

Air Pollution Exposure in London:

Impact of the London Environment Strategy

**Second Addendum Report: Further Analysis of
Ethnicity and Exposure**

April 2019



Title	Air Pollution Exposure in London: Impact of the London Environment Strategy; Second Addendum Report: Further Analysis of Ethnicity and Exposure
Customer	Greater London Authority
Recipient	Rosalind O'Driscoll
Report Reference	1293-2
Report Status	Final
Revisions	V1.3

Author(s)	Tim Williamson, Justine Raoult
Reviewed by	Katie King
Signature	
Date	02/04/2019

Company Details:	Aether Ltd Oxford Centre for Innovation New Road Oxford OX1 1BY UK Registered in England 6630896
Contact:	enquiries@aether-uk.com +44(0)1865 261466 www.aether-uk.com

Executive Summary

This is an addendum to the report Air Pollution Exposure in London: Impact of the London Environment Strategy (2019) and should be reviewed alongside the original. This addendum looks in more detail at the exposure to air pollution of different ethnic groupings.

The key outcome of this analysis, as with the original report, is that areas which have the highest numbers of non-white ethnic group residents are more likely to have the highest concentrations of NO₂. More specifically:

- ▶ In 2013 concentrations of NO₂ were on average between 16 and 19 per cent higher in areas where non-white people were most likely to live compared to areas where white people were most likely to live
- ▶ The difference in mean concentrations of NO₂ for areas where white and non-white groups were most likely to live reduces from 4.8 – 10.7 µg/m³ in 2013 to 1.9 – 3.1 µg/m³ in 2030 in the LES scenario, a reduction in the inequality in exposure of over 60 per cent
- ▶ All ethnic groups benefit as a result of policies in the LES and ethnic groups currently most affected by poor air quality (non-white groups) benefit the most. Areas where white people are most likely to live on average see an average reduction in NO₂ concentrations of 46 per cent, whereas areas where non-white people are most likely to live improve between 48 and 53 per cent

1 Introduction

In January 2019, Aether produced a report for the Greater London Authority (GLA) analysing the impact that the London Environment Strategy (LES) policies are predicted to have on inequalities with regard to air pollution in London, as compared to a “baseline scenario”¹. Both scenarios included the implementation of the central London Ultra-Low Emission Zone (ULEZ-CL) within the Congestion Charge Zone in April 2019 as well as taking into account known future trends, such as vehicle use and performance and, to a certain extent, projected changes in the population of London. The LES scenario also included the impact of policies and measures set out in the LES.

The report built on previous analysis undertaken by Aether on behalf of the Greater London Authority (GLA): Updated Analysis of Air Pollution Exposure in London (2017) and Analysing Air Pollution Exposure in London (2013). Both of these previous reports focused mainly on the current air quality in London (as represented by the most up to date data available at the time), seeking to identify whether air pollution had a role in health and social inequality and the degree to which it could be quantified. However, the primary aim of the January 2019 study was to investigate the impact of future policy on inequalities in exposure.

A key section of the 2019 report dealt with the exposure to air pollution, under the two scenarios and in different years, of different ethnic groupings. In discussion with the GLA some further analysis of the data underpinning this section has been undertaken. The outcomes of the analysis are presented in this Addendum report which should be read alongside the main report.

¹ <https://www.london.gov.uk/what-we-do/environment/environment-publications/air-pollution-london-impact-environment-strategy>

2 Exposure and Ethnicity

2.1 Analysis in the January 2019 Report

In the January 2019 analysis, each LSOA in London was allocated to an ethnicity decile for each of the five ethnic groups (see Table 1), defined as groups of 10 percent of LSOAs ranked by percentage population of the relevant ethnic group. Decile 1 represents the 10 percent of LSOAs with the lowest percentage of the population of the relevant ethnic group, and decile 10 represents the 10 percent of LSOAs with the highest percentage of population in the relevant ethnic group. The deciles were based on percentage populations rather than actual population to prevent a skewing effect on LSOAs with larger total populations.

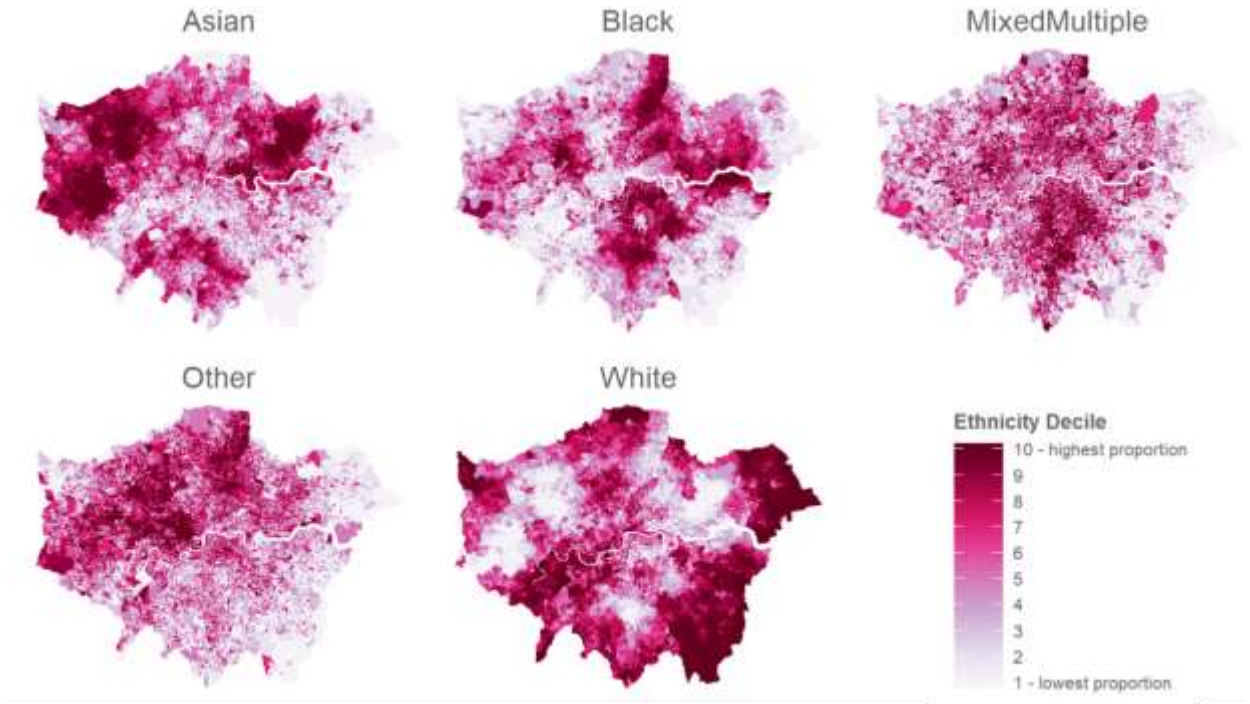
Table 1: The ethnic groups used and their corresponding sup-groups, taken from the 2011 census

Ethnic Group	Sub-groups
White	White: English/Welsh/Scottish/Northern Irish/British White: Irish White: Gypsy or Irish Traveller White: Other White
Asian/Asian British	Asian/Asian British: Indian Asian/Asian British: Pakistani Asian/Asian British: Bangladeshi Asian/Asian British: Chinese Asian/Asian British: Other Asian
Black/African/Caribbean/Black British	Black/African/Caribbean/Black British: African Black/African/Caribbean/Black British: Caribbean Black/African/Caribbean/Black British: Other Black
Mixed/multiple	Mixed/multiple ethnic group: White and Black Caribbean Mixed/multiple ethnic group: White and Black African Mixed/multiple ethnic group: White and Asian Mixed/multiple ethnic group: Other Mixed
Other ethnic groups	Other ethnic group: Arab Other ethnic group: Any other ethnic group

Note that, because the deciles are defined and ordered according to the distribution of each ethnic group individually, it does not necessarily mean that the areas in the highest decile for an ethnic group are dominated by that group. For example, in those LSOAs which are in the highest decile for Mixed/Multi-ethnic population, no more than 25% of the total population of those LSOAs identifies as being from that group. Mixed/Multi Ethnic is a relatively small population and does not form the majority in any LSOAs. This is an important point when interpreting the analysis results.

The population distributions for each ethnic group in Table 1 are shown in Figure 1.

Figure 1: Population distributions (population deciles) for five ethnic groupings in London, 2011



The air pollution concentration has been calculated for each LSOA by averaging air pollution in each modelled 20m grid square. In the January 2019 report, all LSOAs were ranked as in Figure 2 and Figure 3, by ascending annual average concentration for NO₂, and colour coded to show whether they are a 10th decile LSOA:

- for any non-white ethnic group (red),
- for the white group (green), or
- not in the 10th decile for any group (grey).

Only the 10th decile was used as some LSOAs can be 8th or 9th decile for more than one ethnic group.

Figure 2: All LSOAs ranked by annual average NO₂ concentration and colour coded where they are the 10th decile for ethnicity, 2013

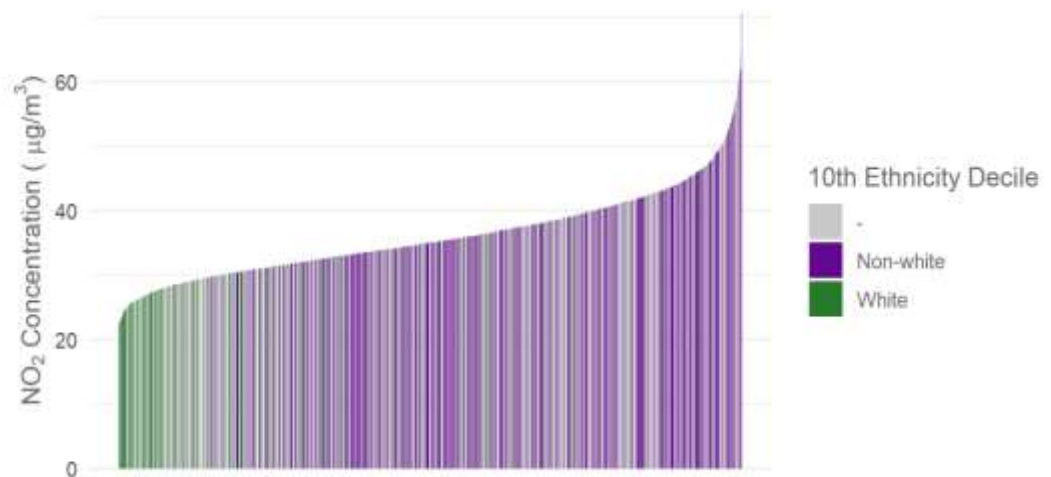
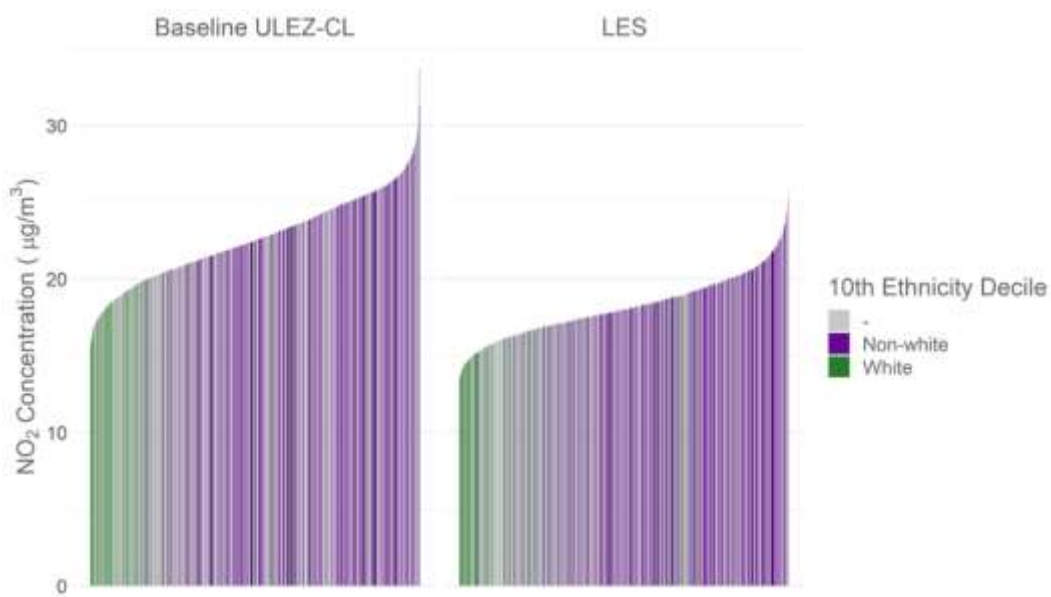


Figure 3: All LSOAs ranked by annual average NO₂ concentration and colour coded where they are the 10th decile for ethnicity, 2030 Baseline (including the ULEZ-CL) and LES scenarios



2.2 Additional analysis for this report

The data used for the graphs above have been further analysed to calculate:

- the proportion of the LSOAs in ethnicity decile 10 that are also LSOAs with the 25% highest concentrations (i.e. whether higher concentrations occur in areas with higher proportions of each ethnic group), and
- the average (mean) concentration found in decile 10 LSOAs for each ethnicity.

These results are shown in Table 2 and

Table 3, below.

Table 2: Proportion of “decile 10” LSOAs by ethnicity in the top 25% highest LSOA Concentrations for annual average NO₂

Ethnic group	2013	2030 Baseline (with the ULEZ-CL)	2030 LES
	% LSOAs in top 25% highest concentrations	% LSOAs in top 25% highest concentrations	% LSOAs in top 25% highest concentrations
Asian	13%	15%	17%
Black	20%	22%	20%
Mixed/ Multiple	30%	30%	28%
Other	34%	31%	31%
White	4%	3%	4%

Table 3: Mean concentration of annual average NO₂ in decile 10 LSOAs for each ethnicity

Ethnic group	2013	2030 Baseline (with the ULEZ-CL)	2030 LES
	Mean NO ₂ conc.	Mean NO ₂ conc.	Mean NO ₂ conc.
Asian	35.2	22.7	18.2
Black	37.7	23.8	18.8
Mixed/ Multiple	38.3	23.7	18.8
Other	41.1	24.4	19.5
Non-white	35.2 - 41.1	22.7 - 24.4	18.2 - 19.5
White	30.5	19.8	16.4

This reveals a number of features:

- LSOAs containing the highest numbers of Mixed/Multiple and Other ethnic groups (decile 10) have the highest proportion of LSOAs with the top 25% highest NO₂ concentrations, followed by Black, Asian and White.
- The proportions do not change significantly by 2030, either for the baseline or LES scenarios. This is related to the fact that the population distribution by ethnicity is fixed at the 2011 census and does not change for future years. Location relative to the centre of London is a strong indicator of exposure.
- However, the concentrations experienced in decile 10 areas for each ethnic group reduce greatly over the period, as shown in Table 3, more so for the non-white populations and for LES over the baseline.

The difference between exposures in white and non-white decile 10 LSOAs is shown in Table 4. Note that the figures for non-white decile 10 LSOAs are shown as a range rather than an average due to the different numbers of people in each ethnic group which make up decile 10 areas. An average would thus be misleading.

Table 4: Mean concentrations for annual average NO₂ in white and non-white decile 10 areas, and the difference between the two, in 2013 and 2030

Ethnic group	2013	2030 Baseline (with the ULEZ-CL)	2030 LES
	Mean NO ₂ conc.	Mean NO ₂ conc.	Mean NO ₂ conc.
Non-white	35.2 - 41.1	22.7 - 24.4	18.2 - 19.5
White	30.5	19.8	16.4
Difference (absolute)	4.8 - 10.7	2.9-4.6	1.9 - 3.1

Areas which have the highest numbers of non-white ethnic group residents are more likely to have the highest concentrations of NO₂. In 2013 concentrations of NO₂ were on average between 16 and 19 per cent higher in areas where non-white people were most likely to live compared to areas where white people were most likely to live.

The inequality in exposure across different ethnicities is greatly reduced by 2030. For NO₂, the difference in mean concentrations for areas where white and non-white groups

are most likely to live goes from 4.8 – 10.7 $\mu\text{g}/\text{m}^3$ in 2013 to 1.9 – 3.1 $\mu\text{g}/\text{m}^3$ in 2030 in the LES scenario, a reduction of over 60 per cent.

All ethnic groups benefit as a result of policies in the LES and ethnic groups currently most affected by poor air quality (non-white groups) benefit the most. Areas where white people are most likely to live on average see an average reduction in NO_2 concentrations of 46 per cent, whereas areas where non-white people are most likely to live improve between 48 and 53 per cent.



Oxford Centre for Innovation

New Road

Oxford

OX1 1BY UK

+44(0)1865 261466

www.aether-uk.com