many.

4. The effects of long-term exposure to air pollution

4.1 Perhaps surprisingly, long term exposure to air pollution is unlikely to be a cause of the increased number of people now suffering from asthma in the UK.

4.2 The scientific evidence suggests that exposure to air pollution has a long-term effect on health, though the effects will vary depending where one lives (urban or rural) and the type of pollutant to which one is predominantly exposed. The full extent of this is hard to quantify, but, if life-long exposure to fine particles was cut by half, life expectancy from birth could be increased, on average, by between 1 and 11 months (depending on assumptions as described in the COMEAP report). To put this in context, the life expectancy of those who have never smoked is around 7 years greater than in those who do smoke. Other lifestyle factors such as diet can also make a large contribution. The mechanism for this effect of long term exposure to particles is not understood. It appears to mainly affect deaths from heart disease.

4.3 A number of pollutants present in the air - benzene, 1,3-butadiene and some polycyclic aromatic hydrocarbons (PAHs) - are potentially carcinogenic, that is, prolonged exposure may lead to the development of cancer. This is known from studies of workers exposed to high concentrations of these chemicals. Tobacco contains many carcinogenic substances, including benzene and PAHs and so smokers will also be exposed to high levels of these compounds. The available evidence strongly suggests that the risks associated with the levels found in the air in the UK are exceedingly small - that is, they are so small that they cannot be measured with any accuracy. Nevertheless, efforts continue to be made to reduce the levels even further as a precautionary measure.

5. Avoiding exposure to air pollutants

5.1 People want to know how they can avoid the harmful effects of air pollutants. Sources of pollution are found indoors and out. The levels of pollution that are reported routinely are outdoor levels, generated mostly from outdoor sources. Elderly people with heart and lung disease are placed at somewhat higher risk from exposure to air pollutants and they probably already spend much of their time indoors. Staying indoors does not generally help to avoid high outdoor pollution levels completely because most pollutants penetrate indoors very effectively. The exception to this is ozone which reacts rapidly with furniture and fittings and is therefore generally much lower indoors.

Outdoors - Individuals

5.2 People can "do their bit" by changing their behaviour. If we all used the car less frequently or shared the use of vehicles, especially for those short, local trips such as "the school run", and we did more walking and cycling instead, this would bring us other health benefits over time.

5.3 While there is little that an individual can do to reduce levels of air pollutants, there are some things that can be done to reduce the effects. It is clearly impractical to avoid going outdoors on days when pollution levels are raised. However, because vigorous exercise increases exposure of the lungs to pollutants, it is best for people who have noticed effects while exercising, to avoid such activity on days when pollution is "high" or "very high". Similarly, it might be best for those with serious lung and heart disorders, the elderly and children to avoid roads with heavy traffic, as far as they can, when pollution levels are "high" or "very high".

5.4 For some people who have noticed that they are affected by raised levels of air pollutants, advanced warning of raised levels might be useful. Some asthmatics find that knowing that a period of raised levels of pollutants is expected helps them to manage their treatment better than they would otherwise. They can adjust their dose of "preventer" or "reliever" medicines if they know that their condition is made worse by air pollution. Not all people with asthma are affected by air pollutants - but for some the information will be useful. Those who suffer from respiratory illnesses, other than asthma, who have noticed their condition gets worse when pollution levels are high, may also benefit from reducing their activity outdoors at these times.

Outdoors - Others

5.5 Locally, nationally and internationally, action is being taken to reduce people's exposure to air pollution. National Government, through the National Air Quality Strategy for England, Scotland, Wales and Northern Ireland and the Integrated Transport Policy, is setting the framework for local action to be taken to reduce levels of pollution. Local authorities are monitoring and assessing air quality within their boundaries to meet the objectives set out in the National Air Quality Strategy to reduce the levels of pollutants and the Environment Agency is also monitoring emissions from industry as part of the Strategy as well. Action is also being taken internationally within the European Union and through the United Nations to reduce global pollution. The EU, motor manufacturers and oil producers are also making improvements in the emissions from new vehicles and the composition of petrol and diesel fuel.

Indoors

5.6 Indoor sources of pollutants can contribute unnecessarily to total exposure and this is an area where individuals can make a large impact by taking relatively simple precautions.

5.7 People who smoke can make a dramatic improvement both to their own health and to indoor air quality by giving up. By not smoking indoors a household's exposure to ETS can be reduced

significantly. This will be particularly beneficial to households containing children, asthma sufferers, sufferers from other lung diseases and heart disease. If you cannot give up, try to smoke in one room away from others who may be vulnerable, ensuring that there is good ventilation, allowing any smoke to escape outdoors.

5.8 Combustion appliances such as gas, oil, or solid fuel fired heaters, water heaters, central heating boilers or stoves, are potential sources of a variety of pollutants and must be correctly installed, used and maintained. Poorly installed or maintained appliances may not burn fuel properly which can lead to the production of the poisonous gas carbon monoxide (CO), which is responsible for about 50 preventable deaths each year. Gas appliances must be installed and maintained by a contractor registered with the Council for Registered Gas Installers (CORGI) and should be checked for safety at least once a year. When using gas cookers, bottled gas heaters or other appliances which do not have a flue, make sure the room is properly ventilated. You can do this by opening a window or using an extractor fan. Air bricks, chimneys, flues and vents must not be blocked. A balance must be struck between measures such as draught proofing to prevent heat loss and maintaining adequate fresh air ventilation. The airing of bedrooms and bedding is important and should be done daily.

5.9 The Department of the Environment, Transport and the Regions produces the following leaflets on indoor air quality issues:

Good Air Quality In Your Home;

Gas Cooking Fumes - what you need to know;

Keep your home free of damp and mould;

House Dust Mites - a step by step guide to mite control in the home;

Asbestos in the home;

Are you redecorating? Advice on old lead paint dust; and

Solid fuel, wood and oil burning appliances: Get them checked and be safe.

All of these are available on request free of charge from the Department of the Environment, Transport and the Regions, Free literature, PO Box 236, Wetherby LS23 7NB (Tel: 0870 1226 236 and Fax: 0870 1226 237).

5.10 The Department of Trade and Industry has also produced several leaflets on the dangers of CO poisoning . These are available free, in bulk, to safety professionals for re-distribution:

Danger! Fires and heaters need air (Urn 95/920)

Killed in her bed (Urn 98/1025)

Wedi'l lladd yn ei gwely (Urn 98/1025W)

Carbon monoxide kills (in Bengali, Hindi, Urdu, Gujerati, Punjabi & English) (Urn 00/635).

Copies of these leaflets can be obtained from: The DTI Publications Orderline, Admail 528, London, SW1W 8YT. Tel: 0870 1502 500, quoting the appropriate Urn reference shown.

6. Diet

6. Several air pollutants, such as ozone, act by releasing chemicals that are described as oxidising

agents into the lung. The body has a natural system of defences against oxidising agents called antioxidants. These are released from the walls of the airways of the lung. Too much pollution can overwhelm these defences. It seems to be possible to reinforce these defences by taking plenty of antioxidants in the diet, including foods rich in Vitamins C and E. These are contained in fresh fruit and vegetables, fruit juice, whole grains and nuts. Eating plenty of these foods might protect the airways as well as bringing other health benefits associated with eating fresh fruit and vegetables, such as protection against heart disease and cancer. Vitamin supplements do not appear to be as effective in conferring general health benefits as when these vitamins are taken through a healthy, balanced diet.

7. Does it make a difference where I live?

7. People often ask whether they should move house to reduce the risks to their health from exposure to air pollution. This is a difficult question to answer.

What we do know:

For an individual pollutant, levels do vary across the country. Levels also vary between different places in the same area e.g. beside roads.

Some pollutants vary more than others and different pollutants are higher in different areas. For example, ozone is higher in rural areas but particles are higher in urban areas.

Air pollution can worsen the symptoms of heart or lung disease in some people but not in others.

Some studies find that asthma symptoms are greater in those living beside roads but other studies do not.

What we do not know:

It may be unclear whether the person enquiring is truly sensitive to air pollution. For example, there are many triggers for asthma and reducing exposure to air pollution will not help if in fact it is another trigger that is more important.

Despite the fact that the person enquiring appears to be sensitive to air pollution, he may not know which pollutant is having an effect.

It may not be obvious how much of a reduction in exposure is required to make a significant difference.

All these points mean that it is very difficult to give advice which is relevant to everyone in this area. Moving is obviously a major life event and can have many consequences for people's health both good and bad. Given that moving is such an event, it is unlikely to be worthwhile for people to move simply because of concerns about possible effects of air pollution. However, if a person is in the process of moving anyway, they could consider choosing a lower pollution area and information is available on levels of air pollutants in different areas to enable people to make their own choice.

8. Information on levels of outdoor air pollutants

8. An air pollution information system has been set up in the UK that provides frequently updated, regional information on levels of air pollutants and forecasts of likely levels via a freephone telephone helpline (0800 556677) and via CEEFAX (pages 410-417) and TELETXT (page 106). More detailed information is available on the internet at <http://www.environment.detr.gov.uk/airq/aqinfo.htm> . The main purpose of monitoring levels of air pollutants is to allow the air quality to be regulated. Providing such information to the public plays an important role in that it encourages us all to reduce those activities that produce air pollutants during periods when levels are already raised. Reducing the use of private transport when levels of air pollution are high is a sensible and helpful response to the information provided. The information also allows the public to monitor how well the UK is doing in reducing general air pollution levels.

9. Further Information and Useful Website Addresses

The Lung & Asthma Information Agency

Public Health Sciences

St George's Hospital Medical School

Cranmer Terrace

London SW17 0RE

Fax: 020 8725 3584

<http://www.sghms.ac.uk/depts/laia/laia.htm>

Email: laia@sghms.ac.uk

(This site contains factsheets, mainly for health professionals, on respiratory and lung diseases. These can be downloaded from the website).

National Asthma Campaign (NAC)

Head Office

Providence House

Providence Place

LONDON N1 0NT

Telephone: 0345 01020 (Asthma helpline Monday-Friday, 9am-7pm)

Telephone: 020 7226 2260 (Administration)

<http://www.asthma.org.uk>

British Lung Foundation

78 Hatton Gardens

London, EC1N 8JR

Tel: 020 7831 5831

Fax: 020 7831 5832 <http://www.lung.org.uk> National Society for Clean Air and Environmental Protection

136 North Street

Brighton, BN1 1RC

Tel: 01273 326313

<http://www.greenchannel.com/nsca>

e-mail: info@nsca.org.uk

ASH - Action on Smoking and Health

Devon House

12-15 Dartmouth Street

LONDON SW1H 9BL

Tel: 020 7935 3519

e-mail: ashuk@ash.org.uk

<http://www.ash.org.uk>

British Heart Foundation

Head Office

14 Fitzhardinge Street

LONDON W1

Tel: 020 7935 0185

The following websites also contain useful information:

www.active.org.uk

The Health Development Agency - contains material on physical activity

www.parents.dfes.gov.uk

DfEE - material on walking (particularly aimed at parents)

www.local-transport.detr.gov.uk/schooltravel/index.htm

Department of the Environment, Transport and the Regions - school travel resource pack and messages for pupils

www.wiredforhealth.gov.uk

Department of Health - healthy schools/school travel/physical activity

www.sustrans.org.uk

Sustrans - specialist organisation working on green travel for schools e.g. "Safe Routes to School"

www.pedestrians.org.uk

Pedestrians Association - information about its "Walk to School" week and other initiatives.

www.greencode.org.uk

Green Code programme for Schools - information packs on sustainable transport and other developments

www.bbc.co.uk/education/schools

Public broadcasting services and schools (with travel links)

<http://www.doh.gov.uk/public/scoth.htm>

REPORT OF THE SCIENTIFIC COMMITTEE ON TOBACCO AND HEALTH This page contains the key Messages and the summary of the report in HTML. The Report is available in full text from the Stationery Office Website at <http://www.official-documents.co.uk/document/doh/tobacco/report.htm> .

<http://www.doh.gov.uk/smokexec.htm>

SMOKING KILLS - Executive Summary of the Government White Paper (A leaflet and other material can be found at this site)

<http://www.doh.gov.uk/pub/docs/doh/ets.pdf>

Statement by the Committee on the Carcinogenicity of Chemicals in Food, Consumer Products and the Environment to the Scientific Committee on Tobacco and Health on Environmental Tobacco Smoke (ETS) and lung cancer.