KING'S College LONDON

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Assessing the impact of the Mayor's "schools air quality audit" recommendations in reducing pupils' exposure to poor air quality – feasibility and base line data collection

STUDY PROTOCOL

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1. Background and Rationale of the Study

Current research suggests that each year in the UK, around 40,000 deaths are attributed to exposure to outdoor air pollution [1]. Air pollution has been associated with a wide variety of health problems including heart disease and stroke [2], exacerbation of pre-existing respiratory conditions, and cognitive development issues in children [3-6]. Furthermore, it has been suggested that the damage caused by air pollution occurs across the life time, from a baby's first weeks in the womb all the way to the years of older age [1]. Children are particularly vulnerable to the harmful effects of air pollution, due to their immature and developing immune system and lungs, lower body weight and relatively high inhalation rate [1, 7-9] [10].

As part of his plans to tackle air quality issues, the Mayor of London, Sadiq Khan, commissioned 50 primary school 'air quality audits'. These audits were funded by £250,000 from the Mayor's Air Quality Fund and were conducted by engineering consultancy WSP, with the aim of identifying measures which could help protect children's health from the harmful effects of air pollutants. The 50 participating primary schools were in areas exceeding legal limits of nitrogen dioxide (NO_2) in several London Boroughs. The audits were completed at the end of 2017, with reports published in May 2018. The audit reports made recommendations specific to each school and included major infrastructure measures, such as closing roads, moving playgrounds or school entrances. Recommendations to reduce indoor air pollution were also made and included improved ventilation systems and adding green infrastructure (e.g. 'green hedges'). Aside from potentially expensive infrastructure changes, several behavioural or practise changes were recommended, such as tackling vehicle idling outside the school and promoting active travel. The audits also developed educational material to be incorporated in the London Curriculum, where it could be accessed and used by teachers to support engagement activities to raise awareness of the issue of air quality amongst children and the school community.

The mayor recently announced a new £1 million fund for air pollution-mitigation in schools, from which the 50 audited schools will receive a £10,000 starter grant to help implement the audit recommendations.

While the audits will provide schools with valuable information and advice, implementation of the recommendations are the responsibility of the schools and boroughs. Discussions with the Greater London Authority (GLA) have confirmed that there are no plans for research funding to evaluate the impact of implementing the audit recommendations on air quality or child health. This is a unique opportunity to design a large-scale intervention study on the impact of implementation of central and/or local government advice on the local environment and health of children in and around schools. However, immediate base line data collection is imperative to capture pre-intervention data on key stakeholder attitudes and practises, including the perceived feasibility of implementing recommendations.

2. Study Aim

To assess the feasibility of the Mayor's schools air quality audit recommendations for reducing pupils' exposure to poor air quality and gather qualitative data for subsequent impacts assessment.

2.1 Objectives

1. To evaluate the extent to which the recommendations will be implemented by the audited schools.
2. Identify any barriers encountered by the school Heads and the respective borough Air Quality Officers when attempting to implement the audit recommendations and how these challenges will be overcome.
3. To collect base line data from key stakeholders, including staff, government officers and school children, prior to interventions being introduced in terms of air pollution awareness and current practices.

3. Study Design

The proposed study will take place across the 50 London primary schools that took part in the Mayor's air quality audits.

3.1 Recruitment

The proposed study will follow a purposive sampling strategy - seeking a range of views- within constraints of time and budget.

<u>Inclusion Criteria</u>

- Air Quality Officers (n=25)
  - Air quality officers must be from one of the London boroughs that participated in the school air quality audits.
  - Able to provide informed written consent to take part in the study.
  - There is no upper age limit.
- The Heads of the 50 schools audited (n=50)
  - School Heads must be from one of the 50 schools audited.
  - Able to provide informed written consent to take part in the study.
  - There is no upper age limit.

- Primary school children (n=approximately 3,000, depending on the number of children in year 5 from each of the participating schools)
    - Children must be from one of the 50 Primary schools audited.
    - Children should be in year 5. (This year group has been selected as Year 5 children can be contacted the following year for any follow up survey and do not have the time pressures typical of Year 6 children preparing for the Statutory Assessment Tests (SATs). Furthermore, Year 5 children are more likely to better understand and interpret survey questions, and as result they can formulate an appropriate response).
    - Children should be able to provide informed written consent from their parents to take part in the study.
    - Children should be able to provide informed written consent (children will be asked to consent to participate before filling in the survey)
    - The lower age limit is 9 and the upper age limit is 10 (children in year five are generally 9-10 years old). If for any reason there are children who are outside this age range, they would still be invited to participate in the survey as long as they are in year 5.
- The parent/legal guardians of year 5 children from the audited schools (n=approximately 3,000)
    - Able to provide informed written consent to take part in the study.

Exclusion criteria

- Individuals who are unable to meet the inclusion criteria described above

3.2 Data Collection - Interviews and Surveys

Interviews with Air Quality Officers (AQOs)

We will contact the Air Quality Officers from each of the London boroughs that participated in the school air quality audits (n=25). The AQOs will be approached via email/letter with a formal invitation to participate in an interview. AQOs will receive together with the introductory email/letter, a Participant Information Sheet (PIS) and a consent form. If after reading the PIS, potential participants decide to take part in the study, they will be advised to contact the researcher directly via email/phone, so a suitable date, time and location for the interview can be arranged.

The interviews will be limited to approximately 20 minutes and they will focus on the following areas: 1) extent of implementation of the air quality audits 2) barriers encountered when attempting to implement the audit recommendations 3) strategies adopted or planning to be adopted to overcome the challenges encountered. The interviews will be conducted in a public place suitable for the interviewees.

Interviews and Surveys with Head teachers

We will first contact the Heads of the 50 schools audited (n=50). The Heads of the schools will be approached via email/letter with a formal invitation to take part in this study. Together with the email/letter, school Heads will receive a Participant Information Sheet (PIS) and a consent form. In the PIS, potential participants will be informed of the purpose of the study and the details regarding their participation with involves two parts; a) online survey and b) an interview.

We will also use this opportunity to ask the Heads of the school for permission to conduct a survey with year 5 children and their parents.

Survey for school Heads

The aim of the Head teachers' online survey is to evaluate the extent to which the recommendations made by the audit will be implemented by the schools. These surveys will be completely anonymous, and participants will be made aware that there is no way of tracing their responses back to them. A link to access the online survey will be provided at the end of the PIS.

Semi-structured interviews for school Heads

The aim of the semi-structured interviews is to identify any barriers encountered by the school Heads when attempting to implement the audit recommendations and the strategies adopted or planning to be adopted to overcome the challenges encountered.

In the PIS, potential participants will be informed of the purpose of the study and details regarding the interview will be provided. If after reading the PIS, potential participants decide to take part in the study, they will be advised to contact the researcher directly via email/phone so a suitable date, time and location for the interview can be arrange.

The interviews will be limited to approximately 20 minutes and they will focus on the following areas: 1) the barriers Head teachers have encountered when attempting to implement the audit recommendations and 2) the strategies (if any) adopted or planning to be adopted to overcome the challenges encountered. The interviews will be conducted in a public place suitable for the interviewees.

Surveys with children and parents

We will first ask the Heads of the 50 schools to give us permission to conduct an anonymous survey with year 5 children and their parents. The purpose of this survey is to assess air pollution awareness levels and current practices among school children and their parents. If permission is granted, we will deliver to each school information and consent packets for each child to take home. The information and consent packs will have the following:

1) Parent participant information sheet
2) Children participant information sheet
3) Parent survey
4) Children survey

Survey for parents/legal guardians

This survey will ask parents questions about their current modes of transport to go to and from school and about their understanding of the current air pollution situation in and around their child's school. The survey will also ask questions about the air quality audits conducted in their child's school. The survey will take approximately 5 minutes to complete.

Participants will be advised that if they decide to take part in the survey, they would need to fill in the attached survey and send it back to school with their child. Before the survey begins, participants will be asked to provide an explicit confirmation of informed consent.

Survey for children

We will also like to know what children think about the current air pollution situation in their school, as well as their awareness and understanding of air pollution. The survey will take approximately 5 minutes to complete. However, before we can ask the children to complete the anonymous survey, we require written parental consent.

Parents will be informed that if they decide that they want their children to complete the survey they need to:

1) Ask their children to read their PIS (children PIS) before they complete the survey.

2) Indicate (tick a box at the beginning of the children survey) that they have read and understood the information provided and that they consent for the children to take part in the survey.

3) Make sure that if the child wants to take part in the survey after reading the Children PIS, they indicate (tick a box before they start the survey) that they have read and understood the information provided in the "child information sheet" and that they consent to take part in the survey.

3.3 Data Analysis

The data obtained from the surveys (online and paper) will be managed and analysed using the Data Analysis and Statistical Software Stata. Qualitative data from the semi-structured interviews will be analysed using an inductive and iterative analytical procedure. A thematic content analysis approach will be used to identify recurrent or common 'themes'. The NVivo software (Version 11) will be used to assist with the management and handling of qualitative data.

3.4 Formal Information/Data Security Standards

The UK Data Protection Act 1998 will apply to all information gathered and held on password-locked computer files and locked cabinets within King's College London. No data will be accessed by anyone other than the research team. No data will be able to be linked back to any individual taking part in the interviews or the surveys.

3.5 Data Sharing and Access

The proposed study aims to gather base line data collected prior to the implementation of any intervention as this will provide information against which to assess the effectiveness of the intervention(s) after completion. Further funding will be sought in order to gather data post-implementation of the recommendations.

For the above reason we will retain the anonymised data, so we can use it in the future (if funding granted). All data to be retain/store will be anonymised.

4. Ethics/Regulatory Approvals

Prior to starting data collection, ethical approval will be obtained from the Kings' College London (KCL) Biomedical Sciences, Dentistry, Medicine and Natural and Mathematical Sciences Research Ethics Subcommittee (BDM RESC).

It is expected that the researcher would have to visit the school premises either to deliver surveys or to interview head teachers. Therefore, a Disclosure and Barring Services (DBS) certificate will be obtained before accessing any of the school's premises.

5. The Project Management and Governance

Two committees will be in regular correspondence: a management committee compose of the lead applicant, co-applicants and research associate and a study steering committee (SSC) composed of two academic experts and two members of the public who have direct experience of the topic in consideration (one school teacher and one mother who has been involved in the development of measures to reduce air pollution around her child's school) and a representative of the GLA.

The management committee will meet in person every two months: (1) to establish and agree working methods, protocols and priorities; (2) monitor progress against our Gantt chart; (3) identify and resolve any potential problems of delay, inconsistency or arising issues; and (4) assure the overall quality of the work. The Study Steering Committee (SSC) will be regularly consulted and invited to the first management committee meeting. The SSC will provide an overall oversight of the project from a scientific, methodological and practical point of view.

6. Dissemination of Results

The ultimate goal of this study and its future phases is to evaluate and refine policies designed to reduce air pollution in and around schools and protect children from its harmful effects. The base line stage of this study (for which we are seeking funding) will deliver evidence-based information in regard to the feasibility of the implementation of the audit recommendations It will also provide base line data (prior to intervention) in regard to current air pollution awareness levels and current practices among school children.

The findings from this study will also be incorporated into ongoing research funded by the NIHR on the impact of the London Ultra Low Emissions Zone (ULEZ) on children health in London and Luton (CHILL).

The preliminary findings from the first phase of this study will be used to produce a report which will also incorporate the details of the proposed study second phase. This report will be delivered with the support and input of the GLA and will be disseminated through the Mayor's media channels. We will also make it available to the public through the website of the London Air Quality Network (LAQN – www.londonair.org.uk), which is the primary source of air pollution information in London for the public, policy users and practitioners. Findings will also back to the schools themselves through a public-facing report. The findings from this study will also be presented at relevant conferences, such as the Annual London Air Quality Network conference, and published in a relevant peer reviewed journal.

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