BTS POSITION STATEMENT

AIR QUALITY AND LUNG HEALTH 2022

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British Thoracic Society

1. Context and background

1.1 BTS Position Statements outline the Society's stance on a given topic and underpin our strategic work to promote services that reduce the health and economic burden of lung disease. They do not involve a specific review of evidence.

1.2. This Statement is informed by the following:

- According to a previous estimate, during a lifetime, a person breathes about 250 million litres of air [1].
- There is good evidence that exposures to poor air quality from ambient (outdoor) air pollution, the indoor environment, or the workplace, can all have negative effects on lung health, contributing to an estimated 50,000 deaths in the UK each year [2].
- Poor air quality may affect all individuals, but children, the elderly, and those with pre-existing respiratory conditions (particularly asthma and COPD) are amongst the most vulnerable.
- Exposures to poor air quality in all forms whether outdoors, at home, or in the workplace are strongly linked to social deprivation and potentiate health inequalities.

2. Goals

2.1 The British Thoracic Society (BTS) has the following goals in relation to air quality and lung health:

- to support the position that every person has the right to breath clean air at home, outside, and at work.
- to inform, educate and support respiratory health care professionals in providing advice to patients, their carers and in the case of children, parents, on actions that can be taken to mitigate the effects of air pollution.

3. Outdoor / ambient air quality

3.1 Background – what we know

Outdoor air quality in the UK is affected by a wide range of natural (e.g. pollen levels) and human (e.g. air pollution) factors that vary by geographical location and seasonal weather conditions. Damaging air pollutants of concern include fine particulate matter (PM), oxides of nitrogen (NO_x), ammonia (NH_3), sulphur dioxide (SO_2), and non-methane volatile organic compounds (NMVOCs) that are produced from transport, industrial processes, farming, energy generation and domestic heating [3].The UK has a commitment to reduce overall emissions from these pollutants which are monitored by the Department for Environment, Food and Rural Affairs and by Local Authorities.

One of the most important sources of ambient air pollution in the UK is road transport with diesel vehicles emitting significantly higher levels of the most concerning NO_x and PM pollutants. Over the last six decades, there has been a ten-fold increase in UK road traffic [4] with a total of more than 39 million licensed vehicles in GB in 2021 [5]; concerns relating to the associated air pollution and resultant climate change have recently led the Government to announce plans to ban the sale of new diesel and petrol cars from 2030 [6].

3.2 Why we are concerned

Data from the World Health Organisation in 2019 confirmed that the UK has a significant and ongoing problem with poor air quality in urban areas, with 44 of the 51 major cities exceeding recommended levels of PM) [7]. The devastating personal impact of outdoor air pollution was recently highlighted in the United Kingdom following the death of nine-year-old Ella Kissi-Debrah from a fatal asthma attack [8]. Although this was the first case in the UK where the coroner recorded air pollution as a cause of death, previous figures from the Royal College of Physicians estimate a high mortality burden, with an excess of 40,000

deaths per year and associated annual costs of more than £20 billion [9].

Although the different mechanisms responsible remain to be fully determined, there is now a considerable body of evidence showing that even low-level air pollution exposure has an adverse effect on respiratory and cardiovascular health [10]. Antenatal and childhood exposure to air pollution has been linked to asthma and impaired lung development, predisposing individuals to chronic lung problems in the future [11].The elderly and those with pre-existing respiratory or cardiovascular disease are also disproportionately affected by outdoor air pollution; increases in daily PM exposures have been associated with hospitalisation and increased mortality due to acute exacerbations of COPD, asthma or ischaemic heart disease, [12]. Longitudinal UK data have also demonstrated that short-term PM and NO_2 exposures are associated with increased frequency of primary care consultations and increased inhaler prescriptions [13]. In addition to exacerbating pre-existing health conditions, chronic exposure to outdoor air pollution has also been found to increase the risks of lung cancer, ischaemic heart disease, diabetes, stroke and dementia [14].

3.3 What we need to do

- BTS supports the recommendations made in the NICE Guideline on Outdoor Air Quality and Health (published in 2017) that covers road-traffic-related air pollution and its links to ill health. These recommendations apply to local authorities, staff working in transport and highways authorities, local government elected members, employers, healthcare professionals and members of the public [15].
- Patients with chronic respiratory disease should be directed to freely available online resources that provide guidance on the topic of outdoor air pollution (e.g., those available on the **Asthma + Lung UK** [16] and **European Lung Foundation** [17] websites).
- We support the recommendations from the recent Prevention of Future Deaths report and support health care workers being empowered to ask about air pollution when screening for respiratory conditions [18].
- Adequate professional education on the severity of the problem and preventative measures is required. This is now included in the respiratory trainees' curriculum, but should be extended to all professional bodies, including allied healthcare professionals and nurses. BTS is committed to including air quality on the agenda of educational and scientific meetings where appropriate.

4. Indoor / domestic air quality

4.1 Background – what we know

The potential for Indoor Air Pollution (IAP) to cause harm is high, as people in the UK spend up to 60% of their time at home, and a further 20-30% in other indoor spaces such as schools, workplaces, shops, transport, and enclosed leisure environments [19]. IAP comprises a very wide range of physical (e.g. damp), biological (allergens, mould and airborne respiratory pathogens) and chemical (numerous) agents. Their sources are correspondingly various and in the home include, among others, water ingress, pets, building materials, furniture and furnishings, smoking of all types, cooking, heating (including using free standing gas heaters and open solid fuel fires), paints, varnishes and glues, cleaning products, air fresheners, deodorants and perfumes, pesticides and fungicides, and candle or incense burning. Levels of IAP exposure are highly dependent on structural factors such as a building's ventilation, insulation and proximity to important sources of outdoor pollution, such as main roads or polluting industries; on crowding; and on behaviours, including smoking, pet ownership, and the use of cleaning and other 'chemicals'.

4.2 Why we are concerned

With the exceptions of environmental tobacco smoke and domestic damp/mould [20], there are very few data on the adverse respiratory health effects of IAP. The gaps in research evidence in this area are well described in the

recent report from the RCPCH [21]. There is limited evidence that domestic and school exposures to oxides of nitrogen (released from gas stoves, or the result of ingress of outdoor traffic fumes), some volatile organic compounds (e.g. formaldehyde, benzene, limonene) and pesticides may increase the risk of respiratory symptoms and be associated with small decrements in lung function, particularly in young children and women. Individuals with atopic asthma will often find that exposure to some domestic pets (cats, rodents) will trigger symptoms; in some settings of poor housing, infestation with mice or cockroaches increases the risk of asthma exacerbations in children.

Any respiratory risks of IAP are likely to have a greater impact on those who spend more time indoors, such as the very young, the elderly and the unemployed; on those with underlying lung diseases such as atopic asthma; and on children whose lung development is incomplete. Broadly, too, housing quality in the UK reflects social deprivation, and the adverse effects of IAP tend to exacerbate health inequalities.

While there are proven strategies for reducing the concentration of some components of IAP, there are very few examples of such interventions that have successfully improved respiratory health. There are concerns that IAP may have a greater – and increasing - population health impact than outdoor or occupational exposures but, to date, there is little evidence to support this. In addition to the reasons outlined above, these concerns reflect:

- Fewer natural ameliorating factors such as photo-degradation, weather, and temperature fluctuations.
- The need for increased building 'tightness' (to reduce thermal loss) which tends to reduce ventilation, allowing greater accumulation of allergens, chemicals, particles and infectious agents.
- For most sources of IAP there are no data on their potential respiratory hazards or safe levels of exposure; where data exist, they are often derived from occupational studies which may not be appropriate.

4.3 What we need to do

- BTS supports the recommendations made in the National Institute for Health and Care Excellence [22] report on indoor air quality at home (published in 2020); these recommendations apply to local authorities, health care professionals and to those who design, build, maintain and let domestic properties.
- Patients with chronic respiratory disease should be directed to freely available online resources that provide guidance on the topic of indoor air pollution (e.g., those available on the **Asthma + Lung UK** [23] and **European Lung Foundation** [24] **websites).**
- Advice for patients and carers, on 'allergen' avoidance in the home, has been produced by the NHS and is freely available online [25].

5. Workplace

5.1 Background – what we know

Over 32 million people work in the United Kingdom [26], and over a lifetime, have the potential to amass ~60,000 hours in the workplace [27]. The 'workplace' encompasses a very diverse range of working conditions, and the previously discussed factors associated with both poor outdoor and indoor air quality can be of direct relevance to many UK workers. In addition, there are certain exposures which are unique to workplaces, and where they are poorly controlled there is the potential to cause "occupational" forms of respiratory disease such as asthma (e.g., flour dust), COPD (e.g., coal mine dust), interstitial lung disease (e.g., metalworking fluid mist), and cancer (e.g., asbestos fibres).

The benefits of being employed require workplaces to be safe and free from risks to health; there is a legal duty for employers to consider this under the Health and Safety at Work Act [28] and Control of Substances Hazardous to Health (COSHH) Regulations [29]. Employers are required to carry out risk

assessments to identify any potential exposures to harmful substances in the air and decide how to prevent or minimise the risk in their workforce. Based on the hierarchy of controls [30] the most effective measures should be used wherever practical. For certain substances, there are legal workplace exposure limits (WELs) requiring that airborne contamination must be controlled "as far as is reasonably practicable" using the most effective measures available. Occupational hygienists can carry out objective monitoring of industrial dusts and fumes to determine if levels are within the WEL. Monitoring of health and safety practice is an iterative process and should be carried out on a regular basis.

5.2 Why we are concerned

As for other sources of air pollution, individuals with pre-existing respiratory conditions (particularly asthma and COPD) are more vulnerable to the effects of poor air quality in the workplace. Around 1 in 5 of all working asthmatics have work-related worsening of symptoms, with exposure to airborne dusts and fumes being a commonly cited cause [31].

Poor air quality at work is also a common cause of respiratory disease, with epidemiological studies consistently providing estimates that 15-20% of the overall health burdens from asthma, COPD and lung cancer, can reasonably be attributed to workplace exposures [32]. With the additional consideration of other forms of occupational lung disease (particularly due to asbestos), there are in the region of 12 000 deaths per year in the UK that can be linked to past exposures at work [33]. Although the epidemiology is consistent with a high burden of disease, the number of cases diagnosed and reported to the national surveillance scheme are much lower.

For patients with long latency occupational diseases (e.g. pneumoconiosis, lung cancer and mesothelioma), the issues of poor air quality relate to exposures many decades in the past. For other patients however, particularly those with allergic occupational asthma and hypersensitivity pneumonitis, symptoms are driven by current working environments, and delayed recognition adversely affects prognosis. In occupational asthma, there is good evidence that early removal from exposure results in a better health outcome [34], but carries with it a significant risk of unemployment. Evidence suggests that referral for assessment of occupational asthma is often delayed [35], resulting in ~1 in 6 cases developing severe disease [36]. In addition, to the costs to the individual, the impact on society of work-related lung disease is high; lifetime costs for occupational asthma alone are estimated to be more than £100 million [37].

5.3 What we need to do

- Healthcare workers should be aware of existing guidance to screen respiratory patients for a workplace cause for their disease; for patients with adult asthma, the BTS has produced specific guidance in the Occupational Asthma Clinical Statement [38].
- Patients with suspected occupational or work-aggravated respiratory disease should be referred as soon as possible to a clinician with a specialist interest in in occupational lung disease. Contact details for the national network of NHS centres with Occupational Lung Disease outpatient services are available online [39].
- Patients with suspected work-related respiratory disease should be directed to freely available online resources that provide guidance on this topic (e.g., those available on the **Asthma and Lung UK** [40] **and European Lung Foundation websites** [41]).
- Secondary care respiratory consultants are encouraged to report cases of OLD to the government funded national surveillance scheme [42], run by the University of Manchester.

6. Roles and responsibilities

6.1 Healthcare professionals

- Healthcare professionals should be aware of vulnerable groups who are particularly affected by poor air quality (outdoor, indoor

and workplace) and be provided with the training and resources to advise patients accordingly.

- Health care professionals should be aware of the potential for poor air quality (outdoor, indoor and in the workplace) to cause and/or aggravate common respiratory conditions (e.g. asthma, COPD, HP) and consider whether this is a factor for each patient they care for.
- Patients with respiratory disease that is suspected to be caused or exacerbated by exposure to poor air quality (outdoor, indoor and in the workplace) are likely to benefit from early referral to a clinician with relevant specialist expertise (e.g., asthma, COPD, occupational lung disease, or interstitial lung disease outpatient services).

6.2 Government

BTS strongly supports:

- calls for Government to consult on, implement and monitor updated legal targets that would move the UK closer to current WHO recommendations outlining the levels of air quality that are safe to breathe.

- health charities as well as the DHSC to be key stakeholders within this agenda. Integration with key national policies is key, for example, with both the Levelling up the UK White Paper, and the forthcoming White Paper on Health disparities.

- changes at a national level that will reduce exposure to harmful air pollution and help prevent climate change, including the introduction of low emission zones in urban areas, a move to zero emission road transport, and clean energy production.

- the need for nationally funded research that leads to a better understanding of both the effects of poor air quality on respiratory health, and the factors that can mitigate the impact of exposure.

6.3 The Society's own activities

BTS has a key role in raising awareness of the effects of poor air quality on lung health and will:

- continue with the production of evidence-based guidance;
- continue to support a programme of education for healthcare professionals;
- provide expertise to stakeholder organisations;
- be an active member of relevant national groups, for example UKHACC, Clean Air Champions.

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June 2022

[1] Every breath we take: the lifelong impact of air pollution. RCP London 2016.
[2] Occupational Lung Disease statistics in Great Britain, 2021. HSE website.
[3] Health matters: air pollution 2018. https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution
[4] Department for Transport. Statistical Release - Annual Road Traffic Estimates: Great Britain 2017. July 2018.
[5] RAC Foundation website https://www.racfoundation.org/motoring-faqs/mobility#a1

[6] Government takes historic step towards net-zero with end of sale of new petrol and diesel cars by 2030 https://www.gov.uk/government/news/government-takes-historic-step-towards-net-zero-with-end-of-sale-of-new-petrol-and-diesel-cars-by-2030

[7] Royal College of Physicians. Reducing air pollution in the UK: Progress report. 2018.

[8] Air pollution: Coroner calls for law change after Ella Adoo-Kissi-Debrah's death. BBC News website 21/04/21 https://www.bbc.co.uk/news/uk-england-london-56801794

[9] Every breath we take: the lifelong impact of air pollution. RCP London 2016

[10] World Health Organisation. Ambient (outdoor) air pollution Sept 2021 [Available from: https://www.who.int/en/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health.

[11] Bettiol A, Gelain E, Milanesio E, Asta F, Rusconi F. The first 1000 days of life: traffic-related air pollution and development of wheezing and asthma in childhood. A systematic review of birth cohort studies. Environ Health. 2021;20(1):46.

[12] Katsouyanni K, Zmirou D, Spix C, Sunyer J, Schouten JP, Ponka A, et al. Short-term effects of air pollution on health: a European approach using epidemiological time-series data. The APHEA project: background, objectives, design. Eur Respir J. 1995;8(6):1030-8.

[13] Brook RD, Rajagopalan S, Pope CA, 3rd, Brook JR, Bhatnagar A, Diez-Roux AV, et al. Particulate matter air pollution and cardiovascular disease: An update to the scientific statement from the American Heart Association. Circulation. 2010;121(21):2331-78.

[14] Ashworth M, Analitis A, Whitney D, Samoli E, Zafeiratou S, Atkinson R, et al. Spatio-temporal associations of air pollutant concentrations, GP respiratory consultations and respiratory inhaler prescriptions: a 5-year study of primary care in the borough of Lambeth, South London. Environ Health. 2021;20(1):54.

[15] Air pollution: outdoor air quality and health NICE guideline [NG70] Published: 30 June 2017 https://www.nice.org.uk/guidance/ng70

[16] Air pollution. https://www.blf.org.uk/support-for-you/air-pollution

[17] Outdoor air pollution. https://europeanlung.org/en/information-hub/keeping-lungs-healthy/outdoor-air-pollution/

[18] Air pollution: Coroner calls for law change after Ella Adoo-Kissi-Debrah's death. BBC News website 21/04/21 https://www.bbc.co.uk/news/uk-england-london-56801794

[19] Indoor air quality at home. NICE guideline NG149. Published 08 Jan 2020 https://www.nice.org.uk/guidance/ng149/resources/indoor-air-quality-at-home-pdf-66141788215237)

[20] Knibbs LD, Woldeyohannes S, Marks GB, Cowie CT (2018) Damp housing, gas stoves, and the burden of childhood asthma in Australia. Med J Aust 2018;208:299-302

[21] RCPCH January 2020: The inside story: Health effects of indoor air quality on children and young people; a little excitable; not adults

[22] Indoor air quality at home. NICE guideline NG149. Published 08 Jan 2020 https://www.nice.org.uk/guidance/ng149/resources/indoor-air-quality-at-home-pdf-66141788215237)

[23] About Indoor Air Pollution - the British Lung Foundation https://www.blf.org.uk/support-for-you/indoor-air-pollution?cmp_id=1486843561&adg_id=57808462699&kwd=indoor%20air%20pollution&device=c&gclid=CjwKCAiA0KmPBhBqEiwAJqKK42zdhHG-5n8UqTMIfUnnflmTV_7kpySsKoeQhFwidppu-fxc-2GBEBoCT8kQAvD_BwE

[24] Indoor air pollution. European Lung Foundation. https://www.european-lung-foundation.org/3483-indoor-air-pollution.htm

[25] Allergies – prevention – NHS, (https://www.nhs.uk/conditions/allergies/prevention/

[26] Watson, Bob. 2021. "X01: Labour Force Survey Single-Month Estimates." Office for National Statistics. https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/labourforcesurveysinglemonthestimatesx01

[27] ONS1 https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours

[28] Health and Safety at Work etc Act 1974 – legislation explained (hse.gov.uk)

[29] COSHH basics - COSHH (hse.gov.uk)

[30] Working with substances hazardous to health A brief guide to COSHH. https://www.hse.gov.uk/pubns/indg136.pdf

[31] Fishwick D. Work aggravated asthma; a review of the recent evidence. Br Med Bull. 2014 Jun;110(1):77-88

[32] Blanc, Paul D., Isabella Annesi-Maesano, John R. Balmes, Kristin J. Cummings, David Fishwick, David

Miedinger, Nicola Murgia, et al. 2019. "The Occupational Burden of Nonmalignant Respiratory Diseases. An Official American Thoracic Society and European Respiratory Society Statement." American Journal of Respiratory and Critical Care Medicine 199 (11): 1312–34.

[33] RR858 - Lung cancer - The burden of occupational cancer in Great Britain – Lung Cancer 2012. (hse.gov.uk) https://www.hse.gov.uk/research/rrhtm/rr858.htm

[34] Feary J, Cannon J, Fitzgerald B, Szram J, Schofield S, Cullinan P. Follow-up survey of patients with occupational asthma. Occup Med (Lond). 2020 Jun 20;70(4):231-234. doi: 10.1093/occmed/kqaa049. PMID: 32307530

[35] Fishwick D, Bradshaw L, Davies J, Henson M, Stenton C, Burge S, Niven R, Warburton CJ, Hendrick D, Rogers T, Rawbone R, Curran AD. Are we failing workers with symptoms suggestive of occupational asthma? Prim Care Respir J. 2007 Oct;16(5):304-10. doi: 10.3132/pcrj.2007.00064. PMID: 17934677; PMCID: PMC6634236.rk/

[36] Vandenplas O, Godet J, Hurdubaea L, Rifflart C, Suojalehto H, Walusiak-Skorupa J, et al. Severe Occupational Asthma: Insights From a Multicenter European Cohort. J Allergy Clin Immunol Pract. 2019;7(7):2309-18. e4

[37] Ayres, Jon G., Richard Boyd, Hilary Cowie, and J. Fintan Hurley. 2011. "Costs of Occupational Asthma in the UK." Thorax 66 (2): 128–33.

[38] Barber CM et al. 2022. BTS Occupational Asthma Clinical Statement

[39] Group of Occupational Respiratory Disease Specialists (GORDS). http://www.occupationalasthma.com/occupational_asthma_pageview.aspx?id=6229). Last accessed 23/11/21.

[40] Occupational Lung Disease. https://www.blf.org.uk/taskforce/data-tracker/occupational-lung-disease/occupational-lung-disease

[41] Occupational lung disease https://europeanlung.org/en/information-hub/lung-conditions/occupational-lung-disease/

[42] Surveillance of Work-related and Occupational Respiratory Disease. https://sites.manchester.ac.uk/thor/thor-uk-reporting-schemes/sword/

Useful links:
More information is available on the BTS and Respiratory Futures websites here:
https://www.brit-thoracic.org.uk/about-us/environment-and-lung-health/
https://www.respiratoryfutures.org.uk/data-collections/air-pollution-and-respiratory-health/

Guidance documents and further reading:

Indoor Air Quality at home NICE (NG14)
https://www.nice.org.uk/guidance/ng149/resources/indoor-air-quality-at-home-pdf-66141788215237
This guidance includes specific recommendations for:

1.1 Prioritising indoor air quality in local strategy or plans
1.2 Referrals for a housing assessment
1.3 Raising awareness of poor indoor air quality in the home
1.4 Advice and information for the general population
1.5 Healthcare professionals
1.6 Regulators and building control teams
1.7 Architects and designers
1.8 Builders, contractors and developers
1.9 Rental properties

Indoor Air Quality Guidelines for selected Volatile Organic Compounds (VOCs) in the UK. PHE September 2019
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/831319/VO__statement_Final_12092019_CS__1_.pdf
Table 1 (p6) of this document provides a useful summary of indoor air quality guidelines for selected VOCs in the UK.

RCPCH January 2020: The inside story: Health effects of indoor air quality on children and young people
https://www.rcpch.ac.uk/sites/default/files/2020-01/the-inside-story-report_january-2020.pdf

WHO guidelines for indoor air quality: selected pollutants (2010)

NHS Allergen advice: 'Prevention'
https://www.nhs.uk/conditions/allergies/prevention/
This includes information on house dust mites, pets and mould spores.

WHO guidelines for indoor air quality: selected pollutants (2010)

An executive summary is available here: https://www.ncbi.nlm.nih.gov/books/NBK138699/

UK Indoor Air Quality (Parliamentary PostNote 20210)
https://www.parliament.uk/globalassets/documents/post/postpn366_indoor_air_quality.pdf

The Institute of Air Quality Management (IAQM) Indoor Air Quality Guidance: Assessment, Monitoring, Modelling and Mitigation (Sept 2021)
https://iaqm.co.uk/guidance/