



GLOBAL BLACK
MATERNAL HEALTH

BLACK CHILD
CLEAN AIR

BLACK CHILD CLEAN AIR REPORT

Air pollution in pregnancy:

Exploring the views and experiences of Black mothers and Black pregnant women living in London



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www.globalblackmaternalhealth.org

www.blackchildcleanair.com

A MESSAGE FROM GLOBAL BLACK MATERNAL HEALTH'S CEO



Agnes Agyepong

CEO and Founder of Global Black Maternal Health

My journey began with a personal experience that forever altered the course of my life...

Through the trials and tribulations of my own labour experience, I witnessed first-hand the disparities and trauma that Black women can face within our healthcare system, where Black women are nearly 4x more likely to die in pregnancy and twice as likely to experience a stillbirth. It was a wake-up call that resonated deep within my soul, propelling me forward on a path of advocacy and empowerment.

As I delved into the complex web of maternal health disparities, I was confronted with a disheartening reality. Reports would present race as a risk factor, without delving into the contextual nuances and systemic issues at play. This realization compelled me to explore further and shed light on the interplay between air pollution,

racial inequity, and maternal health.

Black Londoners are confronted with an unjust burden, breathing in air polluted to illegal levels three times more often than their counterparts. This insidious exposure to harmful pollutants poses grave risks to the health and well-being of both mothers and babies. From an increased likelihood of preterm birth and low birth weight to the heart-breaking prospect of stillbirth, the consequences reverberate through generations.

The correlation between the disproportionate exposure to air pollution and the alarming statistics of maternal mortality and stillbirth among Black women cannot be ignored. Yet, with the environmental sector being the least

diverse sector next to farming, Black communities are often missing from the conversation around clean air. As a society we must confront the reality that air pollution, this invisible foe, affects us all, but it discriminates in its impact, hitting the most vulnerable the hardest.

Previous studies of air pollution have not included the very women who are amongst the most impacted. We stand at a crucial crossroads. We have the power to effect change, and to challenge the systems that perpetuate these disparities, and it starts with amplifying the voices of Black women.

We are incredibly proud to bring this landmark research to the forefront. We have the knowledge and the opportunity to change the future for Black mothers. If we embrace the findings from communities, we can bring real, lasting change.

It's time for action.

FOREWORD

'I CAN'T BREATHE'

When we consider health inequalities if we do not consider causes inflicted by wider societal structures, we fail to tackle the root of the problem. This landmark study on air pollution in pregnancy, addresses a root cause of chronic health issues in Black populations.

It is now known that particles from air pollutants reach the placenta interface as evidenced by microscopic studies. These particles are likely to lead to epigenetic changes and imprinting which is passed through the generations to have long lasting health effects in these communities.

This simply demonstrates the wider determinants of health. When the air that communities breathe brings disease rather than life it leads to inequitable outcomes from birth. As well as the personal loss, there is no doubt that this leads to economic drain on our health system which affects everyone from every background and community.

We have a responsibility at all levels, individual, organisational, societal and governmental to push for policies to bring change for the better. Our systems should provide not only clean air but enable individuals to understand the impact of where they live on their life expectancy, mortality and disease-free years of life.

Air pollution is not simply about the planet dying but also the destruction of the health of its people and not least those with inequitable choices about where they live. The findings of this report must trigger change and trigger research, system and policy change to lead to cleaner air for all.



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FOREWORD

Time and time again, research shows that the health effects of air pollution are fundamentally unfair. And what better example of this inequality is there than the fact that air pollution affects the health of unborn babies still growing in the womb?

Evidence shows that, not only are Black people and people from other minoritised ethnicities disproportionately affected by air pollution, but there are shocking racial disparities in maternal health in the UK.

By working with and for Black mothers and Black pregnant women, this report delivers on Impact on Urban Health's priority to engage and amplify the voices of those most affected by air pollution. This research will fill a gap in the existing evidence base. As the first-ever air pollution study speaking directly to Black mothers and Black pregnant women, it will bring experiences and opinions to life.

The research will also be a catalyst for further engagement with Black communities in south London, inspiring them to be agents of change on an issue that disproportionately affects their health and that of their children.

Perspectives uncovered through this partnership will challenge policymakers and professional bodies to do more to protect the health of Black mothers and babies in cities. These findings will be used to influence professional bodies to develop more information, guidance and training on air pollution and health, and to tailor interventions and solutions that work for Black mothers and Black pregnant women.

This report – another example of the fantastic work being done by Global Black Maternal Health – is essential for policymakers, professional bodies, and anyone with an interest in public health and social justice. It offers a glimpse to a fairer, healthier future for mothers, pregnant women, and their children.



Nikita Sinclair

Portfolio manager at Impact on Urban Health

ACKNOWLEDGEMENTS

We would like to acknowledge our expert panel members Clotilde Abe (Prosperitys), Jennifer Ogunyemi (Sisters in Business), Rachel Buabeng (Mummy's Day Out) for their support, as well as our advisory team, Dr Karen Joash and Janet Fyle, MBE for their guidance. Thanks must also be given to Kate Langford, Nikita Sinclair, Rachel Tetteh, and Celia Venebles. Our biggest thanks go to all of the women who took part in this landmark study. Your contribution will help to instigate the change that is needed to ensure that our voices feed into decision-making around clean air.



EXECUTIVE SUMMARY

Air pollution is considered the greatest environmental threat to health: exposure to air pollutants present in both indoor and outdoor air have been associated with a number of negative health effects such as cancer, asthma and stroke.

Research has also established links between air pollution and increased risk of negative outcomes for mothers and babies including low birth weight, preterm birth and symptoms of maternal depression.

However, there is evidence of racial inequalities in exposure to air pollution such that it disproportionately impacts Black communities living in London. Expectant mothers from the Black community living in London are, therefore, facing increased risks to their health and the health of their children.

Despite this, little work has been done to understand the perceptions of and behaviours driven by attitudes towards air pollution in the very group who may be at most risk of its harmful effects.

The first aim of the study was to explore the awareness, attitudes, and behaviours of Black mothers and Black pregnant women who are living in London towards air pollution and air pollution during pregnancy.

The second aim was to use the findings to develop recommendations for both Black families and professionals from healthcare, policy, and environmental groups that focus on reducing the impact of air pollution on Black mothers, Black pregnant women and their children living in London.



Using an online survey, quantitative and qualitative data (open-text comments), were gathered from 226 women who identified as being Black or of mixed Black heritage, who were living in London, and who were currently pregnant or pregnant within the last five years (no earlier than November 2017).

The findings indicated that:



Most Black mothers and Black pregnant women had some awareness of the negative impact of air pollution but that this awareness was greater when thinking about their own health than the health of an unborn baby or a child once born.



Whilst most mothers and pregnant women were concerned about the impacts of air pollution, there were some who were not. For these women, lack of concern was due to reasons including other pregnancy-related priorities, limited knowledge about air pollution and perceived low risk of its effects on their health.



The majority of women accurately demonstrated knowledge of transport as being a major air pollutant and reported being concerned by the indoor air pollutants: damp and mould, smoke and vapour, and chemicals in cleaning products.



Women were less concerned about cooking appliances despite gas appliances being a significant indoor air pollutant.



Many women had made changes to their lifestyle in response to their concerns about air pollution, though there were some who would have liked to but could not for various reasons including systemic barriers to action (for example, having limited choice about the area in which they live).

Despite air pollution being a global concern, its negative health impacts on some of the most at-risk people are not well-known. Black mothers and Black pregnant women living in London recognise that they need to better understand how air pollution can impact the health of their unborn children and children once born.

It is also clear that better knowledge about the sources of indoor air pollution is needed. There is evidence that this education will be welcomed as Black mothers and Black pregnant women want to be able to make informed decisions about their lifestyle choices.

The findings in this report, therefore, highlight that there is work to be done.

Stakeholders including Government agencies and healthcare service providers, must now take action to raise awareness about air pollution that will be effective in its reach and will support mothers and pregnant women to mitigate their risks against its harmful effects.

We have, therefore, set out 14 recommendations for policy makers, healthcare professionals, governing organisations, Black communities, and ourselves, Global Black Maternal Health, to initiate efforts to reduce the negative health effects of air pollution that disproportionately impact Black women and children in London.



ACCOUNTABLE BODY

For policymakers, including the Mayor of London, Transport for London, Public Health, Members of Parliament and Local Authorities

RECOMMENDATION

Significant action is required to reduce the levels of air pollution in London. Policymakers should consult with groups most affected, including Black communities and organisations in the development of policy impacting air quality in London.

Raise awareness of air pollution among Black families by:

- A. producing co-produced, public-friendly and culturally cognisant materials on the adverse impacts of indoor and outdoor air pollution
- B. disseminating materials among Black community leaders and in appropriate cultural spaces

Commit to racial equity in air quality through:

- A. a pledge to assess the financial, social and health implications of policies relating to air pollution. Specifically, the introduction of low traffic neighbourhoods and changes to the Ultra-Low Emissions Zone (ULEZ) for pregnant women and families within London .
- B. working collaboratively with GBMH and other stakeholder organisations who provide a bridge between policy makers and communities

ACCOUNTABLE BODY

For maternity services, healthcare professionals and governing bodies

including the Royal College of Midwifery, Nursing and Midwifery Council and Royal College of Obstetricians and Gynaecologists

For Black families and communities

RECOMMENDATION

Directly consult with Black women and Black stakeholder organisations to understand the specific challenges Black families face in improving their air quality and countering the impacts of air pollution.

Provide co-produced, public-friendly and culturally cognisant educational materials to Black women living in cities and areas of high pollution, as part of family planning, antenatal and postnatal care.

Through research, in collaboration with GBMH and other stakeholder organisations, examine what healthcare professionals understand about air pollution, how confident they feel about communicating this information, the challenges associated with delivering this information and what resources they feel they will need to be able to deliver this information.

Build the evidence base on the impact of air pollution on maternity outcomes, to include a focus on at risk populations, notably Black pregnant women, mothers and children.

Use the GBMH resource list to inform yourself about Air Pollution and the steps you can take to reduce the impact to you and your family.

Use the GBMH Black Child Clean Air template letter to write to your local leaders and MP.

ACCOUNTABLE BODY

RECOMMENDATION

For Global Black Maternal Health

Host the annual Black Child Clean Air Conference (BCCA) to provide: representation for Black women and families in the air pollution and environmental activism space.

- A. facilitate the expansion of a network of policy makers, health professionals, academics, Black communities, clean air advocates and other stakeholders to create the UK’s most diverse air quality conference
- B. encourage and facilitate cross pollination within the BCCA network for innovative, forward thinking and inclusive solutions to air quality issues

Facilitate round table discussions between policy makers, health professionals and Black community stakeholders in pursuit of improving air quality for Black pregnant women, mothers and children.

Collaborate with key stakeholders (for example, community midwifery teams, children’s centres and other community groups) to develop and deliver workshops on air pollution for Black women and families.

Support Black women in becoming clean air advocates through the GBMH Black Child Clean Air initiative.

Commit to reassessing the awareness, attitudes and behaviours of Black pregnant women and mothers towards air pollution in London, in order to contribute to the development of policy and health care support that improves clinical and social outcomes for Black families.

INTRODUCTION



Air pollution and its impact on health

Air pollution is a worldwide issue, with almost all the global population breathing air that exceeds WHO guideline limits¹. Research shows that air pollution is now responsible for 20% of deaths globally².

Fine particulate matter (PM_{2.5}), nitrogen dioxide (NO₂), and volatile organic compounds (VOCs) have been the subject of much research because exposure to these pollutants, which are ubiquitous in both indoor and outdoor environments, have been associated with adverse health effects. For instance, research has indicated that children exposed to higher levels of PM_{2.5} are more likely to develop asthma³, and that long-term exposure to NO₂ and VOCs is associated with an increased risk of cancer^{4,5,6}. There is evidence also that these pollutants are linked to increased risk of chronic obstructive pulmonary disease and stroke⁷. For these reasons, air pollution is considered the greatest environmental threat

to health and associations with damage to health have necessitated the implementation of policies such as the Ambient Air Quality Directive (2008/50/EC)⁸, which commits the UK to reducing air pollution concentrations; the Clean Air Strategy⁹ set out by the UK Government in 2019, which aims to reduce the harm to health from air pollution by half; and the Ultra-Low Emission Zone (ULEZ) scheme, introduced in 2017 by the Mayor of London and Transport for London, which aims to improve London's air quality by reducing the number of vehicles that fail to meet emissions standards¹⁰.

¹ WHO. Air Pollution. 2022

² Vohra K, Vodanos A, Schwartz J, Marais EA, Sulprizio MP, Mickley LJ. Global mortality from outdoor fine particle pollution generated by fossil fuel combustion: Results from GEOS-Chem. *Environ Res.* 2021;195:110754. doi:10.1016/j.envres.2021.110754.

³ Holst GJ, Pedersen CB, Thygesen M, et al. Air pollution and family related determinants of asthma onset and persistent wheezing in children: nationwide case-control study. *BMJ.* 2020;370:m2791. Published 2020 Aug 19. doi:10.1136/bmj.m2791.

⁴ Amadou A, Praud D, Coudon T, et al. Long-term exposure to nitrogen dioxide air pollution and breast cancer risk: A nested case-control within the French E3N cohort study. *Environ Pollut.* 2023;317:120719. doi:10.1016/j.envpol.2022.120719.

⁵ Boeglin ML, Wessels D, Henshel D. An investigation of the relationship between air emissions of volatile organic compounds and the incidence of cancer in Indiana counties. *Environ Res.* 2006;100(2):242-254. doi:10.1016/j.envres.2005.04.004

⁶ Wong CM, Tsang H, Lai HK, et al. Cancer Mortality Risks from Long-term Exposure to Ambient Fine Particle. *Cancer Epidemiol Biomarkers Prev.* 2016;25(5):839-845. doi:10.1158/1055-9965.EPI-15-0626

⁷ Royal College of Physicians and Royal College of Paediatrics and Child Health. Every breath we take: the lifelong impact of air pollution | RCP London, 2016

⁸ European Council on Air Quality and Cleaner Air for Europe 2008/50/EC, Off. J. Eur. Union, 1, 1–44, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0050&from=en>. 2008.

⁹ Department of Environment, Food and Rural Affairs. Clean Air Strategy 2019. 2019

¹⁰ Transport for London. Why do we have a ULEZ? 2023.

Pertinent to the current study, is emerging research indicating a link between long-term exposure to air pollution and increased risk of negative maternal and fetal outcomes, including low birth weight¹¹, preterm birth¹², reduced live birth rate¹³ and maternal depressive symptoms – particularly in Black women¹⁴. Significantly, in their recent study, researchers were able to detect black carbon particles on the fetal side of the placenta, providing evidence for the transfer of particulate matter towards the fetus¹⁵. Together, these findings have now raised such concern that, in their 2021 Position statement, the Royal College of Obstetricians and Gynaecologists, whose aim is to improve the health of women, urged the UK Government to invest in air pollution monitoring and legally enforced air quality standards that meet WHO recommended limits¹⁶.

Sources of air pollution

Whilst some may associate PM_{2.5} and NO₂ with vehicle exhaust emissions, fuel burning, and industry, it is important to recognise that these pollutants are also readily found inside of the home. NO₂, for example, is released into the air when

heating and cooking with gas. One study found that NO₂ levels in UK kitchens with a gas cooker were twice as high as kitchens with an electric cooker during winter¹⁷, whilst another study found that pregnant women who used gas appliances when cooking had 194.6% higher exposure to PM_{2.5} compared to those who did not¹⁸.

Other sources of indoor air pollution include particles released into the air from damp and mould, burning candles and incense, and from pet dander, as well as the chemicals emitted from tobacco smoke and cleaning and decorating products¹⁹, all of which can be harmful when inhaled.

Exposure to these pollutants is problematic largely because people spend around 90% of their time indoors (for example, at home, at work, at school)²⁰. Thus, indoor air pollution is as real a risk to our health as outdoor air pollution. Nonetheless, with domestic combustion and road transport as two of the main outdoor sources of PM_{2.5} and NO₂, and over 70% of UK towns and cities having unsafe levels of these pollutants²¹, outdoor air pollution remains a significant issue.

¹¹ Smith RB, Fecht D, Gulliver J, et al. Impact of London's road traffic air and noise pollution on birth weight: retrospective population based cohort study. *BMJ*. 2017;359:j5299. Published 2017 Dec 5. doi:10.1136/bmj.j5299

¹² Klepac P, Locatelli I, Korošec S, Künzli N, Kušec A. Ambient air pollution and pregnancy outcomes: A comprehensive review and identification of environmental public health challenges. *Environ Res*. 2018;167:144-159. doi:10.1016/j.envres.2018.07.008

¹³ Conforti A, Mascia M, Cioffi G, et al. Air pollution and female fertility: a systematic review of literature. *Reprod Biol Endocrinol*. 2018;16(1):117. Published 2018 Dec 30. doi:10.1186/s12958-018-0433-z

¹⁴ Sheffield PE, Speranza R, Chiu YM, et al. Association between particulate air pollution exposure during pregnancy and postpartum maternal psychological functioning. *PLoS One*. 2018;13(4):e0195267. Published 2018 Apr 18. doi:10.1371/journal.pone.0195267

¹⁵ Bové H, Bongaerts E, Slenders E, et al. Ambient black carbon particles reach the fetal side of human placenta. *Nat Commun*. 2019;10(1):3866. Published 2019 Sep 17. doi:10.1038/s41467-019-11654-3

¹⁶ RCOG. Position statement: Outdoor air pollution and pregnancy in the UK. 2021.

¹⁷ Kornart C, Sokhi RS, Burton MA, Ravindra K. Activity pattern and personal exposure to nitrogen dioxide in indoor and outdoor microenvironments. *Environ Int*. 2010;36(1):36-45. doi:10.1016/j.envint.2009.09.004

¹⁸ Ha S, Nobles C, Kanner J, et al. Air Pollution Exposure Monitoring among Pregnant Women with and without Asthma. *Int J Environ Res Public Health*. 2020;17(13):4888. Published 2020 Jul 7. doi:10.3390/ijerph17134888

¹⁹ Vardoulakis S, Giagloglou E, Steinle S, et al. Indoor Exposure to Selected Air Pollutants in the Home Environment: A Systematic Review. *Int J Environ Res Public Health*. 2020;17(23):8972. Published 2020 Dec 2. doi:10.3390/ijerph17238972

²⁰ Asthma + Lung UK. What is indoor air pollution? 2023.

²¹ UNICEF. A breath of toxic air: UK children in danger. 2018.



Inequalities in exposure to air pollution

From a sociocultural perspective, London, the capital city in the UK, presents an especially difficult problem with regards to air pollution. This is because studies have uncovered evidence of racial inequalities in exposure to air pollution in that it disproportionately and negatively impacts those from the Black community. One example comes from a 2016 report highlighting that, even though people from the Black Caribbean and Black African community make up just 13.3% of London's population, this group accounts for 15.3% of all Londoners exposed to NO₂ levels that breach EU limits²². Research has also revealed that average levels of NO₂ are 28% higher in London schools with a higher population of non-white pupils²³.

This report also revealed that there are areas within London highly populated by those from the Black community in which NO₂ levels far exceed the limits of the WHO's recommended guidelines. These racial inequalities may reflect differential exposure to air pollutants and raise concerns about the increased health risks that Black people living in London may face due to factors often beyond their control. Moreover, they highlight the increased risk of adverse maternal and fetal outcomes to which Black mothers and Black pregnant women living in London may be subjected.

²² The Guardian. London's black communities disproportionately exposed to air pollution – study. 2016.

²³ Global Clean Air. Deprived and BAME schoolchildren in London experience greater air pollution burden. 2021.

Why it is important to understand Black mothers' and Black pregnant women's attitudes toward air pollution

This focus on the health impacts of air pollution is, of course, crucial for our understanding. However, it provides us with only a partial view of the problem. The social context of air pollution and how it affects people's lives day-to-day in the UK remains under-researched. This means that we have little insight into what people understand about air pollution or their attitudes towards it. We also do not know if and how people's perceptions about air pollution shape their behaviour and lifestyle choices.

Recent research by Impact on Urban Health has, at least, shed some light onto the issue. Their study found that residents in Southwark and Lambeth, areas highly affected by air pollution, were not aware of

how air pollution affects them personally, and that those that were aware, were unable to prioritise the issue and lack confidence to tackle air pollution in the long term. Importantly, their research highlighted a need to understand the barriers to engagement with the air pollution agenda for different communities²⁴.

Nonetheless, further exploration in this area is needed - especially in the group of people amongst the most at risk of devastating maternal health outcomes: Black mothers and Black pregnant women living in high pollutant cities like London. Therefore, in order to identify how best to invest resources to mitigate their risk, we must understand the views on the health impacts of air pollution from the perspective of mothers and pregnant women from the Black community.



²⁴ Impact on Urban Health. A breath of clean air: Insights from Lambeth and Southwark. 2021.

Study aim and objectives

The aim of this study was to explore the awareness, attitudes, and behaviours of Black mothers and Black pregnant women who are living in London towards air pollution and air pollution during pregnancy. To achieve this, four objectives were developed. The objectives were to:

1 Assess Black mothers' and Black pregnant women's awareness of air pollution and air pollution in pregnancy.

2 Explore Black mothers' and Black pregnant women's attitudes towards air pollution and air pollution in pregnancy.

3 Identify whether Black mothers' and Black pregnant women's awareness and attitudes of air pollution in pregnancy shape their behaviour and lifestyle choices.

4 Provide Impact on Urban Health and other funders and policy makers with evidence to support wider projects that will facilitate the innovation and implementation of solutions to improve the health of at-risk communities.

Co-Production

Studies including Black people have rarely involved representatives of the community in the research design. For Global Black Maternal Health, adopting a co-productive approach to this study was not only useful, but essential, and was a central feature of the research.

This study was supported by a panel of experts from the Black maternity and community sectors, who also belonged to the research target group. The panel supported the development of the survey questions, participated in the pilot, disseminated the survey across community networks and participated in the review of the recommendations.

The research team also consisted of Black female professional researchers, living in London who had been pregnant within the last five years. The researchers and authors of this report were responsible for the study design, development of the survey questions, analysis of the data and formulation of the recommendations, with the support of the wider Global Black Maternal Health team.

Through collaboration with Black mothers living in London and other Black professionals on the study's design, fieldwork, and analysis, Global Black Maternal Health are reassured that the resulting interventions and implementation of recommendations will appropriately support Black mothers and families.

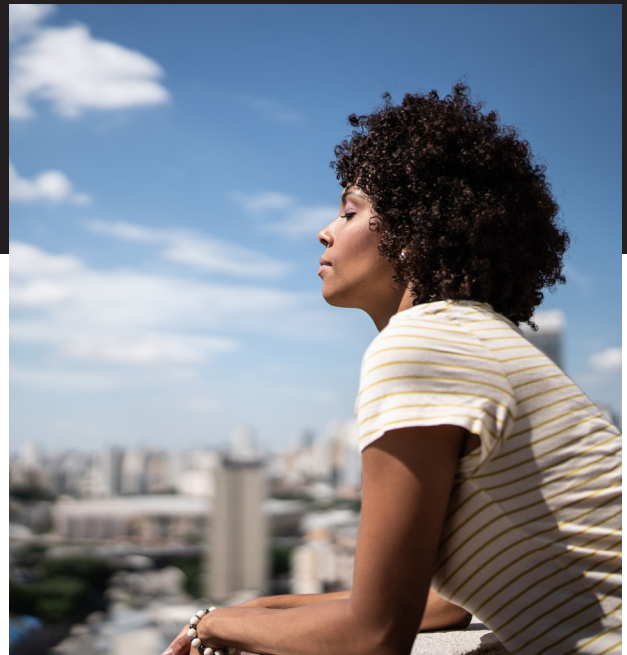
METHODOLOGY

STUDY DESIGN

The study used an online survey to explore the awareness, attitudes, and behaviours of Black mothers and Black pregnant women living in London towards air pollution and air pollution in pregnancy.

PARTICIPANTS AND RECRUITMENT

Participants were those who identified as being a Black woman or woman of Black mixed heritage living in London and either currently pregnant or pregnant within the last five years (no earlier than November 2017). Consent to take part in the study was sought at the start of the survey, and respondents were given the option, at the end of the survey, to provide their email address for the purpose of receiving a copy of the final report and to remain updated about Global Black Maternal Health's activities. All respondents answered screening questions and provided demographic information before being routed to a specific pathway based on the information they had given. Recruitment was via a combination of purposive, snowball, and e-snowball sampling. Purposive sampling is a method of gathering data that targets specific groups of a population - in this case: Black women and women of Black mixed



heritage either pregnant or pregnant within the last five years. Snowball sampling involved recruitment via social networks known to the team (for example, word of mouth) and e-snowball sampling involved sending the survey to interest group leaders known to the researchers (for example, parent groups) for distribution amongst their networks. To this end, the survey was disseminated across the social media platforms Twitter, Instagram, and Facebook to a number of relevant networks including @fivexmore, @prosperitys and @pregnantthenscrewed. The survey was also shared via various WhatsApp groups.

SURVEY DEVELOPMENT

The survey was developed by the researchers (MP, IO, RW, AA) with input from the wider Global Black Maternal Health team and members of the expert panel, and was hosted using the platform SurveyMonkey. Comprising questions that captured both quantitative and qualitative

data (open-text comments), the survey explored awareness of and attitudes towards air pollution and air pollution in pregnancy. Questions also explored behaviour and lifestyle choices that may be influenced by awareness and attitudes towards air pollution and air pollution in pregnancy. The survey was piloted on a small group of Black mothers ($n = 7$) to assess readability and comprehension of the questions, and to get a sense of the completion time. Feedback was incorporated and amendments made until consensus between the research team was achieved. The survey's launch and close coincided with two poignant days: survey launch on Clean Air Day (7th September 2022) and survey close at the end of Black History Month (31st October 2022). All researchers worked within the ethical framework set out in the Government Social Research Guidelines.

SURVEY CONTENT

Participant characteristics

Respondents provided demographic information, including whether they were currently pregnant or had been in the last five years (no earlier than November 2017); age; ethnicity; biological sex; religion; religiosity; employment status; postcode; number of biological children; ages of biological children; highest education level; and annual household income. The survey also asked participants how they travel around their local area; whether they own or have access to a car; their proximity to green space; and whether they live on a main or side road.

Awareness of air pollution:

This section included questions exploring participants' awareness of the impact of air pollution on health in general, and questions related specifically to awareness of the impact of air pollution in pregnancy. Questions also asked participants their belief on the main contributor to air pollution in the UK and their perception of the air quality in their local area.

Attitudes towards air pollution:

This section included questions relating to participants' concerns about the impact of air pollution on their own health and in pregnancy. Some questions routed participants to certain items to allow them to provide more detailed information about the previous response given.

Behaviours related to air pollution:

Questions in this section assessed the behaviour of participants in the context of air pollution and air pollution in pregnancy by asking if and in what way they had made changes to their lifestyle that were attributable to their feelings about air pollution. Participants were given the option to follow up certain responses by providing more detail through open-text comments.

DATA ANALYSIS

Demographic data and closed-text responses from the survey were analysed quantitatively. Descriptive statistics have been used to present these findings. Open-text box responses exploring attitudes and behaviours towards air pollution and air pollution in pregnancy were analysed qualitatively. Responses were read and re-read (by MP and RW) to gain an overall sense of participants' experiences. Codes were assigned to the responses and themes were coded as they arose using a thematic analytic approach, where appropriate.



FINDINGS

PARTICIPANT CHARACTERISTICS

A total of 434 people began the survey; 208 were excluded for one or more of the following reasons: indicating they lived outside of London; completing demographic questions only; not being of Black heritage. The final number of responses included for data analysis was 226.

Pregnancy, children and gender

Of 226 eligible respondents, over three quarters (77%; $n = 174$) stated they had been pregnant within the past five years, whilst 23% ($n = 52$) stated they were currently pregnant. More than half of respondents had one child at the time of taking the survey (53%; $n = 120$), whilst 27% ($n = 60$) had two children and 12% ($n = 28$) were pregnant with their first child. All respondents identified as female.



Pregnancy status

Currently pregnant

23%

Pregnant within the past 5 years

77%



Number of children

0 children (pregnant with first child)

12%

1 child

53%

2 children

27%

3 children

5%

4 or more children

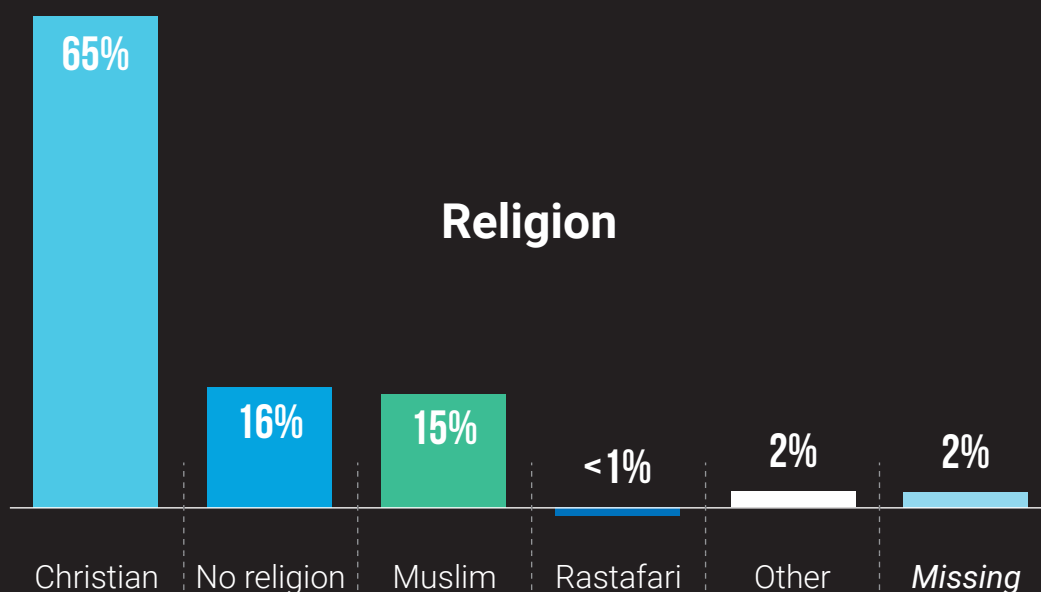
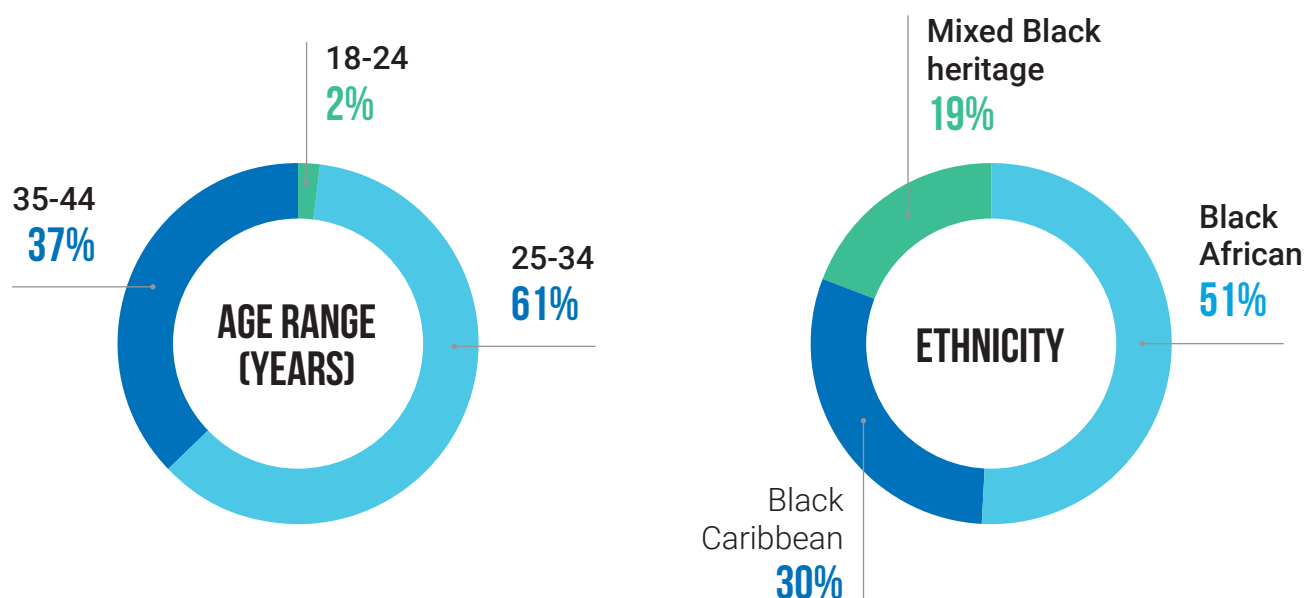
2%

Age, ethnicity and religion

Respondents most commonly reported being between 25-34 years old (61%; $n = 137$) at the time of completing the survey. There were no respondents aged under 18 or over 44 years old.

Over half of respondents (51%; $n = 113$) identified as being of Black African/ African British heritage. Black Caribbean respondents accounted for 30% ($n = 66$) of respondents whilst mixed respondents were 19% ($n = 43$) of the surveyed population.

Most respondents stated their religion was Christianity (65%; $n = 148$). Having no religion was the second highest belief system (16%; $n = 36$) followed by Islam (15%; $n = 34$). When asked about religiosity, 80% of respondents described themselves as somewhat or very religious.



Education, income and skills employment

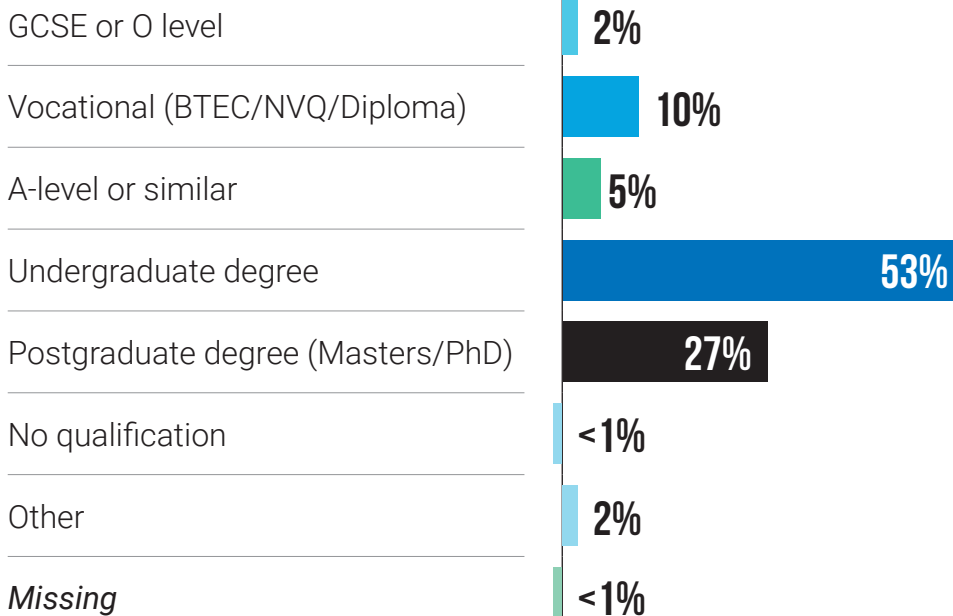
Respondents were asked about their highest level of education. Eighty percent of respondents ($n = 119$) stated they were educated to degree level or above. Seventeen percent of respondents ($n = 38$) had achieved GCSEs, A-levels or a vocational qualification as their highest level of education.

Additionally, women were asked about their total household income. Respondents with a household income of £60,000 or under accounted for 57% of respondents ($n = 129$). Household earnings of £20,000-£40,000 were the most commonly reported (24%; $n = 54$). Twenty-two percent ($n = 49$) had a household income of £60,001-£80,000 or £80,001-£100,000 and 14% ($n = 34$) had earnings in excess of £100,000.

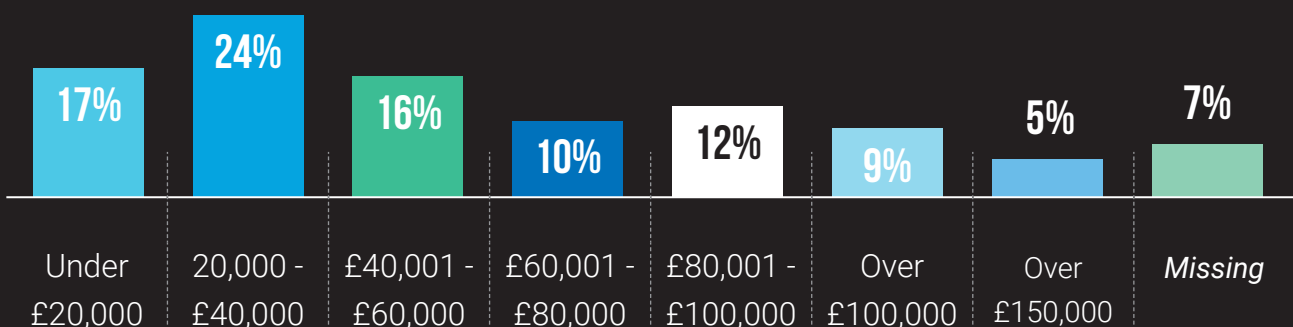
The majority of women were working fulltime or parttime outside of the home (83%; $n = 187$), 12% ($n = 26$) were looking after the home and family, and less than 2% ($n = 4$) were unemployed.



Education



Income



Location, green space and transport

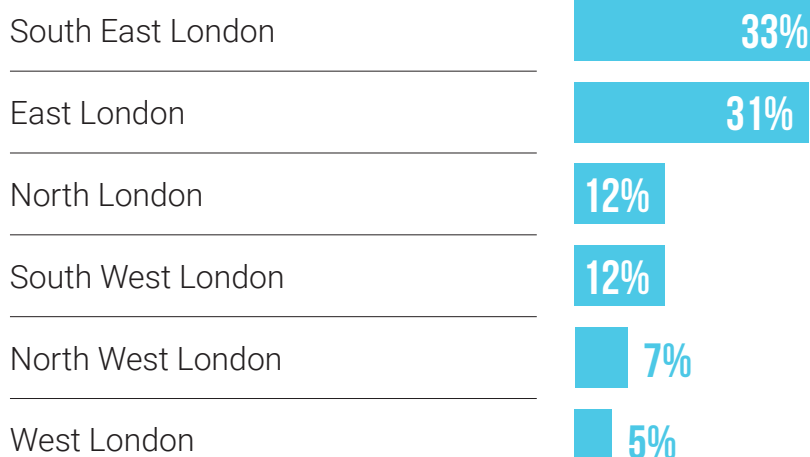
Respondents answered questions about the part of London in which they lived and the type of road on which they lived. Thirty-one percent ($n = 71$) of respondents lived in South London, followed by 21% ($n = 47$) living in East London, 9% ($n = 20$) residing in North London, 7% ($n = 16$) in North West London and 5% ($n = 11$) in West London.

Eighty-two percent ($n = 185$) of women reported living on a residential or side street while only 18% ($n = 41$) stated they lived on a main road at the time of completing the survey. Respondents were asked about their proximity to green spaces, for example parks, fields or other open green areas. Sixty-five percent of respondents ($n = 147$) lived five minutes or less walking distance from a green space, with almost half of those respondents living less than two minutes walking distance from a green space (30%; $n = 69$).

With regards to transportation, 77% of respondents ($n = 173$) reported owning or having access to a car at any time. When asked how often they used a car to travel, 61% ($n = 137$) said often or almost always. Respondents were also asked about walking and cycling. Twenty-seven percent ($n = 60$) stated walking was their mode of transport every day, whilst 50% ($n = 113$) said they used walking as their mode of transport up to three times per week. However, when asked about cycling, 88% of women ($n = 199$) said they never used cycling as their mode of transport.



Location





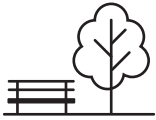
Residential Area

Located on a main road

18%

Located on residential/side street

82%



Proximity to green space

Less than 2 minutes walking distance

31%

5 minutes or less walking distance

34%

10 minutes or less walking distance

26%

20 minutes or less walking distance

8%

Over 20 minutes walking distance

1%



Car Ownership

Owns a car

77%

Does not own a car

23%

SURVEY FINDINGS

Awareness of air pollution

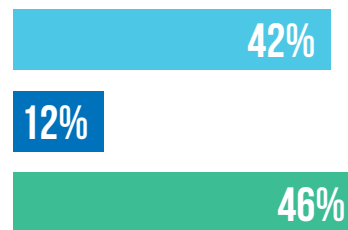
Respondents were asked about their awareness of the impact of air pollution, before being asked to indicate what they thought to be the main cause of air pollution. When asked how much they knew about the impact of air pollution on their own health, most (66%; $n = 150$) reported that they knew 'a little', whilst 17% ($n = 38$) said they knew 'a lot' and 17% ($n = 38$) reported knowing 'nothing at all'.

How much do you know about the impact of air pollution...

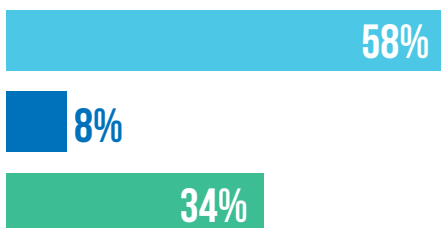
a)...on your health



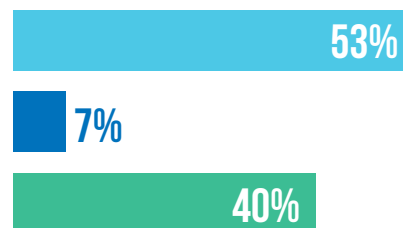
b)...on your health during pregnancy



c)...on the health of a baby in the womb



d)...long-term impact for a child once born



● Nothing at all ● A lot ● A little

Figure A. How much do you know about the impact of air pollution: a) on your health; b) on your health during pregnancy; c) on the health of a baby in the womb; d) in the long-term for a child once born

However, when asked about their awareness of the impact of air pollution on health during pregnancy, respondents reported knowing far less: compared to only 17% who stated they knew ‘nothing at all’ about the impact of air pollution on their health, 42% ($n = 96$) said they knew ‘nothing at all’ about its impact during pregnancy. Respondents declared they knew even less about the impact of air pollution on the health of a baby in the womb and about the long-term health impact of air pollution for a child once born, with 58% ($n = 132$) and 53% ($n = 120$) reporting knowing ‘nothing at all’, respectively (Figure A).

The majority of respondents (78%; $n = 176$) believed the main cause of air pollution in their area to be transport and traffic. Seven percent ($n = 15$) of respondents named energy generation as the main cause of air pollution in their area (Figure B).

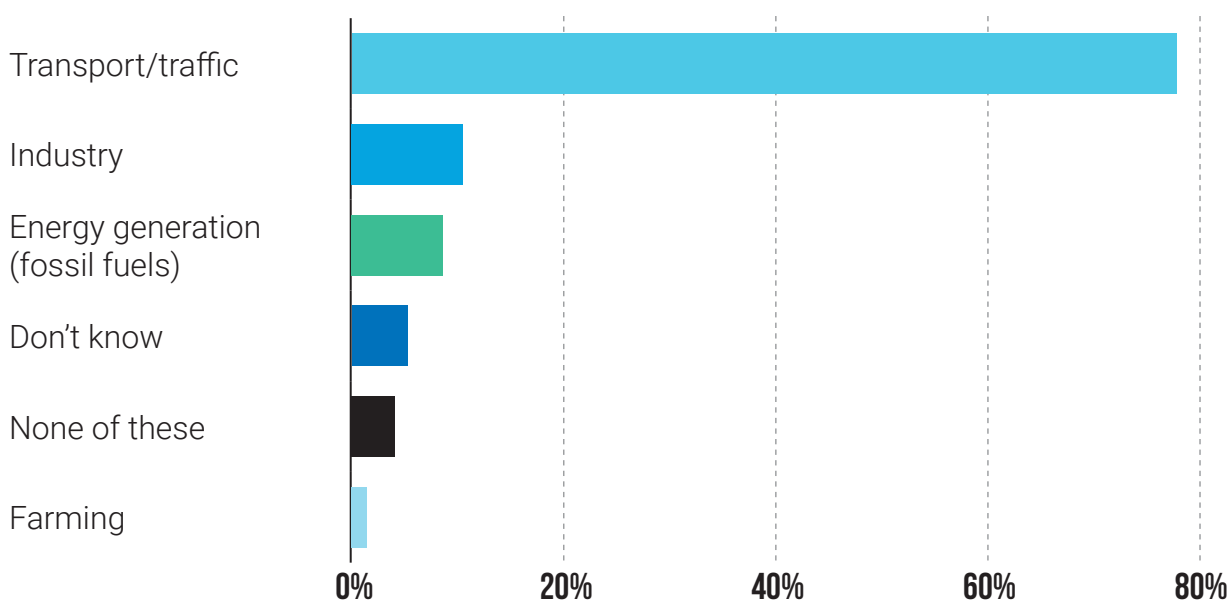


Figure B. Which one is the main cause of air pollution in your area?

Only 6% ($n = 13$) of respondents felt that the air quality in the area was good enough. Most (77%; $n = 173$) felt that it needed some or a lot of improvement (Figure C). Mixed heritage respondents were most likely to say the air quality needs a lot of improvement (49%; $n = 21$) compared to Black African (37%; $n = 42$) and Black Caribbean (36%; $n = 24$) respondents.

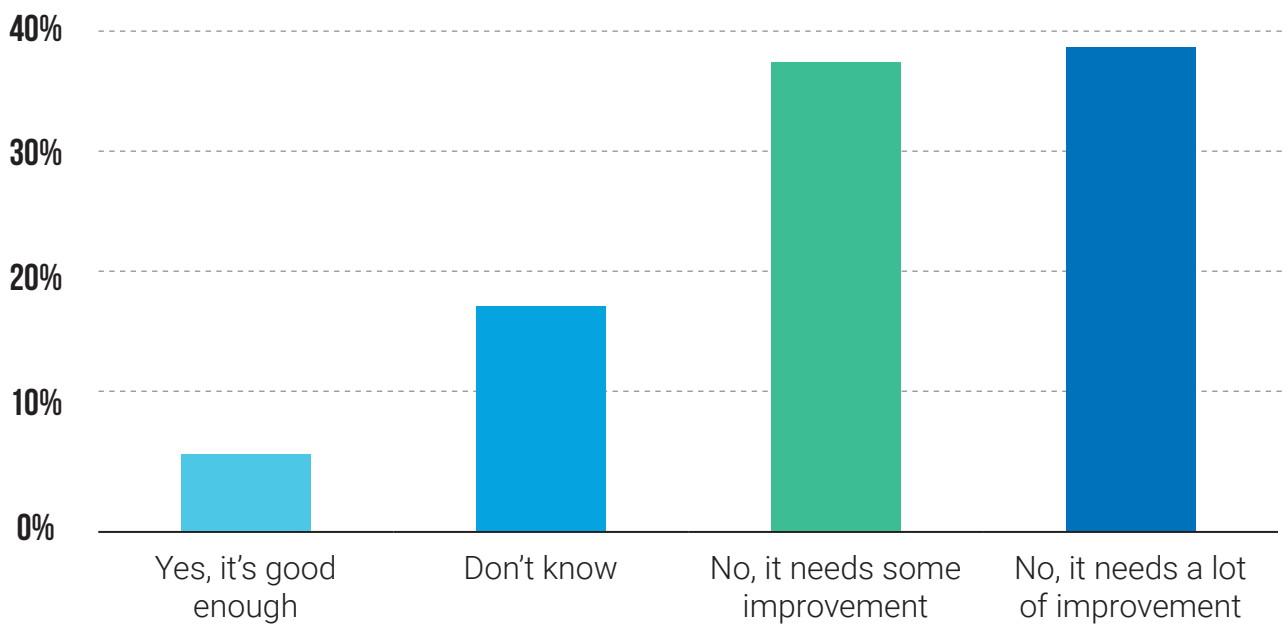


Figure C. Do you think the air quality in your local area is good enough?

Attitudes towards air pollution

The majority of respondents (89%; n = 198) indicated that they were 'concerned' or 'somewhat concerned' about air pollution in their local area (Figure D). Respondents earning between £20,000-£40,000 and between £40,0001- £60,000 were most likely to state they were 'not at all concerned'.

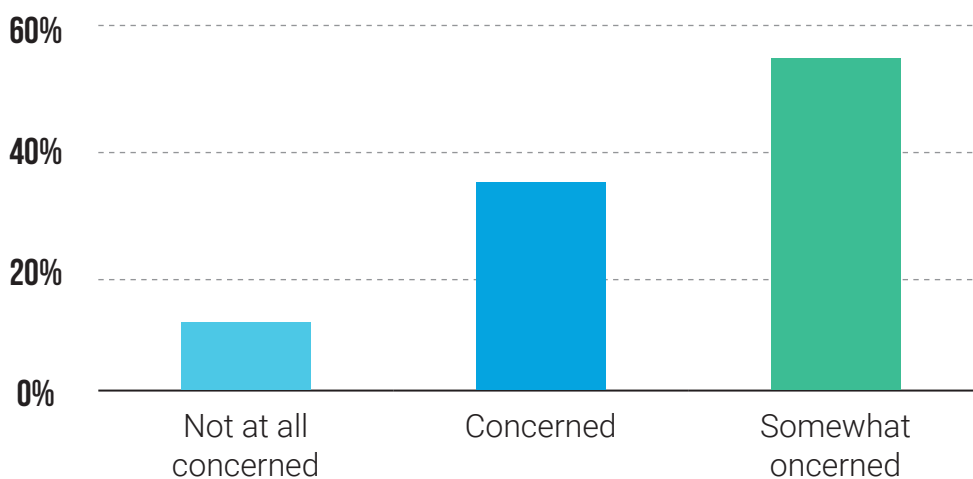


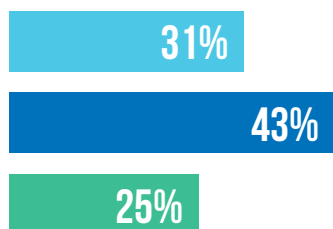
Figure D. How concerned are you about air pollution in your local area?

Of the 25 respondents who stated that they were 'not at all concerned' about air pollution in their local area, 71% (n = 17) stated that this was because they "do not know much about air pollution".

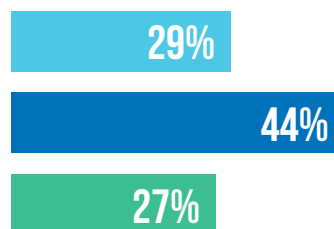
Participants were asked how concerned they were in their current or most recent pregnancy about the impact of air pollution across three domains: a) their health, b) their baby's health, and c) the long-term impact on their child once born (Figure E).

How concerned have you been about the impact of air pollution...

a)...on your health



b)...on your health during pregnancy



c)...on the health of a baby in the womb

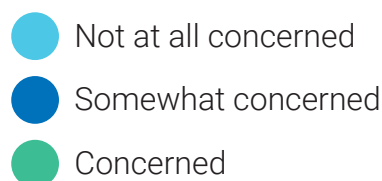
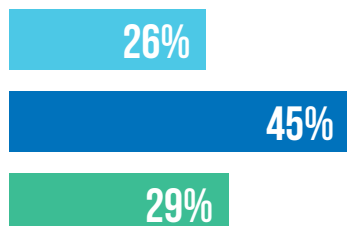


Figure E. How concerned have you been about the impact of air pollution: a) on your health; b) on your health during pregnancy; c) on the health of a baby in the womb; d) in the long-term for a child once born

Whilst the majority of respondents reported being concerned or somewhat concerned about the impact of air pollution on their health, their baby's health, and the long-term impact of air pollution on their child once born, just over a quarter (26%-31%) reported that they were not at all concerned. Almost half of Black Caribbean respondents (49%; n = 30) said they were not at all concerned about the impact of air pollution on their health in their current or most recent pregnancy in comparison to 25% (n = 25) of Black African and 17.5% (n = 7) of Black mixed respondents.

In your current/most recent pregnancy, how concerned have you been about the impact of any of the following on your baby's health?

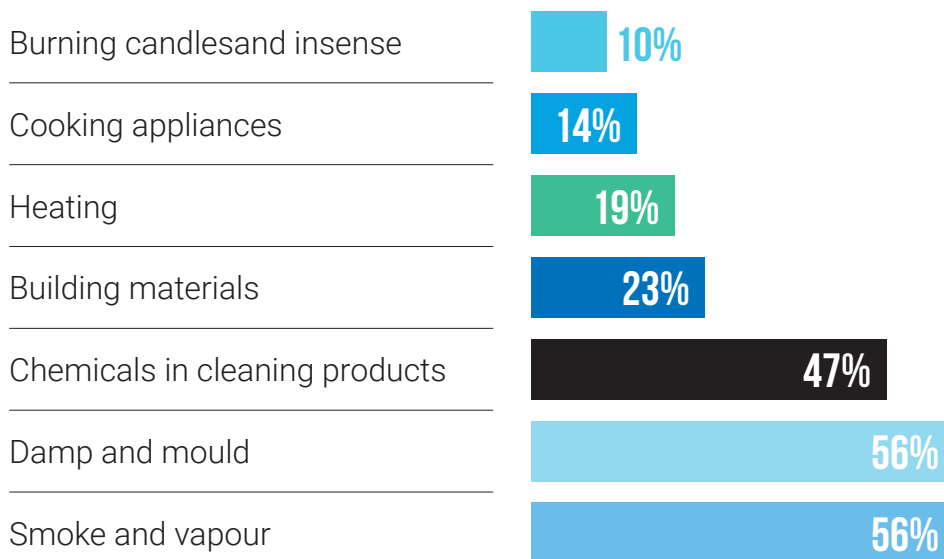


Figure F. In your current/most recent pregnancy, how concerned have you been about the impact of any of the above on your baby's health?

When asked which of a series of air pollutants they had been concerned about for the health of their baby during their current or most recent pregnancy, respondents were most concerned about 'smoke and vapour' and 'damp and mould', and less concerned about building materials, cooking appliances, heating, and burning candles and incense (Figure E).

Participants were given the option to provide more detail on their level of concern about the impact of air pollution via open-text comments. These responses were grouped into two categories: 1) those expressing no concern, and 2) those concerned or somewhat concerned. Since respondents often did not distinguish between the three domains (their health; their baby's health; and the long-term impact on their child once born), responses were collapsed across these domains and analysed collectively before being grouped into themes.

Those not concerned about the impact of air pollution

“I didn’t know it was an issue”

The overwhelming reason for minimal concern about the impact of air pollution was a **lack of awareness and knowledge**. Respondents described not knowing “the seriousness of what impact it could have”, not being “fully educated” on how air pollution can contribute to ill health and having “little awareness”:

“I wasn’t aware that air pollution could affect my baby whilst pregnant”.

For some, lack of awareness was attributable to the professionals involved in their healthcare. For instance, one respondent stated:

“It’s never really something that was highlighted at antenatal appointments”.

Similarly, another reported that:

“It wasn’t something I had thought about until completing this form as this isn’t something that is discussed with me by medical professionals”.

“It didn’t cross my mind”

A number of respondents stated that air pollution and its impacts had **not featured in their thinking** during their current or most recent pregnancy, describing how they “didn’t really give it a thought” and that air pollution is a topic not thought about “unless the matter is raised”. For many, the subject paled in significance to other pregnancy-related concerns such as their diet or whether their pregnancy had been complicated by health issues. For instance, one respondent stated:

“It didn’t cross my mind. I was too concerned with what I was eating, and the results of my scans to think about it”.

Whilst another reported:

“I didn’t think about air pollution as I was too busy trying not to be sick for 40 weeks”.

“I don’t live in a busy area”

For some, a **perceived lack of exposure to pollutants** explained why they were not concerned about the impact of air pollution. These respondents described the area in which they lived as “surrounded with greenery” and “less polluted”. Others spoke about how the national lockdown in 2020 due to the coronavirus pandemic influenced their behaviour and subsequently, their attitudes towards air pollution:

“It was the height of Covid lockdown, there was hardly any traffic on the roads in the area. It was actually a lovely and peaceful time and the cleanest air I would experience in the area”.

“All scans and fetal movements were normal”

For a few, however, minimal concern about the impacts of air pollution was described in the context of **low perceived risk**, with these respondents using the outcome of antenatal assessments as a measure for their level of concern:

“The midwives carry out several tests and breathing issues were not identified”.

Those concerned and somewhat concerned about the impact of air pollution

“The quality of your air can determine the quality of your long-term lung health”

A significant proportion of these responses related to the **impact of air pollution on lung health**. Some people were concerned about their own health, reporting concerns about developing “breathing difficulties” and an “increased risk of respiratory illness”. Others spoke about the impact on young babies; one respondent stated that babies’ lungs are “not strong enough to deal with bad

air”, whilst another worried that they “don’t know how air pollution will affect developing lungs”. Another questioned the role of their locality on their baby’s future health:

“...will my baby develop asthma like his brother due to environmental factors of where we live?”

The impact on the lung health of children was mentioned by a number of respondents, with worries about asthma featuring predominantly. Some equated poor air quality with poor respiratory health, reporting that the quality of air “can cause things like asthma” and that “bad air quality means asthmatic children”. Others were less sure, but felt air pollution had some role to play in their child’s health:

“He has symptoms of asthma and I have no way of knowing if this has been caused by my intake of pollution while pregnant...I’m concerned air pollution will make it worse”.

Respondents with a family history of respiratory issues were especially mindful of the contribution of air pollution to lung health. One respondent, whose older child has asthma, was sensitive to how “the environment can make your health feel better or worse”, and another worried that their baby’s lung health may be at risk after suspecting that their older son’s breathing issues, which later worsened, had been exacerbated by air pollution:

“My son had a viral wheeze which turned into suspected asthma for which he now takes daily medication”.

“You question what you take in from your environment and how this is being transferred to your unborn”

Concerns were raised that **pollutants can be transferred to unborn babies**, negatively impacting their health. For example, one respondent stated that they were worried about how pollution can be “passed through the placenta” and another was concerned about how it “affects the development of the fetus”. This group described feeling worried during pregnancy that exposure to air pollution would put them at risk of complications such as difficulty conceiving and preterm birth. One respondent stated that premature birth was their “biggest concern”, whilst another felt that air pollution had led directly to the early birth of their baby:

“While being pregnant I was worried that if pollution was affecting my health, then it would definitely affect my baby and I ended up having her at 33 weeks 4 days”.

“Living in London means heavier pollution entering my system”

Unlike the group who were not concerned, and who ascribed protection from the impact of air pollution to the greenery of their area, those who were concerned reported being so because they perceived their **surrounding area to be highly polluted**. Those living near a main road and in built-up areas in London were especially worried about the quality of air to which they are regularly exposed. One person, living on a busy main road, explained how they refrain from opening the windows to their apartment because of the smell of exhaust fumes that enters the building. This, they thought, was related to their son’s persistent cough. Another described wanting to move away from their area after what they described as “a long period of exposure”, and another spoke about the loss of her baby to which she felt living near one of London’s busiest A-roads was a contributor:

“I live near the A406 and when I was pregnant, I became very concerned about the effects on my baby. I gave birth at 5 months and my baby did not survive”.

Some people perceived not only their outside surroundings to be highly polluted, but also the environment within their home. Indoor air pollution in the context of mould and damp living conditions was a reason of concern:

“My house has mould, condensation and damp. It also has horrible smells coming from the drain system of the estate I live in. It’s a very busy popular area with loads of vehicles”.

“There was an incident in the media where a Black little girl lost her life due to air pollution”

For a small number of respondents, concern arose after they came across air pollution and its impact on health as **a topic in the media**. For instance, one person spoke of becoming enlightened on “how

life-threatening air pollution can be” after watching a documentary, and the potential for air pollution to be fatal after seeing it being attributed to the deaths of young children caused one respondent to reflect on the health of their own family:

“I’ve seen news stories of children that have died from pollution elsewhere in London and worry that it could happen to myself or my children”.

Behaviour towards air pollution

Respondents were asked if they had modified their lifestyle because of air pollution during their current or most recent pregnancy.

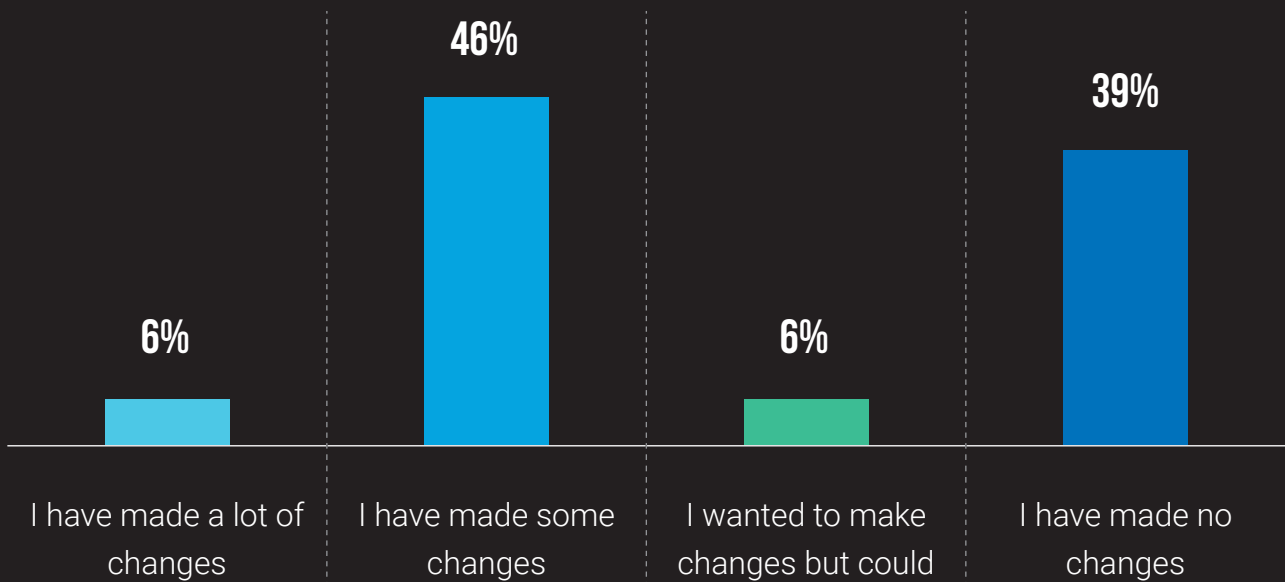


Figure G. In your current/most recent pregnancy, to what extent did you make changes to your lifestyle because of air pollution?

Just over half of respondents (54%; $n = 102$) indicated making changes, whilst 39% ($n = 73$) said that they made no changes. Six percent ($n = 11$) reported that they had wanted to make changes but could not (Figure G). Black African respondents were most likely to have made changes to their lifestyle (30%; $n = 54$) compared to Black Caribbean and black mixed respondents (15%; $n = 27$ and 9%; $n = 17$, respectively). Using open-text comments, participants were able to provide more detail about their responses which were subsequently grouped into two categories: 1) responses from those who made some or a lot of changes to their lifestyle, and 2) responses from those who wanted to make changes but could not.

Those who made some or a lot of changes to their lifestyle

Responses from those who had made lifestyle changes fell naturally into changes made in response to outdoor air pollutants, and changes made in response to indoor air pollutants.

Outdoor air pollutants

The most frequently mentioned lifestyle changes centred around **avoiding car emissions**. People reported achieving this by “taking the back route to avoid busy traffic areas”, ensuring that they “don’t walk on busy roads with the baby”, and doing their best to “avoid main roads as much as possible”.

Avoiding travelling in peak times was also mentioned. Some reported a **change in transport habits**, with one example coming from a respondent who described how they “prefer to drive than take a walk to

avoid air pollution”. However, this lifestyle change was sometimes described in terms of a personal contribution to air pollution, with these people talking about using their car “minimally” and “going for more walks instead of driving”.

One lifestyle change was a **change in exercise habits**, with some opting for home workouts instead of exercising outdoors. Spending **more time in green spaces** was also reported, with some “going to parks more” and others going for daily walks “away from any built-up areas”.

Some felt strongly enough that they **moved to a different area**. For instance, one respondent stated that they had moved “to somewhere closer to the countryside”, whilst another explained that, since moving out of London they avoid travelling into the city unnecessarily. One respondent went to great lengths to mitigate their risk of the impacts of air pollution when trying to conceive:

“I moved away from the city to the mountains when I decided to try for a baby”.

Finally, people mentioned changes to their **ventilation habits**, and described this in terms of their exposure to outside air pollutants. One respondent explained how they refrain from “opening windows too wide or for too long”, another talked about how they “don’t sit outside or open windows at peak traffic times”, whilst another stated that they “close the window if approaching stationary traffic”.

Indoor air pollutants

The predominant lifestyle change in relation to indoor air pollutants centred around **vigilance about cleaning products**. A number of people described “no longer using harsh chemicals”, “not spraying chemicals in the house”, and using “eco-friendly cleaning products”.

Respondents also talked about **avoiding smokers**, explaining how they were more aware of being around people who smoke, and not allowing smokers in their home. Changes to **candle burning** and **removing mould** were also reported:

“I don’t burn incense or candles anymore unless it’s made of soy wax”.

Similar to changes made in response to outdoor air pollutants, respondents also described a change in **ventilation habits**, in this case referring to the quality of the air indoors. Some had purchased air purifiers and described “using air filters when possible”. Others explained how they had tried to improve their indoor air quality by opening the windows in their home, “allowing air to circulate”:

“I don’t like to keep the windows in the children’s room closed”.

Those who wanted to make changes but could not

For the few who wanted to make changes but could not, situations often not within their control, were described. This included



constraints related to where they lived and worked, financial restrictions, such as not being able to afford the filters for anti-pollution face masks, and wider systemic issues:

“I’m trapped in the cladding scandal and have not been able to move. Even though it was my plan to move after the baby was born”.

Moving to a different area

The survey asked respondents whether they had moved from a different area since their current or most recent pregnancy. Seventy percent ($n = 127$) indicated that they had not moved, and 30% ($n = 54$) stated that they had. As above, participants

were able to provide more detail about their responses. Only a small number of respondents cited their reason for moving as being related to air pollution. For instance, one respondent described how they wanted to live “on a quieter road with less pollution and more space”, another mentioned wanting to be “closer to public parks and greener area, and another, having lived in inner-city London, “moved to the suburbs” in search of more greenery and space. Nonetheless, the most common reason people gave for moving was needing a bigger property, followed by the opportunity to become a homeowner and wanting to be closer to family.

General views about the impact of air pollution on maternal, fetal, and child health

At the end of the survey, participants were given the opportunity to share their thoughts via open-text comments on the impact of air pollution on their health, their baby’s health or the long-term impacts for a child once born. Overwhelmingly, respondents’ comments related to **public awareness and education** of air pollution. Many respondents recognised that they lacked knowledge about air pollution and its impacts, with one respondent lamenting that they wished they “knew more at the time of being pregnant” and another describing that they “don’t have enough knowledge on the matter”. Some attributed this to poor sharing of information, perceiving air pollution to be “a topic that is hardly reported on”. In this regard, many described the need to raise awareness of air pollution and its impacts. For instance,

one respondent explained that this information “needs to be made common knowledge”, and another felt that “more education in this area would be beneficial to mothers and expectant mothers”. It was felt by one respondent that sharing this information was the responsibility of healthcare professionals:

“More work is needed to educate pregnant women and this should be through hospitals/midwives and community groups”.

Another respondent felt that education should cover all aspects of air pollution:

“I do believe that there needs to be more awareness about the hidden harm of air pollution and that it is not just caused by outdoor elements but also indoor elements”.

A number of comments highlighted respondents’ **worries about air pollution** and its impacts. Some reported feeling scared and concerned, describing air pollution as “very worrying”. One respondent even reported feeling a sense of guilt:

“I am very concerned about the long-term impact of air pollution regarding my 3-year-old. I do constantly wonder if living on a main road and working in the city whilst pregnant contributed to him having suspected asthma.”

Hyper-vigilant behaviour was described by another respondent. Living in an area with high pollution, they explained that they “constantly monitor” their daughter to see if she will develop asthma.

Comments also highlighted some of the **barriers to mitigating risk**. For instance, one respondent stated feeling “powerless”, and another felt that air pollution and its impacts are beyond their control:

“Honestly, I feel somewhat hopeless about it. I feel acutely aware that the air quality is bad...But as someone who needs to drive to the school pick up, takes a tube to work and lives 10 miles from my parents’ house, I know I’m contributing to it”.

Other barriers included not wanting to be far from family networks and perceiving there to be limited evidence to support the claims about air pollution and its impacts. Finally, respondents highlighted the need for both **personal and wider responsibility** to reduce air pollution and raise awareness about its negative effect on health. It was felt that “the Government should take more action”, with one suggestion that transportation costs should be reduced, and more effective initiatives developed to better incentivise people to take public transport, walk, or cycle. Another suggestion was that “medication for asthma and respiratory conditions should be free considering the level of pollution we are subjected to”.



DISCUSSION AND CONCLUSIONS

The aim of this study was to explore the awareness, attitudes, and behaviours of Black mothers and Black pregnant women living in London towards air pollution and air pollution during pregnancy. Through this work, we have gathered Black mothers' and Black pregnant women's views on air pollution, learned about their perceptions of its impact on maternal, fetal and child health, and identified whether these perceptions have influenced their lifestyle choices. In the first work of its kind, our findings have presented us with novel insights that should be used as a source of innovation in the development of strategies designed to reduce the harmful effects of air pollution for at-risk communities.

How aware are Black mothers and Black pregnant women about the impact of air pollution and air pollution in pregnancy?

Evident from the responses given, was that most of the Black mothers and Black pregnant women we surveyed had some level of awareness of air pollution and concern about its health impacts.

Many frequently cited common outdoor air pollutants in their concerns, and most respondents accurately perceived the biggest contributor to air pollution in London to be transport and traffic.



A number of women also showed concern about indoor air pollutants, worrying most about smoke and vapour, damp and mould, and chemicals in cleaning products. Some were in a position to make lifestyle changes in accordance with these concerns, actively avoiding those who smoked and switching to eco-friendly cleaning products. The fact that some women were able to use their knowledge to mitigate their risk is reassuring.

Less reassuring, however, is that women were not as worried about heating nor about cooking appliances, despite the fact that these sources also release chemicals (fine particulate matter (PM_{2.5}) and nitrous oxide (NO₂)) into the air known to contribute to indoor air pollution.

This lack of concern could simply reflect individual heating and cooking practices (for example, personal use of an electric vs. a gas stove), but it is also possible that the women we surveyed were not aware of these as sources of indoor air pollution.

Thus, whilst our findings indicate that most Black mothers and Black pregnant women are aware of traffic-related air pollutants, they also highlight the gaps that exist in their knowledge about the sources of indoor air pollution.

Given that people spend the majority of their time indoors, it is vital that awareness is raised about the harmful effects of indoor air pollutants and that mothers are offered suggestions about how to minimise their risks (for example, the use of vent hoods whilst cooking with gas appliances and opening windows to allow ventilation).

Relatedly, the findings also reveal that Black mothers and Black pregnant women knew less about the impact of air pollution on the health of a baby in the womb or the health of a child once born than they did about its impact on their own health.

We speculate that one reason for this could be a belief that the fetus remains protected from external pollutants. Another possibility is that campaigns that raise awareness about air pollution may have focused on its impacts on personal health perhaps because the research about its risks to maternal and fetal health are less well known. Whatever the reason, the findings highlight the need to arm expectant mothers with information about these risks so that they can make informed decisions about their lifestyle choices.





How concerned are Black mothers and Black pregnant women about the impact of air pollution and air pollution in pregnancy?

Of those who reported being concerned about air pollution, a substantial number cited worries about its impact on lung health. Some were concerned about the impact of air pollution on the lung health of a baby in the womb – a worry that is justified given the research suggesting that prenatal exposure to air pollutants increases susceptibility to respiratory infections²⁵ and contributes to the development of wheezing and asthma in children²⁶.

Others reported being anxious about the impact of air pollution on the lung health for a child in the long-term which chimes with findings indicating a link between childhood exposure to traffic-related air pollutants and the development of asthma²⁷.

Unsurprisingly, those who had pre-existing medical conditions and who had children already with an asthma diagnosis were especially mindful of the impact of air pollution. Worthy of note, however, is that some of the women we surveyed were not concerned about air pollution, most often due to self-reported lack of awareness or because they perceived themselves for various reasons to be at low risk of its impacts.

²⁵Jedrychowski WA, Perera FP, Spengler JD, et al. Intrauterine exposure to fine particulate matter as a risk factor for increased susceptibility to acute broncho-pulmonary infections in early childhood. *Int J Hyg Environ Health*. 2013;216(4):395-401. doi:10.1016/j.ijheh.2012.12.014

²⁶Hehua Z, Qing C, Shanyan G, Qijun W, Yuhong Z. The impact of prenatal exposure to air pollution on childhood wheezing and asthma: A systematic review. *Environ Res*. 2017;159:519-530. doi:10.1016/j.envres.2017.08.038

²⁷Khreis H, Kelly C, Tate J, Parslow R, Lucas K, Nieuwenhuijsen M. Exposure to traffic-related air pollution and risk of development of childhood asthma: A systematic review and meta-analysis. *Environ Int*. 2017;100:1-31. doi:10.1016/j.envint.2016.11.012

What changes have Black mothers and Black pregnant women made to their lifestyle in response to air pollution?

For some, awareness and attitudes corresponded with behavioural and lifestyle changes. Many Black mothers and Black pregnant women had made lifestyle adjustments because of air pollution. Of those who had, these changes predominantly involved avoiding car emissions, mirroring women's perception of traffic and transport as the most significant pollutant. This was particularly interesting as Black mothers and Black pregnant women reported higher than average levels of car ownership in London²⁸. Several women were able to make more significant changes to their behaviours and lifestyle, for example, moving to or buying a home in a less polluted area. However, it is important to note that although some women who had moved area in the last five years had done so for reasons relating to air pollution, most had not, moving most often because they needed a bigger property. This finding provides some insight into what needs mothers may or may not be able to prioritise.

Apparent from our findings was that changes to behaviours and lifestyle as a consequence of air pollution were often limited to those with both the awareness and resources to make them (for example, those with enough money to buy eco-friendly cleaning products, to be able to

afford a property near green space, or to have the option to take alternate methods of transport).

Importantly, there was evidence that some women would have liked to have made changes but were unable to for reasons beyond their control, including but not limited to a lack of financial resource, reliance on a support network based within the city, or a feeling of powerlessness to the impact of air pollution.

This finding makes clear the need to support mothers to make positive lifestyle changes that are both affordable and practical. The use of pregnancy-specific smartphone apps is now commonplace, with women using them to obtain information on nutrition²⁹, and risks and conditions in pregnancy³⁰. There is no reason why this technology could not also be used to provide women with information about air pollution and its health risks during pregnancy and beyond; a free or low-cost app that offers real time information about the outdoor air quality in the local area and that suggests feasible strategies for minimising exposure to both indoor and outdoor air pollution could, therefore, be an option.

Greater awareness is needed

The findings also revealed that women often have other priorities in pregnancy.

²⁸ Barrett S, Wills J, Washington-Ihime M. Chapter 1: Car ownership, use and parking in London. In: Reclaim the kerb: The future of parking and kerbside management. Centre for London. 2021.

²⁹ Wang N, Deng Z, Wen LM, Ding Y, He G. Understanding the Use of Smartphone Apps for Health Information Among Pregnant Chinese Women: Mixed Methods Study. *JMIR Mhealth Uhealth*. 2019;7(6):e12631. Published 2019 Jun 18. doi:10.2196/12631

³⁰ Lee Y, Moon M. Utilization and Content Evaluation of Mobile Applications for Pregnancy, Birth, and Child Care. *Healthc Inform Res*. 2016;22(2):73-80. doi:10.4258/hir.2016.22.2.73



In the face of pregnancy-related issues, concerns around diet, and other better known risk factors that were discussed with them by healthcare professionals, many women reported that air pollution was not mentioned as part of their antenatal care. Limited knowledge about air pollution or lack of impetus to make air pollution-related lifestyle changes could be attributed to women's expectation that the duty of healthcare professionals is to inform them of all risks during pregnancy. Nonetheless, comments from women indicate that there is a place in antenatal care for education on air pollution: raising awareness and reducing the information deficit for risk-reducing behaviour and lifestyle changes for expectant mothers especially, was mentioned by a number of women. Health promotion initiatives that focus on lifestyle changes in pregnancy are already in use. For instance, England's National Health Service (NHS) has offered a free smoking cessation service for pregnant women for over 20 years³¹, and NHS midwives have used social media to engage women who may need weight management support during pregnancy³². Common to these programmes is the provision of education for knowledge gain – an approach found to prevail in behaviour change programmes³³. Given the key role that midwives play in maternity care for women in the UK³⁴, they are well-placed to educate women about positive lifestyle choices that will support their health and wellbeing during pregnancy and after.

³¹ Department of Health. Funding for smoking in pregnancy services 2002/03. Letter to Health Authorities (England), Chief Executives and Directors of Finance. Department of Health, 2002.

³² Leading Change, Adding Value Team. The use of social media to support weight management in pregnancy. 2019.

³³ Zinsser LA, Stoll K, Wieber F, Pehlke-Milde J, Gross MM. Changing behaviour in pregnant women: A scoping review. *Midwifery*. 2020;85:102680. doi:10.1016/j.midw.2020.102680

³⁴ Sandall J, Devane D, Soltani H, Hatem M, Gates S. Improving quality and safety in maternity care: the contribution of midwife-led care. *J Midwifery Womens Health*. 2010;55(3):255-261. doi:10.1016/j.jmwh.2010.02.002

Raising awareness about air pollution could, therefore, be included in the already existing antenatal provision, but it will be important that healthcare professionals themselves have adequate knowledge about air pollution and risk reduction.

Future work, therefore, needs to explore the awareness and attitudes of healthcare professionals on the impact of air pollution in pregnancy to identify what training, support, and resources might be needed to facilitate the addition of air pollution education to maternity care services in the UK.

Now towards action

In conclusion, the racial inequalities in exposure to air pollution in London make it imperative that education is offered to Black mothers and Black pregnant women about the impact of both indoor and outdoor air pollution on maternal, fetal, and child health.

Despite the disproportionate exposure to air pollution that Black mothers and Black pregnant women may face, many of the women we surveyed felt they lacked knowledge about the impact of air pollution and, remarkably, some reported that it was only on completing the survey that they were prompted to even consider it an issue.

Air pollution is already recognised as a significant threat to health at Government



level and initiatives to improve the air quality (such as the Clean Air Strategy and London's ULEZ scheme) have already been implemented. Its significance has also been realised in the context of England's National Health Service, with the UK's first Children's Environmental Assessment Service at the Royal London Hospital (Barts NHS Health Trust) set to open in 2023.

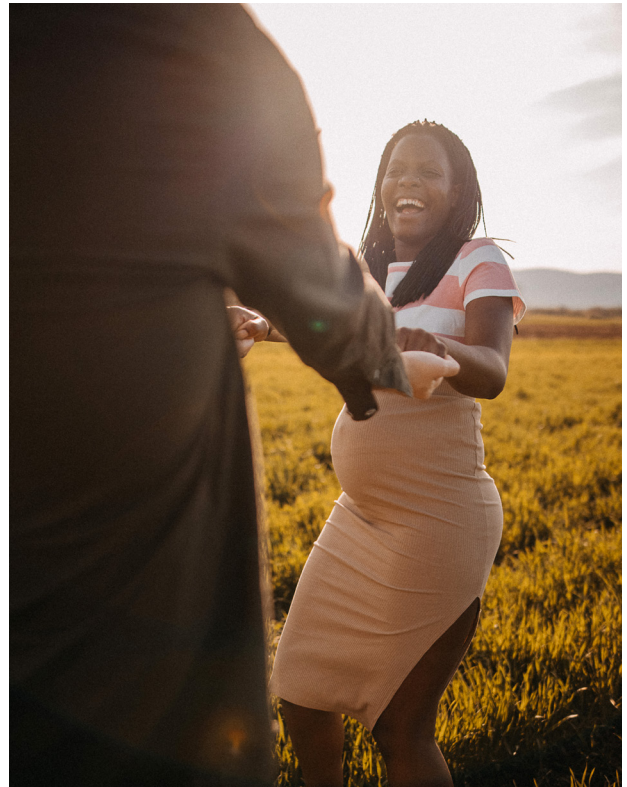
Efforts must now be made to convey the health impacts of air pollution to those communities deemed most at risk in a way that is meaningful and engaging.

There are clear avenues for offering this education within antenatal care, though whether healthcare professionals have the adequate training and resources to deliver this will need to be considered. Nonetheless, it is clear from the Black mothers and Black pregnant women that we surveyed, that they would welcome advice on how to mitigate their risks from air pollution to protect their children and improve their health outcomes.

The next step is action.

STRENGTHS AND LIMITATIONS

This is the first study to our knowledge to have offered unique insight into the perceptions of air pollution and air pollution in pregnancy in Black mothers and Black pregnant women living in London. A further strength is that this work was conducted by a Black-led research team and advised by an all-Black panel of experts; this approach, in which the leaders of the study reflect the target population, has meant that the research has been carried out with the interests of Black women at heart. A limitation of this work, however, is that there was no scope to examine sub-cultural variation in behaviour and lifestyle changes: the findings suggest there may be nuances within Black communities that: a) impact the reach of information about air pollution, and b) underpin the ability for these groups to implement these changes, however this study was not designed to explore these differences. More work is needed to identify whether variation in the awareness, attitudes and behaviours of parents within Black communities exists to ensure that messaging and support is tailored to these groups.



RECOMMENDATIONS

This report sets out recommendations to encourage action among stakeholders to reduce the negative health effects of air pollution that disproportionately impact Black women and children in London.

We have found that Black mothers and Black pregnant women are broadly concerned about air pollution but have low awareness of the issue and are constrained by their resources or capability to reduce their exposure to pollutants. Thus, solutions that rely upon the actions of individuals will remain inadequate and preserve inequitable outcomes.

Action is required across stakeholders to ensure education and empowerment for Black families, but also to ensure Black mothers and Black pregnant women are part of the long-term conversation so that solutions to reduce air pollution adequately consider their needs and experiences.

The authors of this report and the supporting expert panel outline 14 recommendations under four key areas of action for Global Black Maternal Health, policymakers, health professionals, governing bodies and Black communities.

Global Black Maternal Health Areas of Action



AMPLIFY:

to bring Black voices to the fore of the current air pollution debate.



DISCOVER:

to search for solutions that are community driven and evidenced-based.



EDUCATE:

to teach, train and equip communities and stakeholders with the knowledge to make informed choices.



EMPOWER:

to inspire autonomy and the confidence to act.

ACCOUNTABLE BODY	AREA OF ACTION	RECOMMENDATION
<p>For policymakers, including the Mayor of London, Transport for London, Public Health, Members of Parliament and Local Authorities</p>	<p>Amplify and Empower</p>	<p>Significant action is required to reduce the levels of air pollution in London. Policymakers should consult with groups most affected, including Black communities and organisations in the development of policy impacting air quality in London.</p>
	<p>Educate</p>	<p>Raise awareness of air pollution among Black families by:</p> <ul style="list-style-type: none"> A. producing co-produced, public-friendly and culturally cognisant materials on the adverse impacts of indoor and outdoor air pollution B. disseminating materials among Black community leaders and in appropriate cultural spaces
	<p>Discover</p>	<p>Commit to racial equity in air quality through:</p> <ul style="list-style-type: none"> A. a pledge to assess the financial, social and health implications of policies relating to air pollution. Specifically, the introduction of low traffic neighbourhoods and changes Ultra-Low Emissions Zone (ULEZ) for pregnant women and families within London . B. working collaboratively with GBMH and other stakeholder organisations who provide a bridge between policy makers and communities

ACCOUNTABLE BODY	AREA OF ACTION	RECOMMENDATION
<p>For maternity services, healthcare professionals and governing bodies including the Royal College of Midwifery, Nursing and Midwifery Council and Royal College of Obstetricians and Gynaecologists</p>	Amplify	Directly consult with Black women and Black stakeholder organisations to understand the specific challenges Black families face in improving their air quality and countering the impacts of air pollution.
	Educate	Provide co-produced, public-friendly and culturally cognisant educational materials to Black women living in cities and areas of high pollution, as part of family planning, antenatal and postnatal care.
	Discover	<p>Through research, in collaboration with GBMH and other stakeholder organisations, examine what healthcare professionals understand about air pollution, how confident they feel about communicating this information, the challenges associated with delivering this information and what resources they feel they will need to be able to deliver this information.</p> <p>Build the evidence base on the impact of air pollution on maternity outcomes, to include a focus on at risk populations, notably Black pregnant women, mothers and children.</p>
	<p>For Black families and communities</p>	Educate
Empower		Use the GBMH Black Child Clean Air template letter to write to your local leaders and MP.

ACCOUNTABLE BODY	AREA OF ACTION	RECOMMENDATION
<p>For Global Black Maternal Health</p>	<p>Amplify</p>	<p>Host the annual Black Child Clean Air Conference (BCCA) to provide:</p> <ul style="list-style-type: none"> A. representation for Black women and families in the air pollution and environmental activism space. B. facilitate the expansion of a network of policy makers, health professionals, academics, Black communities, clean air advocates and other stakeholders to create the UK’s most diverse air quality conference C. encourage and facilitate cross pollination within the BCCA network for innovative, forward thinking and inclusive solutions to air quality issues <p>Facilitate round table discussions between policy makers, health professionals and Black community stakeholders in pursuit of improving air quality for Black pregnant women, mothers and children.</p>
	<p>Educate</p>	<p>Collaborate with key stakeholders e.g. community midwifery teams, children’s centres and other community groups, to develop and deliver workshops on air pollution for Black women and families.</p>
	<p>Empower</p>	<p>Support Black women in becoming clean air advocates through the GBMH Black Child Clean Air initiative.</p>
	<p>Discover</p>	<p>Commit to reassessing the awareness, attitudes and behaviours of Black pregnant women and mothers towards air pollution in London, in order to contribute to the development of policy and health care support that improves clinical and social outcomes for Black families. For example, through the use of action research, where professionals have the opportunity to improve their practices through on-the-job research and review.</p>



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