



THE TOXIC SCHOOL RUN

UK CHILDREN AT DAILY RISK FROM AIR POLLUTION

FOR EVERY
CHILD IN
DANGER

unicef 
UNITED KINGDOM

Unicef UK research briefing

THE TOXIC SCHOOL RUN

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SUMMARY

Every day, millions of children in our towns and cities are exposed to dangerous levels of pollution in the areas where they live, learn and play. This invisible danger could be stunting their lung growth, increasing their risk of asthma and potentially damaging their brain growth.

This research briefing sets out new data from Queen Mary's University London that looks at children's exposure to air pollution across the school day.

The data (part of a wider unpublished study) finds children are disproportionately exposed to higher doses of pollution during the school run and while they are at school – particularly at break time when they're in the school playground. This suggests that major gains for children's health could be made if funding, interventions and policies were targeted to pollution reduction around schools and nurseries and on the school run itself.

Unicef UK is calling on the government to urgently fund and prioritise policies and health interventions that protect children from toxic air before irreversible damage is done to their health and their futures. To support this, the government should announce a ring-fenced funding pot to pay for measures that protects children from toxic air where they learn and play.

A HEALTH CRISIS FOR CHILDREN

Unicef UK estimates that one in three children in the UK are growing up in areas with unsafe levels of particulate pollution.¹ In our towns and cities, the majority of this harmful pollution comes from vehicle emissions.²

This research briefing looks at children's exposure to black carbon, which is a constituent of particulate matter pollution. Particulate matter refers to tiny bits of solids or liquid suspended in the air. They are measured by their size – they range from bigger particles such as soot or dust to particles which are smaller than the width of a human hair.³

These tiny particles are the most dangerous for our health as they're able to penetrate deep into our lungs, and potentially even into our bloodstream and our brains.⁴

For babies and young children, these health effects are even more acute. Exposure to toxic particulates during these critical early stages of development can leave a child with stunted lungs, with respiratory conditions like asthma and potentially even reduced brain development.⁵ This is a threat to every child's right to health and to grow up in a clean and safe environment.⁶

Additionally, it is estimated the health effects from air pollution exposure cost the NHS and social care services more than £40 million each year. Even the smallest improvement in exposure could reap rewards for children and the UK taxpayer.⁷

¹ Unicef UK (2018) A breath of toxic air – "Levels of particulate pollution on or above the level that the World Health Organization recommends" - <https://www.unicef.org.uk/publications/child-health-breath-of-toxic-air/>

² Public Health England (2017) A briefing for Public health directors
<https://laqm.defra.gov.uk/assets/63091defraairqualityguide9web.pdf>

³ World Health Organisation (2018) Ambient (outdoor) air quality and health [http://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](http://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health)

⁴ Unicef (2017) Danger in the air - https://www.unicef.org/environment/files/Danger_in_the_Air.pdf

⁵ RCP (2017) Every breathe we take <https://www.rcplondon.ac.uk/projects/outputs/every-breathe-we-take-lifelong-impact-air-pollution>

⁶ Article 24 UN Convention on the Rights of the Child - <https://www.unicef.org.uk/what-we-do/un-convention-child-rights/>

⁷ Public Health England (2018) Estimation of costs to the NHS and social care due to the health impacts of air pollution

WHAT DO WE ALREADY KNOW ABOUT CHILDREN'S EXPOSURE TO TOXIC AIR?

There is widespread evidence showing exposure to air pollution is damaging for children's health. Children tend to be the most vulnerable to the health effects of pollution, yet the least responsible for its causes.

Unicef UK estimates one in three children - 4.5 million - are growing up in towns and cities in the UK with unsafe levels of particulate pollution.⁸ Additionally, existing evidence shows:

- Children in around **2,000 schools and nurseries in the UK** are being exposed to illegal and unsafe levels of nitrogen dioxide pollution.⁹
- Young **children breathe faster than adults** so tend to take in more air relative to their body weight.¹⁰
- Children **tend to be exposed to higher doses than adults** as they spend more time outside. They also often walk, or are pushed in buggies, at the height of exhaust emissions so they breathe in more toxic concentrations.¹¹
- Children may be exposed to **higher pollution levels inside cars** than outside, due to emissions circulating and building up in the car rather than dissipating in the wider air.¹²
- Children **are more likely to live in deprived communities** - which tend to be exposed to higher levels of pollution.¹³
- Children's **vulnerability is often compounded** as they are rarely considered explicitly in policy making or solutions to fix the problem.¹⁴

⁸ Unicef UK (2018) A breath of toxic air <https://www.unicef.org.uk/publications/child-health-breath-of-toxic-air/>

⁹ The Guardian and Greenpeace UK (2017) <https://www.theguardian.com/environment/2017/apr/04/thousands-of-british-children-exposed-to-illegal-levels-of-air-pollution>

¹⁰ UNICEF (2016) Clear the air for children - https://www.unicef.org/publications/index_92957.html

¹¹ Kenagy, H.S. Lin, C. Wu, H. Heal, M.R. (2016) Greater nitrogen dioxide concentrations at child versus adult breathing heights close to urban main road kerbside [Air Qual Atmos Health](#), 2016;9:589-595. Epub 2015 Sep 15

¹² Rank (2001) Differences in cyclists and car drivers exposure to air pollution from traffic in the city of Copenhagen, <http://www.sciencedirect.com/science/article/pii/S0048969701007586>

¹³ Public Health England (2018) Estimation of costs to the NHS and social care due to the health impacts of air pollution https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/708854/Estimation_of_costs_to_the_NHS_and_social_care_due_to_the_health_impacts_of_air_pollution.pdf

¹⁴ OHCHR (2017) Report of the Special Rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment http://ap.ohchr.org/documents/dpage_e.aspx?si=A/HRC/37/58

OUR CLEAN AIR ACTION PLAN

In order to protect every child's right to health and to grow up in a clean and safe environment, Unicef UK is calling on the government to:

1. Establish a **ring-fenced funding pot** to pay for measures that protect children from toxic air. This includes protection on the school run and while they're at school and nursery.
2. Set out a **UK-wide strategy on children and air pollution**, with ambitious health targets and objectives across government departments.
3. Create **ambitious networks of clean air zones** that lower pollution and create child-friendly urban areas that promote walking, cycling and public transport.
4. Expand **air quality monitoring, data collection and dissemination** to better understand children's exposure to toxic air where they live, learn and play, and to provide children and their families with the information they need to protect their health.
5. Set up a **children and young people's clean air forum**, to make sure that all future solutions and policies are child-led and child-focused.

NEW RESEARCH – WHERE ARE CHILDREN MOST EXPOSED?

Children across London were monitored as part of a new study by Queen Mary's University London, which looked at children's exposure to air pollution across an average school day.

A snapshot from this wider study is included in this briefing and lead researcher, **Dr Abigail Whitehouse**, tells us about her findings:

"We found a worrying trend that children are being disproportionately exposed to pollution while they are on the school run and at school.

"On average, children spend nearly eight hours at school - about 30 per cent of their day. Yet during this time they receive nearly 44 per cent of their exposure to air pollution. Likewise, children only spend 7 per cent of their day travelling to and from school but receive 15 per cent of their daily exposure to air pollution during this time.

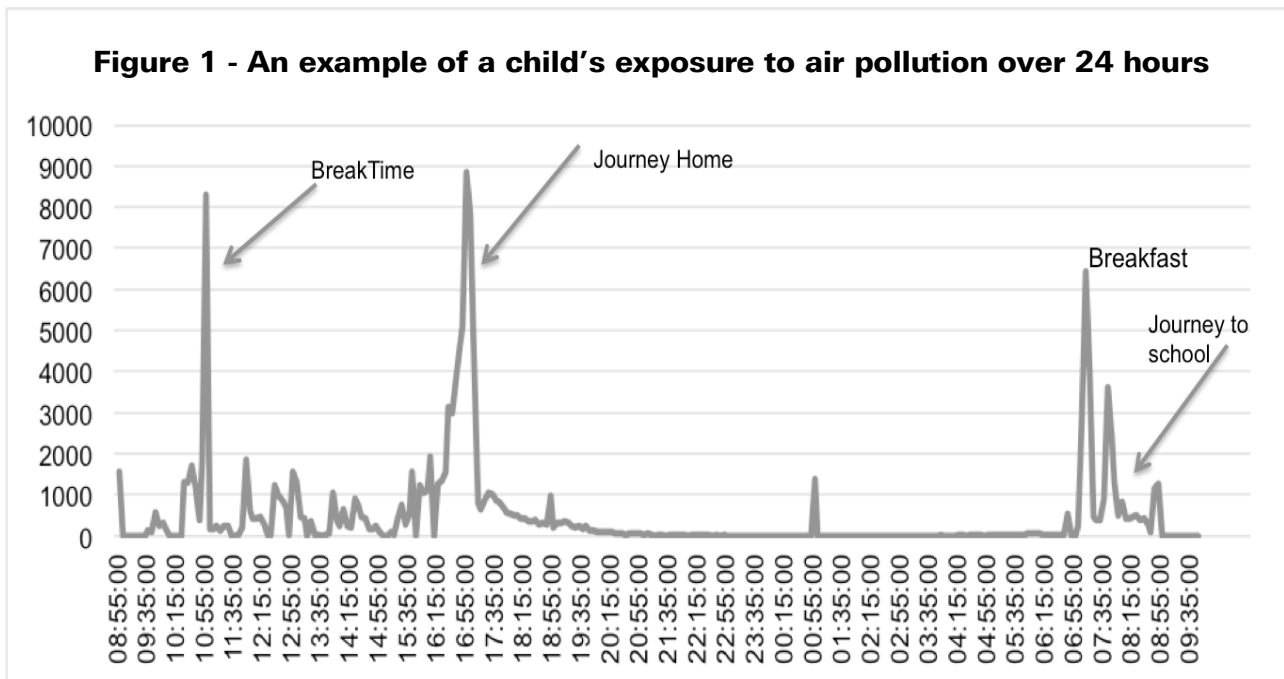
"These findings are alarming and it is therefore essential that policy makers provide guidance for parents and introduce targeted measures that address children's vulnerability during these peak periods. They must not only measure emission levels in urban areas, but the actual exposure of children to pollutants. We need to know where, when, how and to what children are being exposed and then put effective mitigations in place to protect them."

METHODOLOGY

Children carried a MicroAeth personal monitor, which allows us to see when their peak exposure to air pollution occurred. Each child kept an activity diary, which was overlaid against this monitoring data to identify where peak exposure occurred. In this case, black carbon, a pollutant particulate matter, was monitored. Monitoring took place over a 24-hour period on a weekday in order to assess the points at which children are most exposed to black carbon on a 'normal' school day.

RESULTS

We have used six case studies, from a wider study, to illustrate the trend. An example of the 24-hour monitoring period is illustrated by the graph in Figure 1. When a child is exposed to high levels of air pollution, this is expressed as a peak on the graph. In Figure 1, a number of peaks occur: two of the most dramatic peaks correspond with the journey to and from school; other major peaks are likely to be linked to exposure to cooking in the home and exposure to pollutants outside while the children are on break time at school. It is also noticeable that the exposure to air pollution is higher at school, in general, than when children are at home.¹⁵



For each participant, time spent in each major microenvironment across the day (home, school, travelling to school, other periods of time inside/outside) was calculated as a percentage of the whole day. Table 1 outlines data taken from six different children from six different schools across London; the percentages vary, reflecting differences in travel methods and distance to school.

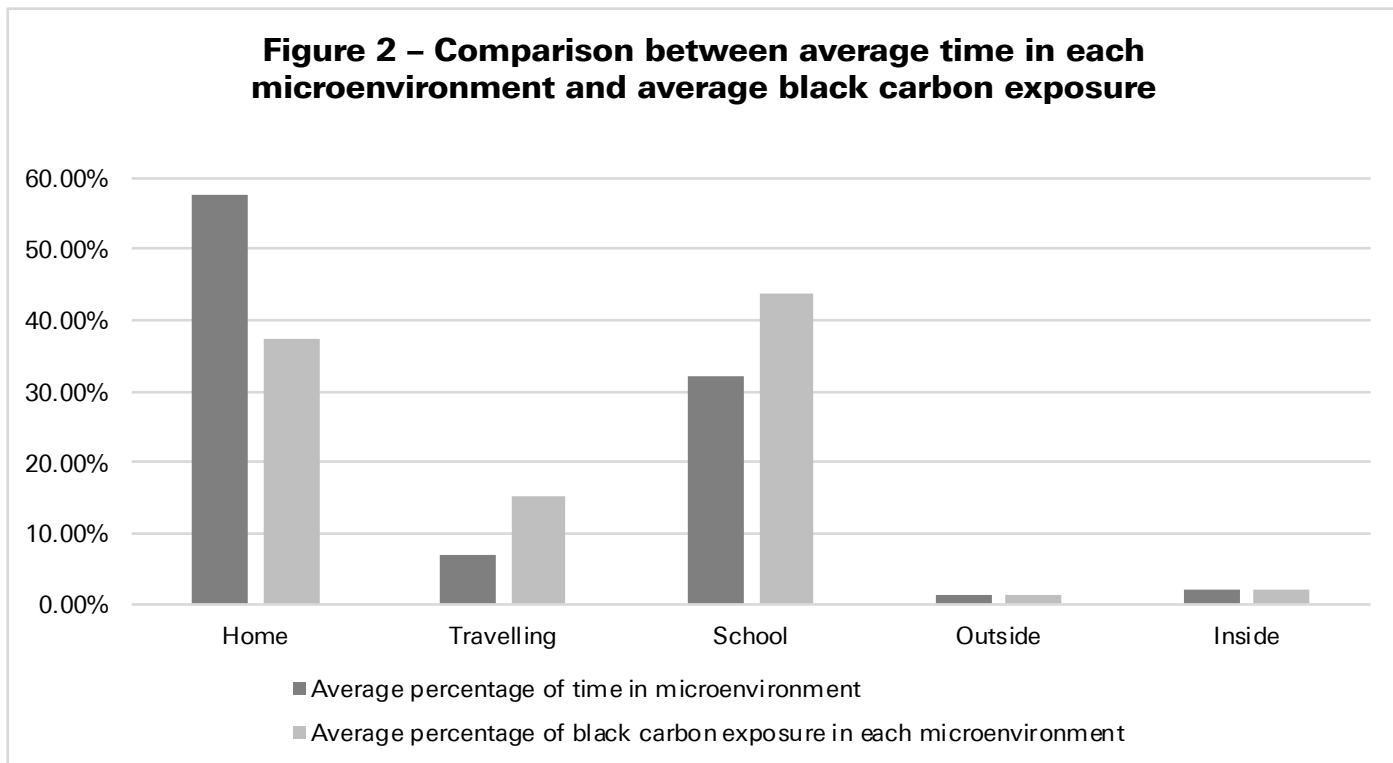
¹⁵ An activity diary was kept for each participant

Table 1 – Percentage of time spent in each micro-environment					
Participant	Home	Travelling	School	Outside, other	Inside, other
1	50.18%	8.86%	32.10%	0.00%	8.86%
2	56.97%	4.78%	38.25%	0.00%	0.00%
3	53.82%	4.46%	34.08%	7.64%	0.00%
4	68.57%	6.07%	25.36%	0.00%	0.00%
5	55.96%	10.26%	29.80%	0.00%	3.97%
6	59.67%	6.33%	34.00%	0.00%	0.00%
	Home	Travelling	School	Outside	Inside
Average	57.53%	6.79%	32.26%	1.27%	2.14%

Table 2 shows exposure to black carbon for each microenvironment when translated into a percentage of each child’s exposure across the whole day.

Table 2 – Percentage of total black carbon exposure in each microenvironment					
Participant	Home	Travelling	School	Outside, other	Inside, other
1	9.13%	15.29%	65.05%	0.00%	10.52%
2	32.06%	15.60%	52.33%	0.00%	0.00%
3	40.82%	5.66%	45.21%	8.31%	0.00%
4	55.48%	10.98%	33.54%	0.00%	0.00%
5	40.33%	22.83%	34.51%	0.00%	2.33%
6	47.55%	20.02%	32.43%	0.00%	0.00%
	Home	Travelling	School	Outside	Inside
Average	37.56%	15.06%	43.85%	1.39%	2.14%

Figure 2 compares these data sets to assess how the time spent in each microenvironment corresponds to average time children were exposed to black carbon.



CONCLUSION

The main finding is that, while children spend on average around 60 per cent of their average day at home and only 30 per cent at school, their exposure to black carbon is disproportionately high during the school day and while they're on the school run. Exposure levels peak during the school run and during school break times and are at the lowest when children are at home.

While the findings presented here are only a small snapshot of children's exposure to air pollution, they represent a broader trend that is backed up by as yet unpublished research. They suggest that significant health gains could be made by focusing public funding and policies on mitigations that seek to reduce children's exposure when they are travelling to and from school and while they are at school.

These findings indicate a number of research needs to better understand children's vulnerability to air pollution, including:

- further research into the sources of exposure to toxic air during the school run and the school day, and how these may best be mitigated;
- temporal, spatial and demographic studies of children's exposure around the UK to understand how vulnerabilities differ by time, space and socioeconomic context¹⁶;
- more robust monitoring of children's exposure to indoor air pollution in each indoor space in which children live, learn and play – from the home to nurseries and schools, to community and play centres;
- evidence-based analysis of specific air pollution mitigations and interventions in and around schools and nurseries.

As well as highlighting areas for further research, the findings presented here indicate the need for urgent action to mitigate children's exposure to toxic air during the school run.

¹⁶ This study only looked at children in London, and Unicef UK plans to commission further comparative studies across UK towns and cities.

Current research suggests that the health benefits of cycling and walking for the average person far outweigh the health costs from exposure to air pollution,¹⁷ however these health benefits could be maximised if low pollution routes were prioritised and integrated with cycling and walking plans. This is particularly important for children who have pre-existing health conditions such as asthma and may be more susceptible to the health effects of toxic air. It is also an important consideration in dense urban areas like London where concentrations of pollution are persistently high, both on main roads and side roads, and where avoiding highly polluted routes to school can be very difficult.

This research adds to the alarming evidence of children's disproportionate exposure and vulnerability to toxic air. The UK government needs to take urgent action on toxic air to protect children's health and ultimately, their futures.

¹⁷ Sustrans (2017) The role of walking and cycling in solving the UK's air quality crisis
https://www.sustrans.org.uk/sites/default/files/file_content_type/role-of-walking-and-cycling-in-solving-uk-air-quality-crisis.pdf

At least one in three children are growing up in areas of the UK with hazardous levels of air pollution. Toxic emissions pose a serious and dangerous threat to their health.

In order to protect every child's right to a clean environment, including breathing clean air, Unicef UK is calling on the government to:

1. Establish a **funding pot** to pay for measures that protect children from toxic air.
2. Set out a **UK-wide strategy** on children and air pollution.
3. Create ambitious networks of **clean air zones** that lower pollution and create child-friendly areas.
4. Expand **air quality monitoring**, data collection and dissemination to better understand children's exposure to toxic air.
5. Set up a **children and young people's clean air forum**, to make sure that all future solutions and policies are child-led and child-focused.

Find out more
unicef.uk/cleanair

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