IMPERIAL

WellHome: A Community-Based Study for Investigating Indoor Air Pollution in an Urban Community in London.

Diana Varaden, Adam Skillern, David Green, Benjamin Barratt, Frank Kelly

Environmental Research Group
Imperial College London

Background

- The combined effect of outdoor and indoor air pollution causes about 7 million premature deaths every year.

- Air pollution has been associated with a wide variety of chronic and acute health problems.

- Despite its importance in human exposure terms, links between indoor air quality and public health is an under-researched area.

…. Measuring indoor air pollution can be challenging!

We spend about 90% of our time indoors

Indoor air pollution can be caused by:

- How we heat our homes
- How we cook
- Poor ventilation
- Damp
- Some building materials
- Chemicals in cleaning products
- Etc.

The WellHome study aims to identify predominant indoor air pollution exposures to children and adults in vulnerable urban communities, emphasising community involvement in co-designing feasible and acceptable research methodologies.

West London Community

WellHome Network (n=100)

UK Urban Communities

Engagement

Involvement

Participation

Participating homes

Our 100+ homes are located mainly in W10, W11, W12 postcodes or the surrounding area. They come from wide-ranging backgrounds and represent the rich cultural, ethnic and religious diversity of West London.

480 total participants in the WellHome study

257 children in the WellHome study

51% of families have children with asthma

42% of families have children with allergies

61% of families live in purpose-built flats or tenements

71.8% of families live in the top most deprived* areas of the UK

74% UK of families are from minority ethnic backgrounds

of families speak additonal languages
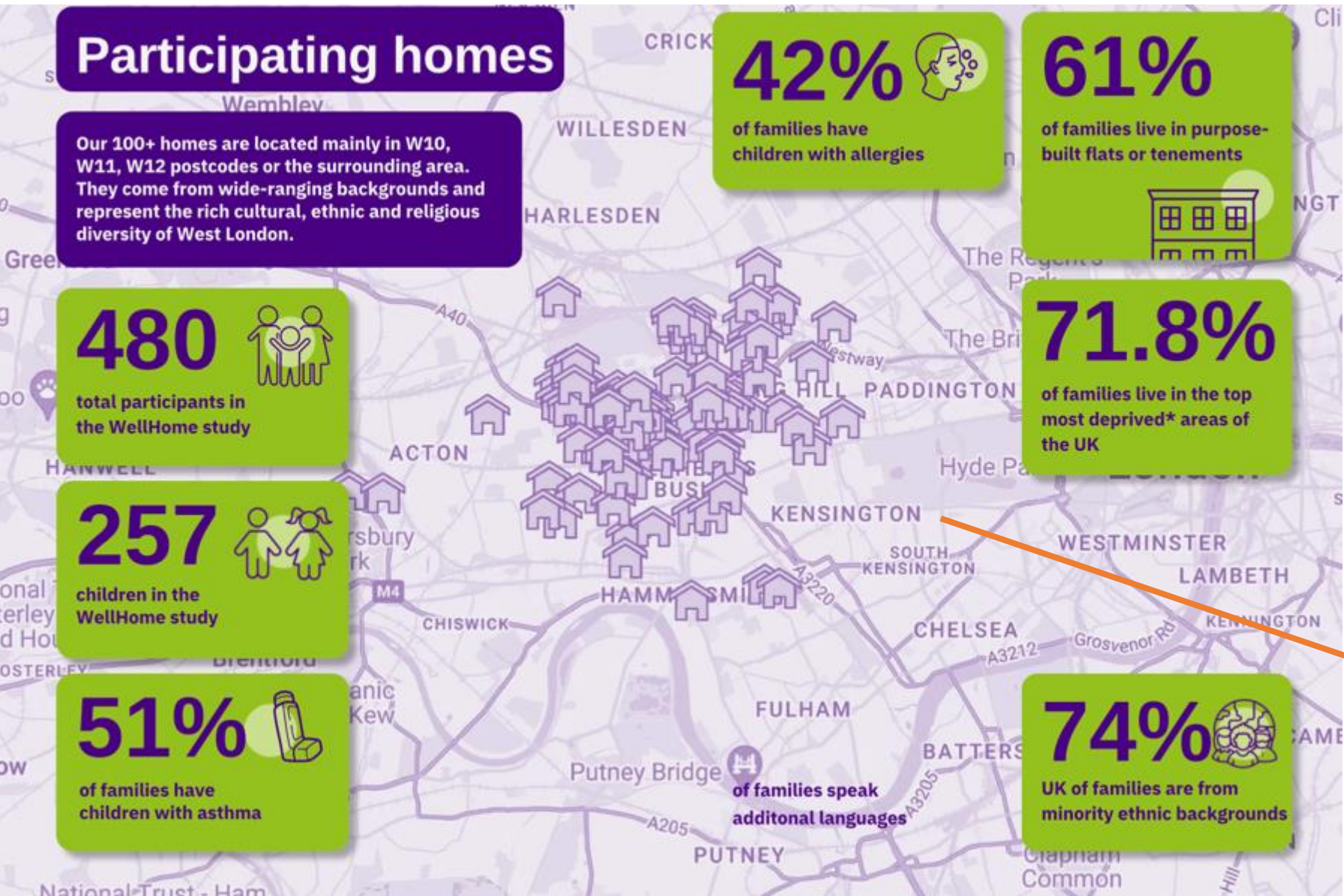
WellHome
West London Healthy Home and Environment Study

Engagement and Involvement Activities

West London Community

Participation
Recruitment of WellHome cohort

WellHome Network
(n=100)

Group 1 — n=20
Group 2 — n=20
Group 3 — n=20
Group 4 — n=20
Group 5 — n=20
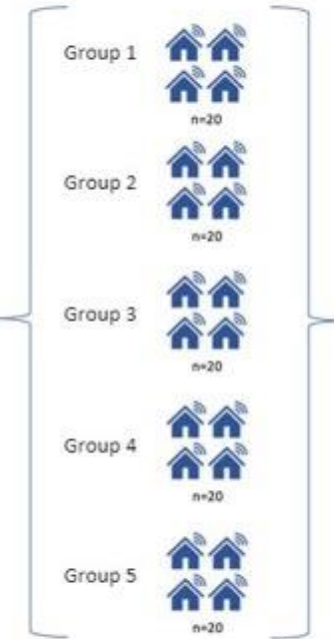
Campaign 1

Home visit 1 - Installation Day

- Questionnaire 1
- Air pollution sensors & samplers installation

Daily activity symptom questionnaire — 4 weeks

Home visit 2 - Retrieve day

- Questionnaire 2
- Air pollution sensors & samplers collection

Feedback Report

3 - 6 months

Campaign 2

Home visit 3 - Installation Day

- Questionnaire 3
- Air pollution sensors & samplers installation

Daily activity symptom questionnaire — 4 weeks

Home visit 4 - Retrieve day

- Questionnaire 4
- Air pollution sensors & samplers collection

Feedback Report

Engagement Activities   Involvement Opportunities   Community Air Quality Research Hub

Kitchen   Bedroom   Living room

MRC
Centre for Environment & Health
UKRI Medical Research Council   Imperial College London

Centre for Climate Change and Social Transformations

Asthma UK Centre for Applied Research   asthma UK

Preliminary Results (Campaign1)
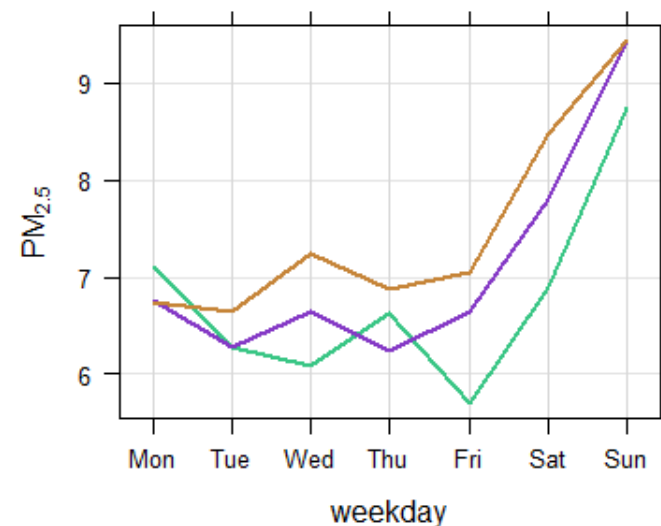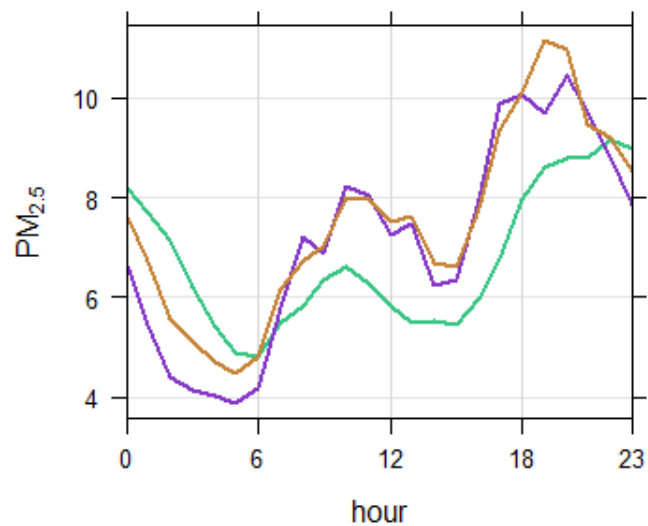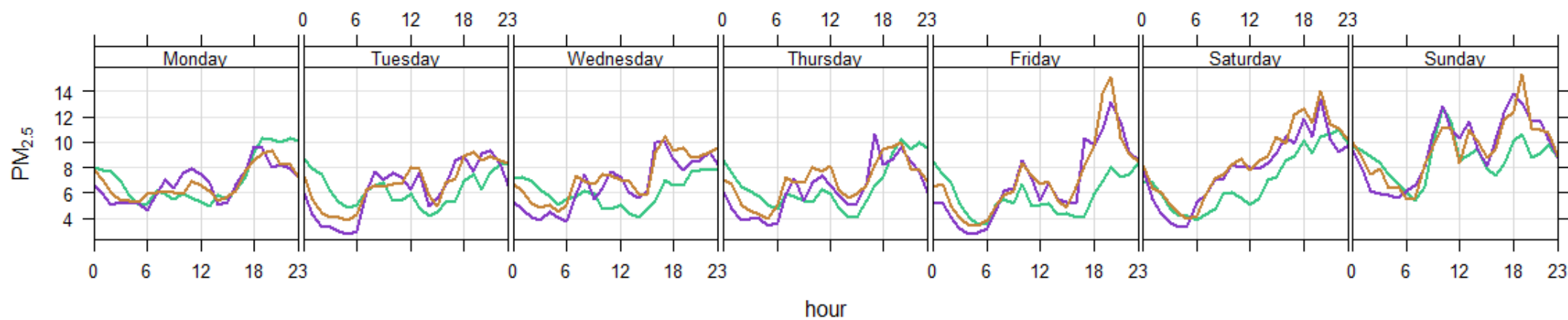
Dissemination

Co-designing reports with families

Four Focus Groups
21 families participating

I don't not like it

It is hard to understand

But it looks nice!

Participants Feedback

Some kind of guideline or comparison reference of PM$_{2.5}$ safety levels

Show us the PM$_{2.5}$ values

Compare the rooms in their home

Compare our own home to the average

Co-designing reports with families

WellHome
West London Healthy Home and Environment Study

Introduction

What is the purpose of this study?

Air pollution is considered the **largest environmental health risk** in the UK.

The purpose of this study is to better u... indoor air quality. This is important be... although we spend most of our time ind... almost all research on this topic is base... measurements of air pollution outdoors...

What is this study doing?

The WellHome study **measures indoor a...** in homes around the West London area, ... in homes with those affected by asthm...

This is where your role in the study com...

How am I helping?

In the past year, we have **visited you a...** valuable and unique air quality data ab... home.

Now, the researchers at WellHome hav... **initial findings** to share with you.

What will this report contain?

This report contains information about PM2.5 levels in your home.

What is PM2.5?

Particulate matter (PM) are tiny bits of solids or liquids suspended in the air. The size, shape, origin, and composition of these particles can vary at different times and places. PM2.5 are particles that have a diameter of 2.5 microns or less — a human hair is over 20 times wider than a PM particle.

Where does PM2.5 come from?

Common sources of particulate matter include road traffic and smoking; indoor sources include cooking and cleaning as well as dust and candles or incense.

Health concerns of PM2.5

While large particles are filtered in the nose and throat and so are less likely to cause problems, PM2.5 can be a cause of concern because it is small enough to settle in our airways and deep within the lungs. Also, a PM2.5 particle can be 3 times smaller than a red blood cell, allowing it to enter the blood stream.

Particulate matter (PM2.5) in your home

In Graph 2 below, the average PM2.5 concentrations are displayed by room over a specific time range. The horizontal axis (x-axis) lists the time ranges of a typical day for a family. PM2.5 levels are shown on the vertical axis (y-axis) in micrograms per cubic metre (µg/m³).

This graph illustrates the variation in PM levels across different rooms in your home throughout the specified time period.

Average PM2.5 concentrations in your rooms during the day
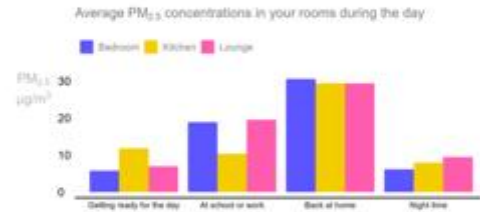
Graph 2.

Particulate matter (PM2.5) in your home

Graph 1 below shows you the difference in daily average concentrati... between the two visits. In these graphs the days are displayed along... bottom (x-axis), and the concentration of the pollutant (PM2.5) is show... the left (y-axis). PM2.5 is measured in micrograms per cubic metre (µg... indicating the amount of tiny particles in a volume of air.

The **purple line** shows the average PM2.5 concentration in BEDROOMS for other homes during the same period.

The **blue line** indicates the World Health Organisation's (WHO) guideline for maximum daily PM2.5 exposure.

The **green line** in the grap... represents the average PM... concentration in **your ho...** each day of the monitorin... from the sensor with the ... available data.

First visit

Second visit
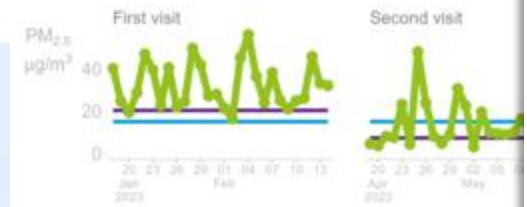
Graph 1.

How can I improve the quality of air in my home?

Here are several recommendations you can follow to improve the quality of the air in your home:

• **Ventilation is key!** increase ventilation during and after activities that produce pollutants or moisture, especially when using cleaning or personal care products, cooking, bathing, and painting, decorating or buying new furniture.

• Open your windows for 5 to 10 minutes a day if you can, so air can move around. But be cautious on high pollen or air pollution days if these are health triggers for your family. You can check the air pollution forecast here: https://www.londonair.org.uk

• When cooking, use ventilation like a cooker hood, extractor fan or simply open a window. Ideally, cooker hoods should vent outdoors so fumes are directed out of the kitchen.

• If you can, keep the ventilation running for about 10 minutes after you are done cooking to help keep the air fresh and remove any lingering odours or fumes.

• If your home has a mechanical ventilation system, make sure you know how to use and maintain it. Ask your landlord if you aren't sure.

Conclusions and next steps

- Preliminary findings highlight locations and times within participating households where air pollution peaks are most prevalent. Ongoing analysis will explore connections between these findings and participant behaviours and health.

- $PM_{2.5}$ results will be combined with a suite of additional metrics simultaneously gathered in each home, including bioaerosols, chemical contaminants, microplastics, temperature and humidity.

- Involving people in the research process, while time- and resource-intensive, offers significant benefits that can greatly enhance the quality and impact of the research.

- We will continue to communicate results to participants through co-designed reports, providing advice and information on actionable ways in which they could improve the air quality in their homes.

- Anticipated outcomes include offering clear information to shape effective recommendations for householders, authorities, and policymakers, thus fostering healthier home environments.

Thank You

The WellHome team

Principal Investigator: Professor Frank Kelly - Imperial College London (ICL)

Co-investigators: Dr Benjamin Barratt (ICL), Dr David Green Imperial (ICL), Professor Klea Katsouyanni (ICL), Professor Margaret Dallman (ICL), Professor Wouter Poortinga (Cardiff University), Dr Leon Barron (ICL), Dr Ian Mudway (ICL), Professor Matthew Fisher (ICL), Dr Stephanie Wright (ICL), Professor Chris Griffiths (Queen Mary University of London), Dr Sean Beevers (ICL), Dr Heather Walton (ICL), Dr Diana Varaden (ICL), Dr Anja Tremper (ICL), Dr Tuan Vu (ICL), Dr Dimitris Evangelopoulos (ICL).

Community Engagement Officer: Esther Lie

WellHome Ambassadors

Our Partners:

Imperial College London — White City Community Engagement (WCCE) Team

nova new opportunities

BUBBLE & SQUEAK

clarity

dyson

WellHome@imperial.ac.uk

@StudyWellHome

MRC Centre for Environment & Health
UKRI Medical Research Council | Imperial College London

Centre for Climate Change and Social Transformations

Asthma UK Centre for Applied Research
asthma UK