RCPCH policy report

Clean air, healthy childhoods: Innovative clinical responses to environmental health inequalities

RCPCH Clean Air Fund partnership

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RCPCH
Royal College of Paediatrics and Child Health
Leading the way in Children's Health

Contents

This project is funded by the Clean Air Fund, a global philanthropic organisation dedicated to tackling air pollution. You can read more about our partnership on our Air Pollution Companion.

Foreword

The environments in which children grow up have a profound impact on their health, development, and life course. Across the UK, environmental challenges such as air pollution, housing insecurity, and overcrowded living conditions continue to undermine the wellbeing of countless children and young people. These are not abstract issues; they are daily realities for families who are often already navigating the pressures of poverty, disadvantage and marginalisation.

As clinicians, we are increasingly witnessing the health consequences of these conditions: chronic respiratory symptoms, disrupted development, and preventable hospital admissions. Overcrowded homes drive the spread of respiratory infections and increase exposure to indoor pollutants. Damp, mould, poor ventilation, and unsafe infrastructure have become more than just housing concerns – they are urgent public health issues.

The Clean Air Clinics profiled in this report stand as a testament to what is possible when we look beyond symptoms to the root causes of illness. Their work highlights the growing recognition within our profession that healthcare must respond not only to disease but also to the conditions in which health is made or lost.

This report provides compelling evidence that clinicians are both willing and well placed to address the environmental determinants of health. It also underscores the urgent need for systems, funding and policies that empower us to act effectively on behalf of the children and families we serve.

Dr Helena Clements, RCPCH Officer for Climate Change

"Clean air is not a privilege, it's a right we all deserve for our health and our future."
Young person participating in Kaizen report

Children and young people surveyed by RCPCH &Us have demonstrated just how aware they are of the health implications for themselves and others caused by poor air quality. They voiced strong beliefs on clean air as a human right and the need for the people in power to do more. Furthermore, their desire for education and advocacy for clean air presents a timely opportunity for clinicians and policymakers to rethink how air pollution is addressed in clinical practice. Incorporating young people's voices is crucial, and clinicians have a central role to play in translating concerns into practical action.

Executive summary

This report explores how environmental factors impact child health and how Clean Air Clinics are addressing these challenges. It combines findings from interviews with clinic teams, a survey of paediatricians, and engagement with children, young people, and families. The aim is to highlight the opportunities, challenges, and transferable practices that can inform future models of care.

In this report we identify several key findings:

Impact of Clean Air Clinics

The clinics at Alder Hey and Royal London demonstrate how a dedicated, multidisciplinary approach can address the environmental determinants of health. Through personalised reports, collaborative advocacy, and extended, dedicated consultations, the clinics have supported families in securing improved housing and reducing exposure to harmful environmental conditions.

Sector-wide challenges

Socioeconomic deprivation, poor housing conditions, and high pollution exposure are significant barriers to good child health. These issues are often unaddressed in routine care due to time constraints, limited training, and systemic resource pressures.

Systemic and operational limitations

The current models rely on charitable and academic funding, research integration, and a small number of expert clinicians. Without sustainable funding and dedicated training, replication across the NHS remains a challenge.

Opportunities and transferable practices

The clinics offer valuable insights into cross-sector collaboration, holistic assessment, and patient empowerment. These can inform future practice across paediatric services, even without dedicated clean air teams.

Clean Air Clinics provide a compelling example of how environmental health can be integrated into child health services. Whilst their models may not be universally scalable at this stage, they provide vital insights and demonstrate how clinical services can meaningfully address the upstream determinants of health while supporting families in practical ways by using tools that all child health professionals could adopt. As this report highlights, the cost of inaction – on air pollution, poor housing, and child health inequalities – is too high to ignore.

Summary of recommendations

For UK governments and administrations:

- Enact a Clean Air Act ensuring legal rights to clean air
- Meet 2005 WHO Air Quality Guidelines
- Expand Awaab's Law across the UK to cover private renters
- Fund air quality monitoring in schools and empower councils to act on breaches

For Local Authorities and housing teams

- Improve housing conditions with faster response to mould and damp complaints.
- Forge stronger partnerships with healthcare services.

For Boards, Trusts and Integrated Care Systems:

- Pilot 'hub and spoke' models to link specialist clinics with local services.
- Allocate time for detailed consultations and housing advocacy.

For Royal Colleges and medical schools:

- Embed environmental health in core curricula
- Encourage research, CPD and education on environmental health across specialities
- Use RCPCH Air Pollution Companion to upskill healthcare professionals to have conversations with children and families on the impact of air pollution and the "talking to patients about air pollution" module of simulated conversations with children, young people and families.

For clinicians:

- Incorporate environmental history into routine care
- Complete accredited CPD activity on environmental impacts on health and health inequalities
- Use evidence-based tools to advocate for healthier environments

Background

Air pollution is now the second leading risk factor for death in children under five globally and in the UK, surpassed only by malnutrition.[1] Pollution exposure in childhood has not only acute effects but impacts across the life course. This health burden falls disproportionately on children in deprived communities, where exposure to poor air quality and substandard housing is greatest.[2]

Despite growing awareness of these risks, environmental health remains an under-addressed determinant of child health. Many paediatric services lack the resources, expertise, or capacity to tackle the intersection of poverty, housing, and pollution. This report evaluates how two pioneering Clean Air Clinics – based at Alder Hey Children's Hospital and The Royal London Hospital – have responded to this challenge with innovative, preventative, and holistic care.

Environmental challenges significantly impact the health and wellbeing of children, young people, and their families, with families in lower income communities disproportionately affected by poor air quality and poorer housing.

Deprivation and poor housing conditions

Housing insecurity, overcrowding, and unsafe living conditions are well understood social determinants of health, with serious impacts on development and wellbeing. Overcrowded living spaces increase dust and particulate matter in the air and contribute to the spread of respiratory infections. Unsafe housing, which may include structural hazards, poor ventilation, damp and mould, and exposure to toxins such as asbestos or lead, poses significant risks to child health.[2]

Limited financial resources make it harder to afford necessary repairs, such as addressing damp and mould, and to move to healthier environments or access necessary healthcare. These living conditions are strongly linked to respiratory illnesses, particularly in children with pre-existing conditions like asthma, further exacerbating disparities in health outcomes.[2]

London and Liverpool

It is estimated that in England, 1.5 million dependent children are living in homes that fail to meet the Decent Homes Standard[3] and in many areas (including London and Liverpool) air pollution levels exceed the World Health Organisation guidelines and European Union legal limits for nitrogen dioxide (NO2) and particulate matter (PM2.5).[4, 5]

Alder Hey Children's Hospital is based in West Derby, Liverpool. Liverpool is ranked as the third most deprived local authority in England, with 63% of residents living in areas among the most deprived nationally. Additionally, 32.3% of children under 16 years old live in low-income families.[6] Research from the Environmental Research Group at King's College London estimates that roadside air pollution in Liverpool stunts lung growth in children by 4.6%.[7]

The Royal London clinic is based in Whitechapel, in the London Borough of Tower Hamlets. As of 2021/22 approximately 33% of children in London, equating to around 700,000 children, were living in relative poverty after housing costs. This rate is notably higher than the national average of 29%. The disparity among boroughs is pronounced; for instance Tower Hamlets reports that 48% of children live in poverty, while Richmond upon Thames has a rate of 12%.[8]

Economic impact

Air pollution is not only a public health crisis but also a major economic burden. Globally, outdoor air pollution costs an estimated $2.9 trillion US dollars annually,[9] with UK-specific losses amounting to 2.6% of national GDP. [10]

In the UK, NHS and social care costs linked to fine particulate matter (PM2.5) and nitrogen dioxide (NO2) reached £42.88 million in 2017, rising to £157 million when including diseases with emerging evidence of association.[11]

Methodology

Aim

This report aims to explore how environmental factors – particularly air pollution and housing conditions – impact child health, and to assess how two novel Clean Air Clinics address these challenges. Through an in-depth evaluation of clinic models, clinician and patient experiences, and wider system barriers, the report identifies opportunities, challenges, and transferable practices to inform broader integration of environmental health into paediatric care.

Data collection methods

Structured interviews with existing Clean Air Clinic teams: we conducted video interviews using a semi-structured approach across both clinic teams (Appendix A). We spoke to three consultants in paediatric respiratory medicine, three specialty registrars currently undertaking research posts, and one paediatric respiratory advanced nurse practitioner.

Questionnaire of interested child health professionals: online questionnaire (Appendix B) disseminated via email, RCPCH member bulletins and specialty groups. The 24 respondents to the survey represented all four nations. They demonstrated a variety of roles and experience, with a mixture of respiratory subspecialists and general clinicians. 16 held consultant posts, one SAS doctor, five specialty registrars and one resident doctor, as well as one respiratory physiologist.

Children and young people (CYP) engagement: RCPCH &Us (the College's CYP engagement team) conducted in-person interviews using a semi-structured approach (Appendix C) to ascertain the understanding and perceptions of the service by CYP and families.

Data analysis

The transcripts from interviews with the clinic clinicians were reviewed manually, as well as by Microsoft Copilot, to produce a summary of key themes. We then conducted a comparative analysis to identify similarities and differences between the clinic approaches.

The qualitative and quantitative responses from the clinician survey were analysed providing information on role/seniority, geographical data and key observations around suitability of patient cohort, as well as the various asks for support and resources.

The RCPCH &Us team provided anonymised thematic responses based on their extensive engagement experience, as well as verbatim insights from CYP and families.

Findings

Impact of Clean Air Clinics

The clinics were both launched by clinicians with significant expertise and standing in air pollution research and policy. Their influence in initiating a novel service, and skills in both shaping and promoting the service, remains pivotal.

The initial education for clinicians consulting with families took committed supervision from the subject matter experts, as well as dedicated time for the specialty registrars on the receiving end. This was generated by their PhD programmes and projects having inbuilt clinical time.

The content of questionnaires, letters, and reports is based upon evolving evidence. The impact of referencing published research has been notable but requires the teams to remain up to date with a changing landscape to ensure maximal impact.

Submission of the patient reports to local services and bodies felt to be influential enough to enact change has taken careful navigation of organisational hierarchy and establishment of relationships locally. This is another example of the requisite for expertise, time commitment and hard work to build effective foundations for instigating real change.

Both clinics work in slightly different ways to achieve their aims which are exemplified in the case studies below:

Alder Hey Clean Air Clinic

Establishment of the clinic

The clinic at Alder Hey was established to address the impact of environmental factors, particularly poor housing conditions, on children's respiratory health. Traditional respiratory clinics primarily focus on medical management but often do not have the capacity to address broader issues that contribute to chronic conditions such as asthma. By creating a dedicated clinic, the aim was to provide targeted support to families facing housing-related health challenges, improving patient outcomes through a more holistic approach.

The initiative was led by Professor Ian Sinha, a paediatric respiratory consultant, who identified a critical gap in care. He observed that a significant proportion of his work involved addressing environmental and housing issues. Contacting landlords and social housing agencies on behalf of patients was both time consuming and disruptive to the flow of his clinics. The standard practice of incorporating a generic paragraph regarding housing conditions into a medically focused clinic letter was felt to have little to no impact.

Professor Sinha identified several patients in urgent need of intervention and immediately integrated them into the new service. Initially, air quality monitors were introduced as part of the clinic's approach, however early data was felt to provide little additional insight beyond what clinicians and families already knew. As a result, the focus shifted towards direct patient interactions and practical solutions tailored to individual housing conditions.

How is the clinic funded?

The clinic is funded primarily through Alder Hey and operates as part of Professor Sinha's regular clinic sessions, with no extra external funding. To sustain operations, resources and time have been carefully managed. Professor Sinha intentionally avoided establishing a formal business model to maintain flexibility and independence, preventing the clinic from being bound by external funding requirements or obligations. As a result, the clinic's exact operational costs have not been fully defined, and no comprehensive health economics analysis has been conducted. Whilst this has allowed short-term operations, ensuring the clinic's continued viability and expansion may require securing external funding or exploring a formal business model in the future.

How is the clinic run?

Staffing

The services at the Alder Hey are overseen by Professor Sinha, with clinic consultations carried out by Professor Sinha or one of two specialty registrars as part of PhD work.

Referral and preparation

Patients at Alder Hey are referred through multiple pathways (such as health visitors, GPs, Emergency Department, and paediatric clinics) – there are purposefully no formal referral criteria. Currently, Alder Hey operates a clinic once a month using a mixed model of in-person and video consultations depending on the family's circumstance and preferences.

Assessment and review

Clinician preparation for patient encounters involves collating investigations, hospital attendances, and referral information, typically taking between 20 and 60 minutes. The appointment itself lasts approximately one hour. During the appointment a full environmental and medical history is obtained. In addition, video calls enable the team to visualise the home environment, focusing on problematic areas such as damp, mould, ventilation, and smoking/vaping, as well as travel and transport. Families are asked to provide photographic evidence to include in the written report.

What are the clinic outputs?

The purpose of the clinic is to make practical change to patient's lives by producing a powerful report linking health and environment. The report is robustly evidenced: linking the patient's history with the environment in which they live, as well as presenting the foundational research. The report shows that the environment in which the patient lives is detrimentally affecting their health, and that there is therefore a strong medical imperative for the family to be rehoused. This report is given to the family, and or sent directly to the relevant housing association.

Royal London Clean Air Clinic

Establishment of the clinic

The clinic was developed to integrate environmental health research into clinical practice, providing targeted care based on findings related to air pollution exposure.

The initiative was led by Professor Jonathan Grigg, a researcher in air pollution and child health, whose involvement in the case of Ella Kissi-Debrah highlighted the need for clinical services addressing environmental health. Alongside Dr Abigail Whitehouse, a paediatric respiratory consultant and senior clinical lecturer, they worked to establish a dedicated clinic focusing on the intersection of pollution and respiratory health.

The clinic monitors pollution levels and their effects on patients, particularly those with asthma. It assesses both outdoor and indoor pollution exposure. It aims to provide data-driven assessments of environmental exposure risks and potential mitigation strategies.

How is the clinic funded?

The Royal London Clinic is currently funded by a healthcare innovation grant from Bart's Charity. The funding allowed for the hiring of a full-time clinical fellow who balances research commitments and service delivery roles, making it challenging to estimate the clinic's exact operational costs. The funding was due to end in July 2025 but currently has a no-cost extension until July 2026. The clinic team believes that three more years of funding are necessary to assess its long-term viability and impact. Efforts are underway to explore further funding options and to evaluate the minimum personnel needed for effective service delivery in future funding applications.

How is the clinic run?

Staffing

The services at the Royal London are overseen by Professor Grigg and Dr Whitehouse, with consultations conducted by Dr Whitehouse or a specialty registrar as part of academic work. There is the intention to employ a research nurse, as well as establishing a revolving registrar-level training post, allowing them to address clinician training needs within the clinic service. Currently, Royal London operates clinics once per month.

Referral and preparation

Patients at Royal London are referred via health visitors, GPs, Emergency Department, and paediatric clinics. There are broad referral criteria (e.g. children aged 3-18 with background chronic respiratory conditions). The clinic takes place monthly, with a specialty registrar undertaking careful review of the medical and social history from the notes. Clinician preparation for appointments takes 20 to 60 minutes, and patients complete an environmental health questionnaire in the waiting room.

Assessment and review

The appointment itself lasts approximately one hour and is in-person at the Royal London Hospital – this includes a full medical history and examination. Following this, there is a home visit to deliver and set up portable air quality monitors (which will be used over a three-day period), take relevant

environmental photographs and conduct mould sensitisation tests. A separate appointment for mould blood tests is arranged, and children are brought back to clinic for follow up.

What are the clinic outputs?

The intention is that the accumulated information will create a picture of a child's risk, and that the data can be used to inform bespoke recommendations on reducing exposure and supporting housing and lifestyle changes. At a research level, the clinic intends to add to the evidence base around child health and air pollution exposure.

Sector-wide challenges

This section presents the key themes that emerged from across the interviews, surveys, and youth engagement activities. It outlines the most pressing challenges in environmental child health, highlights the impact and potential of Clean Air Clinics, and identifies lessons that can be shared across services.

Both the interviews with clinicians and the survey of healthcare professionals highlighted the significant environmental challenges present, and the impact they have on providing effective care.

Socioeconomic deprivation

Socioeconomic deprivation significantly exacerbates environmental challenges. The trend across healthcare practices was that families in lower income communities are disproportionately affected by poor air quality and poorer housing. Furthermore, their limited financial resources make it harder to move to healthier environments or access necessary healthcare, exacerbating health inequalities.

A premature baby seen in the clinic had been living in temporary accommodation for over a year. The mother struggled to contact the landlord for improvements. With support from the clinic, the property was contacted, and quoting a professor's name proved influential. While the baby has not yet moved, the family is now connected with the necessary organisations to address their housing situation.
Source: CAC clinician

Poor housing conditions

The prevalence of poverty, including fuel poverty, in deprived areas witnessed by clinicians across many areas of practice has meant that many families cannot afford repairs necessary to address damp and mould. These conditions were seen as strongly linked to respiratory illnesses, particularly in children with pre-existing conditions like asthma, amplifying disparities in health outcomes.

A young girl with a chronic cough showed clear evidence that her home environment was affecting her health. Her symptoms improved when she stayed with her grandparents and worsened upon returning home. The first report sent to the housing association resulted in no action. After meeting the family again, the Clean Air Clinic team sent another letter, leading to a decision to rehome them. However, the initial plan was to relocate them far from school and their support network. Through advocacy and perseverance, the clinic ensured the family was rehomed closer to their community.
Source: CAC clinician

One child in the severe asthma clinic continued experiencing frequent exacerbations and hospitalisations, even during periods like the COVID-19 pandemic and summer holidays when other children's symptoms improved. In fact, his condition worsened during lockdown because he was confined to his home environment, suggesting that something about the indoor air quality was driving his symptoms.
Source: CAC clinician

Systemic and operational limitations

Healthcare access challenges

Both teams identified the need for interpreters to ensure equitable access to services for non-English speaking families. Whilst this is not unique to clean air clinics, the importance of gathering and delivering clear information is heightened by the necessity for detailed understanding of behavioural and economic factors, which are key to effective management.

Also notable are the pronounced health literacy challenges in the population served by the clinics. The association between air pollution and significant socioeconomic deprivation means there is often a lack of understanding about environmental health more generally. This reinforces the need for enhanced time commitment, detailed written and verbal communication and careful creation of appropriate resources. Professor Sinha, who led the development of the Alder Hey Clinic, has done concurrent work rolling out a network of 'parent champions'. Embedded in under-served populations, primarily tackling bronchiolitis, they are educated about a broad range of topics including air pollution to try and improve understanding and health behaviours in their local community.

Complexity of cases and unmet needs

Common challenges facing paediatric clinics are high referral volumes and increasingly complex patients which require extensive resources. Each clinical consultation is time consuming, both to elicit history, data and evidence and to appropriately write up, initiate action and follow up.

In discussing their patient cohort, respondents to our survey mentioned the volume of asthmatic patients, suggesting the 'asthma and difficult asthma' clinical subgroup as a target population. They recognised the complexity of managing environmental triggers in patients with chronic respiratory conditions and highlighted the role of a holistic approach to improving health.

67% (16 respondents) confirmed interest in setting up a Clean Air Clinic, citing understanding of the health burden of both indoor and outdoor air pollution on their population. Many recognised that deprivation has a considerable impact upon their clinical workload, with child poverty directly linked to air pollution.

"We live in a highly industrialised area, with poor air quality and high levels of deprivation. As a respiratory paediatrician, clean air forms part of the puzzle that has been difficult to solve for us."
Survey respondent

Financial barriers and constraints

Whilst the clinics have operated with different funding models, both have utilised the personnel resource generated by being part of research active institutions. Without PhD clinicians staffing the clinics, they would not have capacity to offer the time intensive appointments and follow up needed to demonstrate positive outcomes. Without thorough economic analysis, the commissioning of a novel, standalone service is unlikely to be possible in the majority of Trusts/Health Boards.

Similarly, the research association (specifically in London) has allowed use of portable air pollution monitors, whose current cost, maintenance and efficacy is likely to make them ill-suited to use in every clinical setting at present.

For many clinicians embedding some of the skills, knowledge and methods exhibited by the clean air clinic teams into routine clinical practice is likely to be the only way of delivering improved environmental healthcare without dedicated funding. However, Trusts/Health Boards should be encouraged to explore prolonged appointments and novel scheduling to facilitate the detailed consultation and planning required for effective intervention.

"Absolutely no money in our systems to support anything other than emergency care for adult medicine! (which is on it's knees). Being financially coupled to a system that includes adults from a deprived community means that children are usually fourth or fifth in line for investment."
Survey respondent

"Investing upfront and actually taking time to really tie these things together will save you time [in the long run]."
CAC clinician

Opportunities and transferable practices

Effective health and housing cross-sector working

Interdisciplinary and community collaboration is a key strength of the services, with clinics working alongside healthcare providers, local authorities, housing associations, and community stakeholders. This collaboration enhances the service's ability to address the multifaceted determinants of health and ensures a holistic approach to patient care.

CYP and parents described the challenges of the multi-agency involvement needed to enact change in housing and environment. They discussed the need for stronger collaboration between multiple public services to address the complex needs of families affected by environmental health issues. Currently there are delays in support to move, frequent upheavals and issues with substandard temporary accommodation. Families are often scared to raise issues of substandard housing due to fear of eviction:

"The threat of being homeless or living with the mould."
RCPCH &Us - voice of children, young people and families

They found some housing services to be dismissive of complaints around conditions:

> ***"It's trying to make sure your letter falls into the right hands...we've had a couple of situations in the Clean Air Clinic where we've sent them out to a housing agency, but then it's sat...on someone's desk quite low down, someone who's not really got the responsibility."***
> CAC clinician

Both services have established strong links with influential actors at housing agencies to accelerate rehousing requests. Where previously clinicians were sending generic housing letters to authorities, the combination of personalised, evidence-citing reports and more influential points of contact within housing and council organisations has led to faster and more productive interventions.

> ***We have seen quite a few refugees/asylum seekers who have struggled with the housing system. Although the timeframes can seem long – e.g. 7 months to move house – compared with the norm of two years, this is a big win.***
> CAC clinician

One of our parent champions visited a family (mum, dad, 2 year old and 4 week old baby). Mum had a c-section scar and was sleeping in the same bed as a kicking toddler because the rest of the house was uninhabitable e.g. water coming in and short circuiting sockets. The parent champion worked with the clean air clinic team and children's centre. We got the fire service out who condemned the property and sorted out temporary accommodation overnight. We contacted the local council. Professor Sinha spoke to their MP and booked them in for a follow up appointment the following week.
Source: CAC clinician

Flexibility and a holistic approach

CYP felt strongly about ensuring flexibility, and a holistic approach. They discussed the importance of accessible and affordable healthcare more broadly, including transportation and childcare support. The challenges of attending in-person appointments within working/school hours were felt to be significant, particularly with clinics occurring at tertiary centres necessitating travel from a wider radius:

> ***"Cost of additional transport from school to hospital can be a burden."***
> RCPCH &Us - voice of children, young people and families

Attendance during school time was felt to be a balance between missing more education time versus parents avoiding the need to coordinate childcare for siblings. As a result, phone and virtual appointments were considered useful alternatives or adjuncts. The clinic's prolonged appointment times, flexible scheduling and use of standardised tools mitigate these to an extent not possible in routine clinical practice.

Empowering patients

The case studies above highlight the enormous personal impact and potential of the services. Alongside the milestone of changes in accommodation that the clinics have achieved, the broader education

offered around environmental determinants of health also returns ownership of their wellbeing to families and young people.

The existence of targeted clinics helps to validate the concerns of families. Having clarity on the links between housing and health reduces the associated stigma:

"Other services dismiss the issue and don't believe us about mould and health."
RCPCH &Us - voice of children, young people and families

"We're here because we know that housing is terrible, and it can really impact health. They're just like oh, someone believes me."
CAC clinician

The clinics have served to amplify understanding amongst both clinicians and patients, with increasing community awareness a notable co-benefit. The manner in which the clinics actively reach out to combat housing issues, establishing links with social services and housing providers, is of ongoing benefit that will likely snowball with longevity and increased uptake.

Empowering clinicians

The clinicians involved also discussed at length the positive impacts of the clinics upon their training, knowledge and future practice. Combining thorough medical and social history with holistic multidisciplinary working demonstrates skills applicable across paediatric training. At a personal level this has allowed paediatric trainees to effectively meet many Progress+ curriculum objectives:

"I do think there are lots of areas of the curriculum that this kind of service does cover... communication aspects and working with families advocacy. There's [also] a big part about the health promotion."
CAC clinician

Specialty registrars in both clinics have been actively involved in collating and contributing to academic research. Using the best and most current evidence has been instrumental in influencing local authorities, as well as educating patients and colleagues. Alongside improving outcomes for individual patients, collecting data and expanding the evidence base allows the clinicians and services to affect population level change. Equipping clinicians with the knowledge and time to act on the growing intersection of climate change, poverty, and health reduces the commonly cited feeling of helplessness and creates space for hopeful action in the face of daunting complexity.

"I love it. I think it's been really helpful for me for multiple reasons. The way that we set up our clinic to spend time with families and go through every aspect of their house, I think I've got a much deeper understanding of the drivers of poor housing quality as well as how that impacts respiratory health. And learning a lot more about the phenotypes of children who present because of environmental problems.."
CAC clinician

"I think really you can see the difference you can make with a very holistic kind of approach and looking at the problem in a family-centred way."
CAC clinician

"We've had one woman who's been able to show her landlord our letter, after spending months trying to get in touch with them. Then one week later he's come out, done a survey and said we need to do XYZ to fix it."
CAC clinician

Potential ways to share knowledge

Both clinicians surveyed and those working in Clean Air Clinics had ideas for the transferability of positive outputs from the clinics. There was general acknowledgement that tertiary centres possess resources and influence not necessarily available to primary and secondary care, but a suggested option would be a 'hub and spoke' model, where the tertiary centres could support smaller centres e.g. with monthly online housing and health MDT's. Whilst tertiary centres should already have the flexibility to provide specialist clinics where needed, secondary and primary care might need support with business cases to redistribute resources towards environmental health.

"We recognise as clinicians that clean air is important for children and healthcare workers are often well placed to detect this and provide appropriate advice."
Survey respondent

"I am a respiratory consultant, and we do see effects of pollution. Sadly, we are somewhat overwhelmed and simply don't have the time to do this but we would love to start this going."
Survey respondent

"Clean air issues should be integrated into the current clinic model not a specific clinic."
Survey respondent

All Clean Air Clinic clinicians agreed that education around environmental and social determinants of health were key outcomes of the clinics. This could include educating allied health professionals and working with partner organisations (such as existing collaborations with Global Action Plan) to create training materials. It could also specifically include upskilling paediatricians by embedding environmental health into the general paediatric curriculum and exams.

The RCPCH Air Pollution Companion resource aims to allow all clinicians access to knowledge, skills and support required to integrate air pollution conversations and positive actions into their clinical practice. It also signposts to the not inconsiderable work being done by other organisations (such as WHO) in the areas of air pollution and housing.

Recommendations

Our recommendations are based upon the desired shift towards prevention and health promotion, and vital in providing holistic and equitable care to the children and families we care for.

For UK governments and administrations

- Enact a Clean Air Act that sets binding air quality targets based on the best available health and environmental evidence in all four nations of the UK.
- Where not yet progressed, meet the 2005 WHO Air Quality Guidelines for PM2.5 by 2030 and develop a clear strategy to achieve the 2021 WHO Air Quality Guidelines.
- Ensure children's health is protected by universal monitoring of outdoor PM2.5 and NO2 levels in all UK schools, as well as granting relevant local authorities the power to amend, close or divert roads when air pollution near schools exceeds limits.
- Support and enact clean air legislation ensuring legal rights to clean air, address indoor air pollution and introduce specific air quality standards for indoor environments.
- Expand Awaab's Law to include protections for private rented households in England. In Scotland, Wales, and Northern Ireland, introduce and expand Awaab's Law to include protection for private rented households.
- Commit to sustained funding for local authorities and councils to address air pollution and enforce current regulations.
- Fund a Young Patients Family Fund for inpatients and outpatients to help families cover the costs of attending hospital and accessing healthcare. In Scotland, extend the existing fund to include outpatients.

For local authorities and housing teams

- Enforce relevant legal duties[i] and act on the environmental determinants of health by ensuring housing conditions reach minimum standards, particularly for those exposed to air pollution (e.g. damp, mould, poor ventilation).
- Proactively inspect housing when a healthcare worker or patient flags poor conditions.
- Ensure that retrofitting schemes focused on improving insulation include clear minimum ventilation requirements and enforce these.
- Follow relevant national guidance to strengthen partnerships between housing and health sectors to ensure timely joined up responses to housing-related health.

For Boards, Trusts and Integrated Care Systems

- Support and equip clinicians to identify and address environmental health factors in their practice.
- Provide funding and guidance for clinics to integrate environmental health interventions into routine care.
- Facilitate collaboration between tertiary centres and local clinics to share knowledge and ensure coordinated care (for example, the creation of a 'hub and spoke model' to allow for clearer lines of communication and support from expert centres, sharing good practice).

i For example in England those set out in the Housing Act 2004, the Health and Social Care Act 2012 and the Homes (Fitness for Human Habitation) Act 2018

- Appoint a departmental lead for environmental health; responsible for forging links with local governments, housing authorities, schools and transport infrastructure to best utilise clinician voice and impact in advocating locally for tangible change.
- Establish a feedback process that captures the voices of children, young people and families across your service/area, and use their input to co-produce service improvement initiatives – for example ensuring appointments are accessible, how to educate children and families surrounding clean air, and ensuring their involvement in both service design and review stage.

For Royal Colleges and medical schools

- Integrate environmental health and air pollution into training curricula and exams where relevant.
- Encourage research, CPD and education on environmental health across specialties, ensuring clinicians have the skills to address air pollution-related health impacts.
- Use resources such as the RCPCH Air Pollution Companion and the talking to patients about air pollution and the "talking to patients about air pollution" module of simulated conversations with children, young people and families.

For clinicians

- By the end of core paediatric training, demonstrate understanding of environmental impacts on health and health inequalities by completing accredited CPD activity, completing at least one supervised learning event/reflective piece, and document this understanding in annual professional development reviews.
- Incorporate a structured approach to actively listen to the voice of each child, young person and their family during individual consultations, and actively work to co-produce and agree solutions related to air pollution and housing.
- Complete a structured training programme on environmental and social history taking and integrate a standardised environmental and social history into patient assessments across all care settings.
- Use evidence based tools such as local authority housing letter templates where possible to advocate for healthier environments.

Conclusion

This report originally set out to evaluate the scalability of novel Clean Air Clinics, however through conducting interviews with Clean Air Clinic clinicians and children and young people, as well as gathering data from wider healthcare professionals, it became clear there are several persistent challenges children and young people are facing.

The consistent message is that air pollution is a significant threat to child health and wellbeing, on which healthcare professionals can have a positive and lasting influence. The Royal London and Alder Hey services are clearly making an impact upon individual patients, as well as the populations they serve more broadly through education and advocacy.

At the time of conducting clinician interviews, the clinics were at different phases in their iteration, and as described previously, building upon differing foundations with background in health inequalities and academic research. The timeline in Liverpool meant that outcomes and testimonies were available, where in London many of their interventions are yet to come to fruition. The existing services are yet to publish data to definitively prove benefit, however the testimonies from both the clinicians involved and from patients who have accessed the clinic are clear on their value. Whilst their experiences suggest potential for time and cost savings due to effective intervention, their outcomes are not replicable for a business case yet.

Since the inception of this project the landscape upon which it is projected has also changed. Governmental changes and shifts in NHS organisational structure mean that services continue to navigate an uncertain future.[12] However, it is clear that environmental health and inequality in child health outcomes remain fundamental pillars of unmet need. Healthcare professionals, local authorities, and the UK government must do more to support families to exercise better healthcare education and preventative actions to maintain wellness and enhance wellbeing.

The RCPCH recognises that scaling up comparable services in the context of current resource limitations and constraints presents logistical, funding and personnel challenges. Resourcing the clinics in the absence of dedicated funding would require diversion of staff time from existing services. The Alder Hey and Royal London team's capacity has been aided by academic and charitable funding.

However, there are a host of learnings from the clinics in terms of both content and approach which can be shared in pursuit of improved outcomes for the increasing proportion of children and families affected by health inequalities, air pollution and environmental factors contributing to ill health.

Acknowledgements

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The voices of young people, through RCPCH &Us as well as families attending these novel clinics, are central to advocating for and delivering ever-improving healthcare to all those who need it. Many thanks for your contributions throughout the conception and construction of this report.

Finally, thanks to the RCPCH Health Policy Team and the Clean Air Fund Partnership at RCPCH; Alison Firth, Dr Alice Willson, Dr Emily Parker, Zara Raffeeq, Fliss Stephenson and Dr Harry Apperley.

Appendices

A - Clinician interview script

Data	
Name	
Role	
Interviewer	

Hi [interviewee] thank you very much for taking the time to talk to me today.

Before we start, I wanted to explain the purpose and contents of this session.

As you know, RCPCH have been funded by the Clean Air Fund to 'Work with RCPCH members working in new Clean Air Clinics to review their impact and capture successes and lessons learned, with a view to scalability of the models of care used at these sites across the UK and internationally.'

We are conducting these conversations with clinicians and young people/families. With your permission we will record the interview and, in conjunction with the other conversations, conduct a thematic analysis of the transcription. This will then feed into a report with recommendations that will be workshopped by the steering group.

Your responses will be anonymised but may be included in a published report.

Are you happy to go ahead with the conversation, and for me to record it?

Confirm verbal consent obtained:	

[Start recording]

Theme	Question	Covered
The clinician	1. Can you tell me about your role and what it involves?	
The origins	2. Can you explain why the clinic was set up? 3. Can you explain how the clinic was set up?	
Practicalities	4. How does the clinic run day-to-day? E.g. how many personnel? What is the time commitment?	
Finances	5. Who is the clinic funded by? And when does this funding run out? 6. How much does the clinic cost to run? 7. Any idea of savings in avoided hospitalisations etc? 8. Would you be willing to share your business case?	
Impact	9. What impact has the clinic had on you as a clinician? 10. What impact has the clinic had on your patients? 11. Are you evaluating the impact of your clinic? If so, how? Do you have any data to support this?	
Challenges	12. What have you found challenging about the process?	
Successes	13. What have been your biggest wins?	
Legacy	14. Have you seen your work replicated elsewhere? 15. What do you think are the main elements of your work that could be effective in other settings? 16. Which elements of the clinic do you think would be challenging to replicate?	

B - Clean Air Clinics Questionnaire (health professionals)

We would be interested to hear your thoughts on how a Clean Air Clinic might be utilised in your Trust, and what the RCPCH could offer to assist in the design, rollout and maintenance of the service.

Please see the RCPCH privacy notice here for information on data usage.

1. Which NHS Trust do you currently work in?
2. What is your job role? Consultant / Nurse / Registrar / Management / Other
3. Would you be interested in setting up a Clean Air Clinic in your Trust, and why?
4. Can you identify a patient cohort for whom you think a dedicated clinic would add value?
5. Who would you envisage leading the service (e.g. Consultant/Specialist nurse)?
6. Have you tried to set up a similar service previously? If so, what were the barriers/issues you faced?
7. How can the RCPCH support you in setting up a service?
8. Would you be happy for us to follow up with you for a more in depth discussion around our goals and future planning? If so, please enter your email address below.
9. Which of the following elements would you ideally like to be able to implement?

   - Environment questionnaire completed by patients/families
   - Home visit proforma
   - Impacts report for families to use
   - A way to provide individual monitoring
10. Would you be happy / able to allow access to data/results from your version of the clinic to be included in research studies?

C - Clean Air Clinic Questions to children and families

Introduction	• Happy to see you – thank you so much for your time • Who I am (youth worker not a medical worker) and who RCPCH are: training college for paediatrics – we run training and exams, do research and set the engagement standards. As part of all this we want to hear from CYPF in order to improve child health services. • This chat is part of a bigger project around clean air and the links to health, and we're looking at how these clinics work and how we can make them better for CYP • Before we start- • All anonymous, share as much or as little as you want to • None of what you say will affect your care in hospital • Collect gender, age, and ethnicity – none of it reported back or used to identify you individually • 4 questions but might not get through them all which is fine. This will take 5 – 10 mins. • OK to go ahead?
Demographics	Gender: Age: Ethnicity:
1.Access/ barriers	How easy was it to attend clinic today? • Were there any issues accessing clinic (e.g. time off work, money for the bus, getting online)? • How could we make it easier for other CYP and their families to access the clinic?
2.Environmental Health	This is an 'Environmental Health/ Clean Air' Clinic. What do you understand about the links between environment and health? • Why do you think you have been referred to this clinic?
3.Impact of the clinic	How do you think Clean Air Clinics could improve the health of CYP and their families? • Do you think the clinic is important for your health? If so, why? • Which services outside the hospital (e/g/ school/housing) do you think the clinic should be working with?
4.Feelings	Did you have any worries/concerns about attending the clinic? • Can you tell us more about that?
Any extra notes afterwards	

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RCPCH policy report

Clean air, healthy childhoods: Innovative clinical responses to environmental health inequalities

RCPCH Clean Air Fund partnership

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