

The inside story: Health effects of indoor air quality on children and young people

Research & Evaluation team

RCPCH and Royal College of Physicians

Children in the UK spend more and more of their lives indoors, and the health impact of the air within our homes and schools must be taken seriously. This report is based on a systematic review of the science of indoor pollution, and conversations with children, young people and families. We make recommendations for Government and local authorities, and provide guidance for families.



Highlights from 'The inside story'

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Introduction

Air pollution has been linked to serious health conditions such as cancer, asthma and cardiovascular diseases. Children are spending more and more of their lives indoors, and the health impact of the air within our homes and schools needs to be taken seriously as a

significant source of ill health.

We did a systematic review to find scientific studies about effects of indoor pollution on children's health. A group of experts worked together to review the evidence and formulate recommendations for action. The RCPCH &Us engagement team visited youth centres, schools and paediatric clinics in hospitals, speaking with over 200 young people and their families about indoor air quality. Young people, parents and carers came together to identify the common themes and experience that were shared.

The Inside Story reports the findings and recommendations from both the experts and young people. It explains evidence and advice about how we should ensure indoor air quality does not pose a health risk to children.

[Download the full report below](#)



Royal College
of Physicians

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What did we find?




The indoor air, and the pollutants present, are the result of a complex set of factors. The air quality changes from building to building, place to place, over time, and in response to the activities taking place indoors. The main way people are exposed is by inhaling pollutants, but they can also be ingested or absorbed through the skin.

Chapter 4 of *The Inside Story* explains these factors in more detail including the impact of:

- **Construction materials:** materials used to construct and decorate buildings are long-term sources of 'VOCs' (air-borne chemical compounds) and formaldehyde. Many furnishings are treated with flame retardant chemicals.
- **Building design:** buildings are becoming more airtight to improve energy efficiency. Improved insulation must allow for adequate ventilation to prevent pollutants building up.
- **Occupants:** large, rapid changes to air quality can be caused by the activities of the people inside. Fires, candles and cooking creates small particles, gases, and VOCs. Products we use for cleaning and cosmetics also release VOCs into the air. Activities such as cooking, showering or drying clothes indoors cause moisture and can lead to damp or mould.

Over 80% of the research our search found were about the links between indoor pollution

and children's respiratory health. There is some evidence of links other conditions. Chapter 5 of *The Inside Story* summarises the evidence and causes for three age-groups of children.

	<p>Birth and infancy</p> <ul style="list-style-type: none">• Respiratory problems – wheeze, rhinitis, atopic asthma, respiratory infections• Low birthweight and pre-term birth
	<p>Pre-school</p> <ul style="list-style-type: none">• Respiratory problems – wheeze, allergies, asthma, risk of respiratory diseases and pneumonia• Eczema and atopic dermatitis• Greater hyperactivity, impulsivity and inattention
	<p>School age</p> <ul style="list-style-type: none">• Respiratory problems – wheeze, rhinitis, asthma, throat irritation, nasal congestion, dry cough• Eczema, dermatitis, conjunctivitis, skin and eye irritation• Reduced cognitive performance, difficulty sleeping

In England, around 170,000 new homes were built in 2018/19. These are the minority; most homes already exist and will do so for many years to come. Older buildings can contain materials that are highly polluting, and they are also more likely to contain older furnishings and appliances.

There are ways to remove sources of indoor pollution from buildings, and strategies that can help reduce the effect of unavoidable pollutants. These are discussed in Chapter 6 of *The Inside Story* and include:

- **Ventilation:** This is needed so people can breathe and have a comfortable indoor environment. It can range from very simple, such as opening windows, to complex mechanical systems and filters. Ventilation is the main way of diluting or removing

pollutants from buildings.

- **Legislation:** Legislation has been used to regulate dangerous substances such as asbestos or radon, but this has mostly been in response to extensive evidence of serious health effects. The report suggests taking a precautionary approach to regulate new substances and materials until there is evidence of their safety.
- **Building regulations:** Current regulations place emphasis on energy efficiency and contain few specific standards for air quality. There are recommended minimum levels of air flow through a building, but there is evidence from the UK that of homes which do not meet these standards.

What changes are needed?

People face difficult choices to find a balance between affordable warmth and good indoor air quality. And few of us choose the different materials used in the construction of our homes. Families with the least means also have the least choice over their housing, and this means they may face a greater health burden from pollutants.

The responsibility for clean air cannot solely rest with individuals. Different professions and parts of government must work together to make sure that buildings are fit for purpose.



Illustration by Maya, age 11

The working group recommended that the **Government and local authorities should:**

- Develop a national strategy, set indoor air quality standards, and have a national body to lead on indoor air quality
- Introduce emissions labelling of household products and building materials
- Give clear information for the public, local authorities, building professions and child health professions
- Establish a process for people in rented and social housing to report indoor air quality problems. Provide assistance for necessary improvements

Every home is different, and individuals should follow any guidance given for their home. But it may help for **individuals to consider**:

- Not smoking, or allowing others to smoke, in your home
- Regularly cleaning and vacuuming to remove dust
- Using ventilation during and after cooking; use of cleaning and cosmetic products; and other activities that create moisture or pollutants
- Increasing ventilation in new homes, after re-decorating, or with new furniture

Future research should prioritise studies of health outcomes for children, and collecting measurements of indoor air quality in more homes and schools.

What did children and families tell us?

Children, young people, parents and carers told us that lots of people don't really understand indoor air pollution, they don't know where to get information about it and they are confused about what they can do.

Here are some of their views:

The infographic consists of an orange rectangular box with white text. At the top, the title "Things that make the air dirty" is written in a bold, sans-serif font. Below the title, there are two columns of text, each listing different sources of indoor air pollution. The first column lists: "Mould", "Gas", "People smoking", "People spraying", and "Cooking smells". The second column lists: "Dust", "Carbon monoxide", "Cleaning products", "Nail varnish", and "Body smells". Below these two columns, there is a decorative horizontal line made of 20 small white dots. At the bottom of the box, the text "Source: RCPCH &Us voice bank 2019" is written in a smaller font.

Mould	Dust
Gas	Carbon monoxide
People smoking	Cleaning products
People spraying	Nail varnish
Cooking smells	Body smells

Source: RCPCH &Us voice bank 2019

Ideas to make the air cleaner

Opening windows
(fresh air in)

Closing windows
(keep dirty air out)

Dehumidifiers

Air purifiers

Cleaning more

Air flow in kitchens

Plants in the house

No carpets

Cleaning products
(chemical free)



Source: RCPCH &Us voice bank 2019

Children, parents and carers shared experiences about their homes and schools, about their health, and about how they can't always make changes in their homes:

We have black mould in the bedrooms. My parents are really worried, they clean it off every couple of months but it comes back. It affects our skin and we breathe it in... the whole family has eczema now.

I know about air pollution from cars, but I haven't thought about indoors before.

I am surprised that some cleaning products are bad for air quality though.

I don't like to be cold... I want the council to put ventilation in the kitchen, so I don't have to open the window.

Children and young people wanted:

1. Government to make sure there is clear, factual and accessible information about indoor air pollution
2. This information to be shared in lots of different ways
3. GPs and clinicians to give children and families advice on their home, if they have health problems that are getting worse because of poor quality air indoors
4. Government to make rules that control products that contribute to poor air quality

The working group

The RCPCH and RCP established an Indoor Air Quality Working Group for this work, bringing together experts from a range of specialities to investigate the evidence around indoor air quality and to propose steps to protect the health of children.

Name	Qualifications
Professor Stephen Holgate – Chair of the project group	CBE, FRCP, FMedSci. Medical Research Council Clinical Professor at the University of Southampton and Honorary Consultant Physician, Special Advisor for the Royal College of Physicians (RCP) on Air Quality and UKRI Clean Air Champion

Name	Qualifications
Professor Jonathan Grigg – Chair of the project group	MD, FRCPCH, FFPH. Professor of Paediatric Respiratory and Environmental Medicine at Queen Mary University of London
Dr Benjamin Jones	MEng, EngD, PhD. Associate Professor at the University of Nottingham Department of Architecture and Built Environment
Dr Marcella Ucci	DiplArch, MSc, PhD. Associate Professor in Environmental and Healthy Buildings at the Bartlett's UCL Institute for Environmental Design and Engineering, University College London
Professor Paul Cullinan	MD, FRCP, FFOM. Professor of Occupational and Environmental Respiratory Disease at Imperial College, and a consultant in lung diseases at Royal Brompton Hospital
Professor Anne Greenough	MD (Cantab), FRCP, FRCPCH. Professor of Neonatology and Clinical Respiratory Physiology King's College London and Honorary Consultant Paediatrician, immediate past Vice-President (Science and Research) at the RCPCH
Ms Briony Turner	FRSA, pgFRGS, AIEMA. Climate Services Development Manager at Space4Climate group, National Centre for Earth Observation and doctoral researcher at King's College London
Professor Hasan Arshad	MBBS, DM, FRCP. Head of the Asthma, Allergy and Clinical Immunology Service at University Hospital Southampton, and Professor of Allergy and Clinical Immunology at the University of Southampton and Director of David Hide Asthma and Allergy Centre, Isle of Wight
Professor Alan Short	MA, PhD (Cantab), Dipl'Arch. The Professor of Architecture (1970) and Vice President of Clare Hall, University of Cambridge
Professor Sotiris Vardoulakis	PhD, FIEnvSc, FIAQM. Professor of Global Environmental Health at the Australian National University; previously Director of Research at the Institute of Occupational Medicine in Edinburgh, UK
Professor Tim Sharpe	BSc, BArch, PhD. Professor of Environmental Architecture, MEARU, Glasgow School of Art
Dr Mike Holland	BSc, PhD. Ecometrics Research and Consulting (EMRC)
Dr Nicola Carslaw	BSc, MSc, PhD. Professor of Indoor Air Chemistry in the Department of Environment and Geography at the University of York
Dr Sani Dimitroulopoulou	BSc, DIC, PhD. Principal Environmental Public Health Scientist on Indoor Environments, Public Health England (PHE) and Honorary Senior Lecturer, The Bartlett School of Environment, Energy and Resources, University College London

Name	Qualifications
Professor Paul Linden	MSc, PhD, FRS. Professor of Fluid Mechanics in the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge

Downloads

[The inside story: health effects of indoor air quality on children and young people \(January 2020\)](#) 2.47 MB

[Effects of Indoor Air Quality - Stage 1 - systematic review scope.pdf](#) 217.43 KB