



Public Health
England

Protecting and improving the nation's health

Appendix 6: Comparisons between different exposure levels and population distributions

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health and Social Care, and a distinct delivery organisation with operational autonomy. We provide government, local government, the NHS, Parliament, industry and the public with evidence-based professional, scientific and delivery expertise and support.

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Contents

Comparing differing exposure and population	4
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Comparing differing exposure and population

South Lakeland and Lambeth were modelled to demonstrate 2 extremes of air pollutant exposure levels within England. A separate analysis was run to demonstrate the impact of the interaction of the exposures and populations for air pollution related diseases. We modelled Lambeth exposure on the South Lakeland population and vice-versa.

The summary of our analyses are the following:

The model was run with the Lambeth exposure inputs modelled with South Lakeland population. This means the older South Lakeland population (as compared to Lambeth) was exposed to higher levels of NO₂ found in Lambeth (as compared South Lakeland). These outputs were compared with the model run for Lambeth exposure and Lambeth population.

South Lakeland exposure was then run with Lambeth population. This means a younger population (compared to South Lakeland) exposed to low levels of NO₂ (as compared to Lambeth).

Attributable cases of asthma (a disease prominent in childhood), type 2 diabetes (non-terminal disease more common in older people), and lung cancer (terminal diseases more common in older people) were analysed.

Table 1 shows that each of the diseases - asthma, diabetes, and lung cancer are much higher (as much as 4 times as high) across both populations when both populations are exposed to Lambeth levels of NO₂.

Comparing the differences by population, we see that when Lambeth exposure is used, then South Lakeland has about as many cases of asthma as Lambeth (both have high young population, and South Lakeland has a higher fertility rate than Lambeth), but South Lakeland has a higher rate of diabetes and lung cancer. This illustrates the effect of both high exposure and an aging population in South Lakeland (as compared to Lambeth which is much younger).

Table 1 also highlights that low exposure to NO₂ alongside a young population results in the smallest number of attributable cases of disease: That is, when running Lambeth population with South Lakeland exposure, we see the attributable incidence cases of all diseases decrease compared to the other combinations presented. This is because NO₂ in South Lakeland is low, and Lambeth population is young so less likely to have a

disease. It is estimated that 411 cases of diabetes in the Lambeth population was attributable to air pollutants at the South Lakeland NO₂ levels, compared with 1669 cases when air pollutants were at current Lambeth levels. When exposing the South Lakeland population to Lambeth air pollution levels the cumulative attributable cases of diabetes more than quadruples (from 610 cases in 2035 with both South Lakeland population and level of air pollutants to 2533 when Lambeth exposure is applied to South Lakelands population).

Table 1: 2035 Attributable cumulative incidence for varied NO₂ exposure and population levels per 100,000 of the population

	Asthma	Diabetes	Lung Cancer
Lambeth exposure and Lambeth Population	1058 [+-8]	1669 [+-10]	93 [+-4]
Lambeth exposure and South Lakeland Population	1025 [+-9]	2533 [+-14]	243 [+-7]
South Lakeland exposure and Lambeth Population	253 [+-8]	411 [+-10]	23 [+-4]
South Lakeland exposure and South Lakeland Population	248 [+-8]	610 [+-14]	58 [+-7]

Comparison of population distributions

These show that the population of Lambeth is relatively young compared with South Lakeland with around 20% of 20 to 29 year olds, compared with around 8% in South Lakeland. South Lakeland has a much older population, with around 15% of 60 to 69 year olds, compared with 6% in Lambeth. However, South Lakeland also have a higher proportion of children relative to 20 to 40 year olds, while Lambeth have a higher proportion of 20 to 40 year olds compared to children. The differences in age profiles will contribute to differences in disease outcomes observed.

