

TRANSPORT FINDINGS

Low Traffic Neighbourhoods, Car Use, and Active Travel: Evidence from the People and Places Survey of Outer London Active Travel Interventions

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Findings

This paper reports on analysis of impacts of active travel interventions in Outer London between 2016-19. We find larger effects (decreased car ownership and use, increased active travel) in intervention areas where Low Traffic Neighbourhoods (LTNs) were introduced. Decreased car ownership and use is only found in such areas. Sample size for LTN areas is small and hence uncertainty about effect magnitude is large, but effect direction is consistent. This suggests that to reduce car use as well as increase active travel, LTNs are an important part of the intervention toolbox.

Research Questions

Announced in 2014, the £100 million mini-Holland programme of active travel interventions is funded by Transport for London and continues until 2021.¹ Built environment measures include new cycle tracks, motor traffic calming and reduction, and pedestrian routes. [Figure 1](#) and [Figure 2](#) show two examples.

While the focus of the programme was active travel (walking and cycling), here we additionally examine how interventions affected car ownership and use. We also examine the impact of living in a 'Low Traffic Neighbourhood' (LTN), i.e. an area-based intervention that removes through motor traffic from the area's residential streets (e.g. via modal filters restricting through motor traffic, [Figure 2](#)). In 2020, LTNs are being implemented across the UK, especially London, through Covid-related emergency active travel funding to support safe walking and cycling and discourage unnecessary car use.

Here we answer the following:

1. Was change in car ownership and car use associated with living in an LTN?
2. Was change in walking and cycling associated with living in an LTN?
3. How did any observed effects compare with non-LTN intervention areas?

¹ <https://tfl.gov.uk/modes/cycling/routes-and-maps/cycle-mini-hollands>



Figure 1: new cycle track, Kingston (Rachel Aldred)



Figure 2: modal filter, Waltham Forest (Rachel Aldred)

Methods and Data

The People and Places study is a longitudinal study that treats the mini-Hollands programme as a ‘natural experiment’. Data here covers baseline (2016) and three follow-up waves (2017-9). Participants (adults resident in

Outer London) were recruited via random household cluster sampling and recruitment from two Transport for London customer databases, with response rates of ~1-2%. We constructed survey weights for each wave to allow for differences in sample composition between the survey sources. For more on sampling see Aldred et al (2019). The survey was administered annually using Qualtrics software in early May to mid-June. Participants provided demographic and social-economic information, plus a past-week travel diary with minutes of walking, cycling, and car use. The diary did not collect trip-level data.

We restricted our analysis to people living in the same area throughout the period 2016-19, thereby avoiding self-selection bias from in-movers (e.g. if the LTN areas attracted non-car owners). Our ‘control’ group consists of residents of the 17 other Outer London boroughs. In previous analyses we have subdivided the intervention boroughs between ‘low dose’ individuals not living near any interventions versus those living in a ‘high-dose’ area where stakeholders identified relevant interventions during the wave in question. In this analysis we additionally subdivided the ‘high dose’ area by identifying the extent of any LTNs within the high-dose areas at each wave. [Figure 3](#) shows (i) the three mini-Holland boroughs, Enfield, Kingston, and Waltham Forest, (ii) ‘high-dose’ areas near active travel interventions, and (iii) LTN areas within these. Only Waltham Forest implemented LTNs during our study, so a small proportion of our sample lived in LTNs, particularly in Wave 1 ([Table 1](#)).

We used Poisson regression with robust standard errors for binary outcomes (Zou 2004), because many of our binary outcomes are common. We used linear regression for our continuous outcomes. Our primary exposure of interest was type of area (control / low dose / high dose, non-LTN / high dose, LTN). All regression analyses adjust for the corresponding measure at baseline, with baseline measures of past-week travel entered as linear terms, alongside quadratic terms if statistically significant. We also adjust for car ownership at baseline (using the baseline value as car ownership at follow-up may mediate some effects),² and for other demographic and socio-economic characteristics as measured at follow-up. For further details on our analysis methods see Aldred et al (2019; forthcoming).

Findings

There is a consistent trend towards people in the LTN area becoming less likely to **own a car**, with the point estimate growing larger and more statistically significant in each follow-up wave (see [Table 2](#) for adjusted regression analyses).

² This is different to Aldred et al (2019; forthcoming), where we have adjusted for car ownership at follow-up. Hence some numbers presented below differ very slightly for the low-dose mini-Holland group. In other respects, we are using an identical analysis method as Aldred et al (2019; forthcoming).

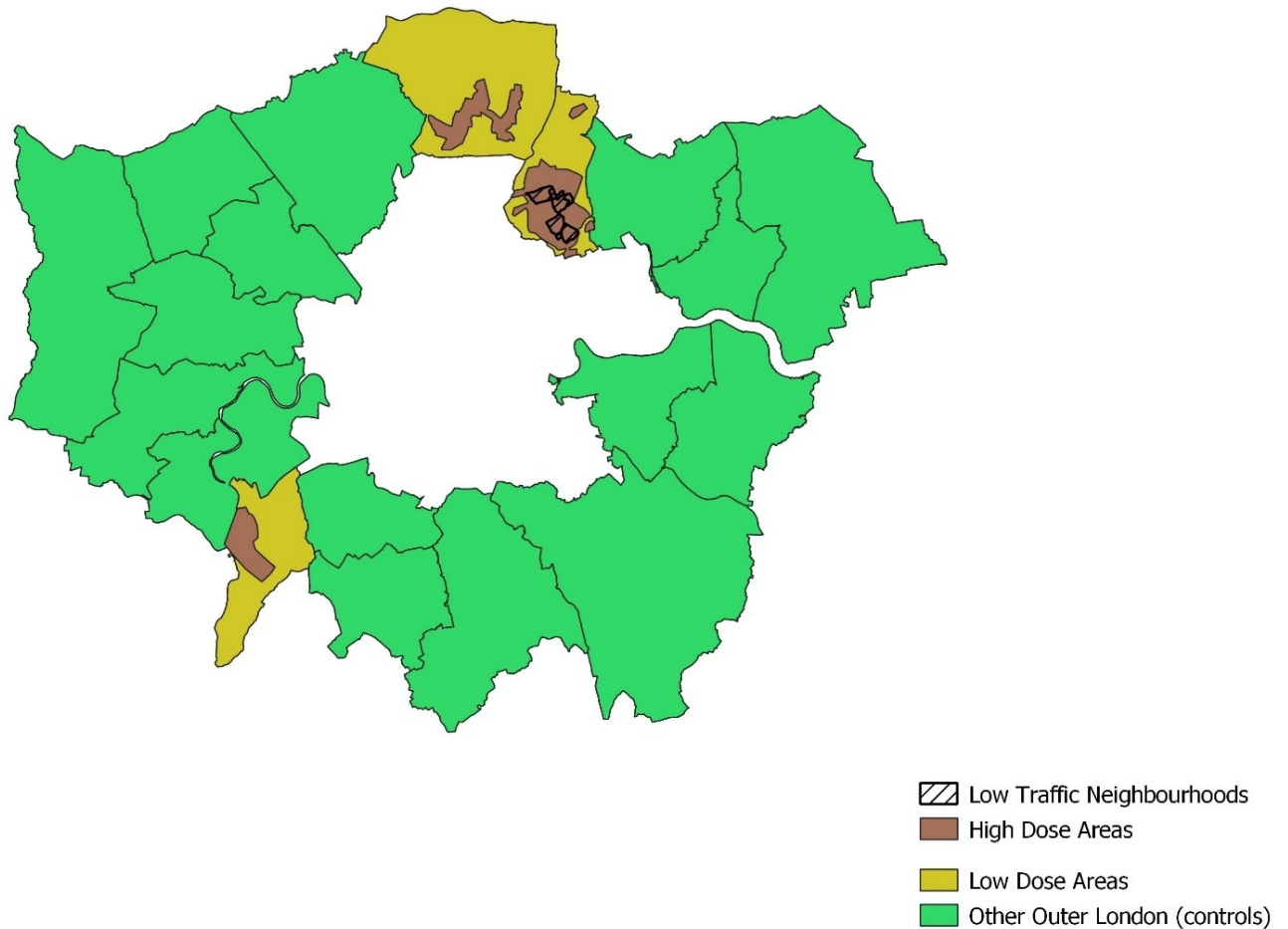


Figure 3: intervention and control areas, Wave 3

By Wave 3, the rate ratio (RR) of 0.80 corresponds to a 20% decrease in the adjusted probability of car ownership. There was no evidence of change in other intervention groups.

Likewise, for **any past week car use**, the largest decrease was the LTN group, with the effect significant in Wave 2 (RR 0.78, $p=0.02$) and borderline significant in Wave 3 (RR 0.81, $p=0.08$). There was a suggestion of a trend towards less past week car use in the high-dose, non-LTN group (RRs 0.93 to 0.96), but the point estimate was always smaller and never close to $p<0.05$.

As for **minutes of past week car use**, the point estimate in the LTN group was always negative and lower than other groups. The central point estimates were for a decrease of 10 minutes/week in Wave 1, 43 minutes/week in Wave 2, and 17 minutes/week in Wave 3. The confidence intervals were wide, however, and only in Wave 2 statistically significant ($p=0.007$). Still, to some extent this counteracts a concern sometimes raised about LTNs that longer car journeys (due to restrictions on through motor traffic) will increase total volumes of car driving and pollution.

Table 1: Sample sizes

| | | Sample size for analyses of % with a car or doing any past week travel of a given mode | Sample size for analyses of average minutes of past week travel |
|--------|--------------------|--|---|
| Wave 1 | Non-mini-Holland | 962 | 914 |
| | Low dose | 460 | 440 |
| | High dose, non-LTN | 241 | 234 |
| | High dose, LTN | 49 | 46 |
| Wave 2 | Non-mini-Holland | 902 | 811 |
| | Low dose | 413 | 366 |
| | High dose, non-LTN | 232 | 209 |
| | High dose, LTN | 63 | 58 |
| Wave 3 | Non-mini-Holland | 830 | 830 |
| | Low dose | 346 | 346 |
| | High dose, non-LTN | 256 | 256 |
| | High dose, LTN | 66 | 66 |

Table 2: Car-related outcomes: Adjusted rate ratios/regression coefficients (95% confidence interval)

| | | % with a household car | % with any car use in the past week | Minutes of car use in the past week |
|--------|--------------------|------------------------|-------------------------------------|-------------------------------------|
| Wave 1 | Non-mini-Holland | 1 | 1 | 0 |
| | Low dose | 1.01 (0.99, 1.03) | 0.98 (0.93, 1.02) | 4.6 (-14.5, 23.6) |
| | High dose, non-LTN | 0.98 (0.93, 1.03) | 0.93 (0.84, 1.02) | -2.7 (-25.8, 20.3) |
| | High dose, LTN | 0.92 (0.82, 1.03) | 0.91 (0.77, 1.09) | -9.9 (-51.2, 31.5) |
| Wave 2 | Non-mini-Holland | 1 | 1 | 0 |
| | Low dose | 1.02 (0.99, 1.06) | 1.02 (0.97, 1.07) | -6.7 (-34.6, 21.3) |
| | High dose, non-LTN | 0.98 (0.93, 1.03) | 0.96 (0.88, 1.05) | -3.1 (-37.2, 30.9) |
| | High dose, LTN | 0.89 (0.77, 1.02)† | 0.78 (0.63, 0.96)* | -43.3 (-74.8, -11.9)** |
| Wave 3 | Non-mini-Holland | 1 | 1 | 0 |
| | Low dose | 1.02 (0.98, 1.05) | 1.05 (0.99, 1.10) | 15.3 (-12.5, 43.1) |
| | High dose, non-LTN | 0.96 (0.90, 1.02) | 0.93 (0.86, 1.02) | -0.3 (-31.3, 30.6) |
| | High dose, LTN | 0.80 (0.68, 0.95)* | 0.81 (0.64, 1.02)† | -17.1 (-56.2, 22.0) |

†p<0.10, *p<0.05, **p<0.01, ***p<0.001, for difference from the non-mini-Holland group. Analyses adjust for the baseline measure of the outcome in question and the baseline number of cars in the household, plus gender, age, ethnicity, disability, household type and employment type at follow-up.

In summary, there was a consistent trend towards reduced car use among LTN residents for all three measures, with the effects particularly large in Waves 2 and 3. Confidence intervals were always wide, particularly for minutes of car use, but three of the six results from Waves 2 and 3 reached statistical significance and a further two were borderline significant. Despite small sample sizes, and uncertainty about the magnitude of the change, the overall trend is unlikely to be due to chance.

We also looked at our **active travel** outcomes for these sub-groups. In 16 of the 18 contrasts ([Table 3](#)) the point estimate was largest in the LTN area. Typically, the second largest was the high-dose, non-LTN area. In addition, many results for the LTN area reached statistical significance (4/6 for walking; 3/6 for cycling; 5/6 for active travel combined). The consistent pattern is therefore of the largest active travel benefits in LTN areas. We cannot make definite statements given wide confidence intervals, but the results seem most consistent with some but not all of this LTN increase in active travel in reflecting mode shift away from car use.

This research contributes to a growing evidence base for built environment interventions to increase active travel (Kärmeniemi et al. 2018; Smith et al. 2017; Stappers et al. 2018; Sun, Oreskovic, and Lin 2014; Yang et al. 2010). Unusually, the research also provides evidence on change in driving, and on Low Traffic Neighbourhoods, an increasingly used but controversial active travel intervention in the UK.

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Table 3: Active travel outcomes: adjusted rate ratios/regression coefficients (95% confidence interval)

| | | % doing any walking in the past week | Minutes of walking in the past week | % doing any cycling in the past week | Minutes of cycling in the past week | % doing any active travel in the past week | Minutes of active travel in the past week |
|--------|--------------------|--------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--|---|
| Wave 1 | Non-mini-Holland | 1 | 0 | 1 | 0 | 1 | 0 |
| | Low dose | 1.03 (0.98, 1.08) | 10.8 (-12.1, 33.8) | 1.11 (0.91, 1.35) | 1.6 (-8.3, 11.4) | 1.03 (0.98, 1.07) | 12.1 (-12.5, 36.7) |
| | High dose, non-LTN | 1.00 (0.94, 1.06) | 26.4 (-8.0, 60.9) | 1.20 (0.95, 1.51) | 6.7 (-6.4, 19.8) | 1.02 (0.97, 1.07) | 33.1 (-3.5, 69.6)† |
| | High dose, LTN | 1.14 (1.07, 1.21)*** | 76.4 (8.4, 144.4)* | 1.46 (1.12, 1.91)** | 14.5 (-6.2, 35.3) | 1.11 (1.05, 1.18)*** | 93.5 (20.4, 166.5)* |
| Wave 2 | Non-mini-Holland | 1 | 0 | 1 | 0 | 1 | 0 |
| | Low dose | 1.01 (0.96, 1.06) | 12.8 (-12.4, 37.9) | 0.99 (0.80, 1.23) | -1.5 (-10.9, 8.0) | 1.00 (0.96, 1.05) | 10.3 (-15.9, 36.4) |
| | High dose, non-LTN | 1.03 (0.97, 1.09) | 43.8 (8.6, 78.9)* | 1.00 (0.76, 1.32) | -7.7 (-18.1, 2.8) | 1.03 (0.99, 1.08) | 37.0 (-0.1, 74.0)† |
| | High dose, LTN | 1.02 (0.94, 1.11) | 47.9 (-10.0, 105.8) | 1.36 (1.00, 1.84)* | 16.6 (-10.4, 43.5) | 1.01 (0.94, 1.10) | 64.8 (1.4, 128.2)* |
| Wave 3 | Non-mini-Holland | 1 | 0 | 1 | 0 | 1 | 0 |
| | Low dose | 1.00 (0.95, 1.05) | -1.0 (-32.3, 30.2) | 1.00 (0.78, 1.29) | -1.6 (-11.1, 8.0) | 0.99 (0.94, 1.04) | -1.6 (-33.9, 30.7) |
| | High dose, non-LTN | 1.03 (0.97, 1.08) | 10.3 (-24.6, 45.3) | 1.28 (1.02, 1.61)* | 12.2 (-1.9, 26.2)† | 1.03 (0.98, 1.08) | 22.1 (-14.8, 59.0) |
| | High dose, LTN | 1.11 (1.05, 1.17)*** | 115.2 (20.7, 209.8)* | 1.68 (1.19, 2.37)** | 20.3 (0.2, 40.5)* | 1.09 (1.04, 1.15)** | 134.2 (38.2, 230.2)** |

†p<0.10, *p<0.05, **p<0.01, ***p<0.001, for difference from the non-mini-Holland group. Analyses adjust for the baseline measure of the outcome in question and the baseline number of cars in the household, plus gender, age, ethnicity, disability, household type and employment type at follow-up.



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