

Improving air quality in UK schools

The issue

Poor air quality in school buildings impacts pupils' and staff health and attention levels.

Poor air quality is the largest environmental risk to public health in the UK.¹ Fine particulate matter (PM_{2.5}) is responsible for a significant proportion of air pollution's health impacts.² These particulate matter pollutants readily enter school buildings and impact indoor air quality there.^{5A} The UK has not yet committed to meeting the 2021 WHO Air Quality Guidelines, designed to protect public health.

UK schools' ventilation rates are low^{5B}, which has been linked to decreased pupil attention and ability to concentrate.³ These ventilation rates are significantly below the UK regulations⁴ specified for most workplaces (e.g. offices) despite schools being workplaces for one million adults.⁵ Low ventilation in classrooms not only leads to increased CO₂ levels but also risks the build-up of a wide range of indoor pollutants which have been linked to a broad range of negative health and cognitive outcomes. UK classroom ventilation is particularly poor in winter, doubling the risk of concentrating airborne viruses⁶ and spreading disease, including to clinically vulnerable groups in schools. Improving classroom air quality significantly reduces illness-related absence during wintertime⁷.

There are currently no requirements to routinely monitor air quality in schools, nor mechanisms to enforce current guidelines. Current guidance for schools (BB101⁸) is outdated as associated ventilation rates in classrooms are low. Some classrooms do not even meet this guidance. Updating and enforcing guidelines is critical to drive improvements in existing school buildings and ensure investment in new buildings recognises the importance of indoor air.

Why it matters

Children are particularly vulnerable to air pollution because they inhale more air than adults in proportion to their body weight, are less able to control their exposure than adults⁹, and pollution can affect developing tissues creating lifelong health implications¹⁰. UK children spend a quarter of their waking hours at school each year, so exposure to poor quality air in school buildings has a significant effect on them, impacting school attendance⁷ and attainment³ and potentially exacerbating health and educational inequalities.

Improving air quality in UK schools would contribute to multiple societal and economic benefits, including **improved public health, improved school attendance and improved educational outcomes.**

Key evidence-based recommendations

- ◆ The UK governments should commit to meeting the 2021 WHO Air Quality Guidelines
- ◆ School air quality guidance should be updated to focus on providing good ventilation and good air quality
- ◆ Interventions to improve school air quality should be provided where evidence demonstrates a need
- ◆ School leaders, staff and unions should be made aware of and advised on good management of school air quality

SAMHE was funded by UKRI to work with schools to provide evidence and improvements in school air quality and link these to health outcomes and educational attainment. SAMHE analysed 38,000 schooldays of air quality data from 346 schools across the UK and published the findings as: ^{5A} [Handy, et al. \(2025\)](#) and ^{5B} [Wood, et al. \(2024\)](#).

References for all other evidence mentioned in this document are: 1 [Public Health England \(2018\)](#); 2 [UK Health Security Agency \(2022\)](#); 3 [Bakó-Biró, et al. \(2012\)](#); 4 [UK Government, Approved Document F \(2022\)](#); 5 [Department for Education \(2024\)](#); 6 [Vouriot, et al. \(2021\)](#); 7 [Noakes, et al. \(2023\)](#); 8 [Department for Education, BB101 \(2018\)](#); 9 [Royal College of Paediatrics and Child Health \(2024\)](#); 10 [UNICEF \(2023\)](#).

SAMHE continues to gather data and currently receives over 100,000 days of data from over 600 UK schools each year. For more details, and hyperlinks to the publications referenced, see www.samhe.org.uk/recommendations.

Research evidence and implications for policy and practice

Findings and evidence	Recommendation
<p>Right to clean air</p> <p>PM_{2.5} levels measured in schools correlate closely with background PM_{2.5} levels measured outdoors, and the data suggests outdoor PM_{2.5} is a major contributor to air pollution in UK classrooms^{SA}.</p>	<p>FAO: UK government and devolved administrations; Secretary of State for Environment, Food and Rural Affairs</p> <ul style="list-style-type: none"> i. Enact a Clean Air Act to establish a legal right to clean air in all four nations of the UK. ii. Develop a clear strategy to meet the 2021 WHO Air Quality Guidelines.
<p>Policy and Guidance</p> <p>BB101 guidance⁸ requires improvement as many classrooms meet the guidance whilst having ventilation rates^{SB} that are far lower than the minimum ventilation rates specified for most workplaces.⁴</p> <p>Schools with pupil numbers above the stated GIAS 'school capacity' exhibited significantly lower per-person ventilation rates^{SB}.</p> <p>The daily mean PM_{2.5} concentration, measured across the schools, was 4.5µg/m³^{SA}. For comparison, WHO annual mean guidance values are currently 5µg/m³.</p>	<p>FAO: Department for Education (and equivalent departments in the devolved nations)</p> <ul style="list-style-type: none"> iii. Update BB101⁸, changing the focus towards achieving good classroom ventilation with consideration to pupil and staff health (e.g. defined as CO₂ concentrations <800 ppm by SAGE during the pandemic) and good air quality (e.g. ensuring classrooms PM_{2.5} levels adhere to WHO annual mean guidance values over the school year). Work with school leaders and other school staff to help them comply with the guidance. iv. Change and enforce legislation to prevent schools and classrooms from exceeding their stated pupil capacity, as exceedance contributes to poor air quality. <p>FAO: School heads/leaders, CEOs and buildings managers</p> <ul style="list-style-type: none"> v. Provide consistent guidance to school staff to manage good ventilation even on cold days, use air quality monitors and consider the air quality impacts of occupant behaviour and building renovations.
<p>Monitoring</p> <p>SAMHE has demonstrated that longitudinal monitoring of school air quality can be achieved at scale, and in a cost effective manner^{SA,SB}.</p>	<p>FAO: Department of Health & Social Care, Department for Education (and equivalent departments in the devolved nations)</p> <ul style="list-style-type: none"> vi. Ensure children's health in schools is protected by establishing regular monitoring of CO₂ (as a proxy for ventilation) and PM_{2.5} in all occupied spaces in all UK schools. Ideally this would also include opportunities for learning about ventilation and air quality.
<p>Building technology</p> <p>Air filters can reduce the concentrations of PM_{2.5} in classrooms by 40%-50% during wintertime. Air filters significantly reduced illness-related absence during the pandemic⁷. Engineering retro-fit technologies, which provide a greater control of ventilation rates, are available both at classroom and building level.</p>	<p>FAO: Department for Education and Department of Health & Social Care (and equivalent departments in the devolved nations)</p> <ul style="list-style-type: none"> vii. Where either PM_{2.5} monitoring indicates air quality is not good, or CO₂ levels indicate ventilation is not good, mitigation measures should be provided for schools. In the first instance, ventilation should be improved, but where this is not possible or sufficient, other measures, such as air cleaners, should be provided. viii. Provide guidance for schools and Local Authorities on what retro-fit/maintenance work can improve air quality (e.g. fixing windows which don't open, cleaning ventilation filters, etc.) <p>FAO: School architects, builders and those who carry out school maintenance</p> <ul style="list-style-type: none"> ix. Ensure new school buildings, and all renovations to school buildings, are designed to achieve good ventilation and air quality, and that the impact of these works on ventilation and air quality are evaluated.