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SAFETY FINDINGS

Removing Through-traffic on Minor Roads Reduces Road Danger at Junctions with Surrounding Major Roads

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Findings

We tested the hypothesis that road safety improves at junctions between minor roads and major roads if the minor roads are modally filtered to remove through traffic. We did this by using police-reported casualty data (2012–2024) to examine the effects of 113 Low Traffic Neighbourhoods (LTNs) implemented in London between 2015 and 2024. Our findings supported our hypothesis: LTN implementation was associated with a 14% reduction in total numbers of casualties at junctions between newly filtered minor roads and surrounding major roads (95% CI: -21% to -8%). This effect was generally consistent across casualty injury severity, casualty travel mode, and the presence of traffic-light controlled signals.

1. Questions

Low Traffic Neighbourhoods (LTNs) are neighbourhood-level schemes that use modal filters to prevent through motor vehicle traffic from travelling along residential side streets. LTNs aim to create safer and more pleasant conditions for walking, wheeling and cycling, and to discourage car use by making car journeys less convenient. Previous research has found that LTNs in London reduce road traffic casualties on internal roads (Furlong et al. 2025). The same research also identified reductions in numbers of cyclist and motorcyclist casualties on boundary roads – i.e. on the roads surrounding an LTN. Boundary roads are typically major roads, and are the roads most likely to experience traffic displacement from inside the LTN.

By removing through traffic from side roads, LTNs are expected to reduce turning movements across the junctions where a side road meets the boundary road. This may reduce the 'T-junction' conflict that accounts for a high proportion of casualties to cyclists and motorcyclists (Pai, Hwang, and Saleh 2009; Talbot et al. 2014). In this study we test the hypothesis that road safety improves at junctions where newly filtered minor roads inside LTNs intersect with major surrounding boundary roads ('boundary to LTN' junctions).

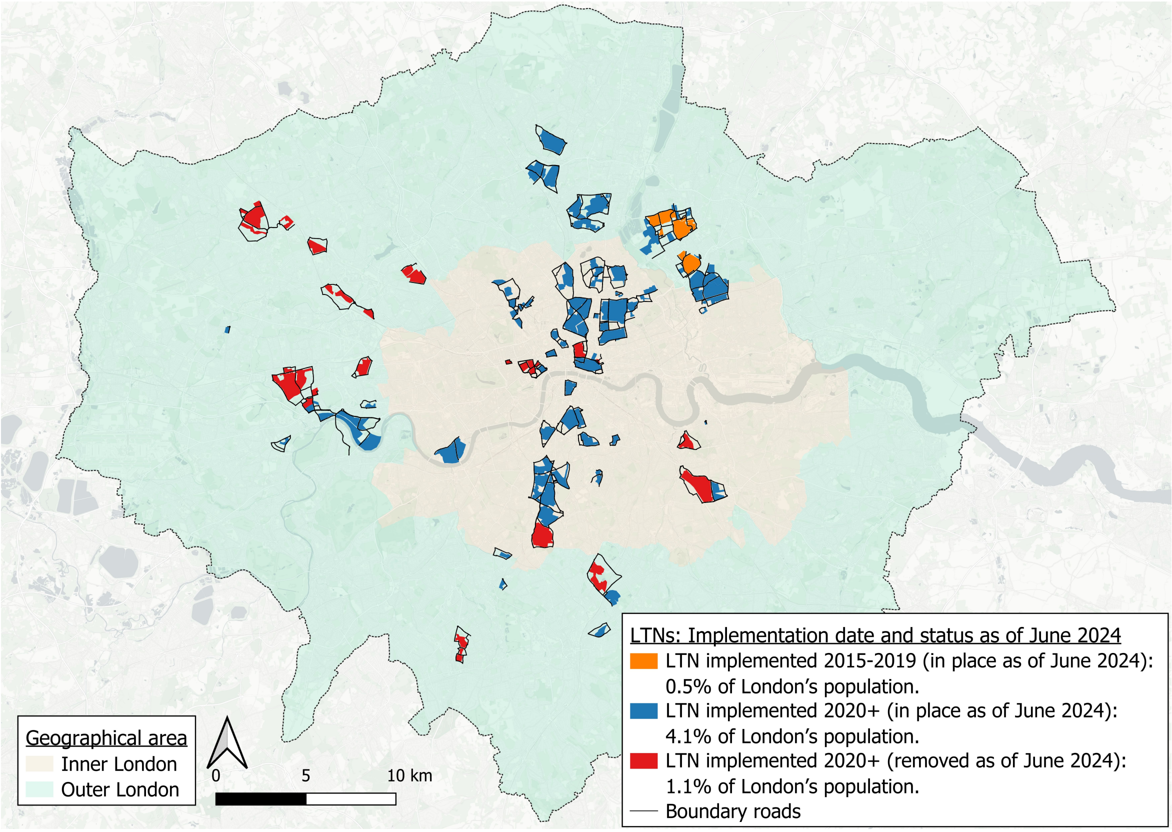

Figure 1. LTNs in Greater London and status as of June 2024, by implementation date

2. Methods

As of June 2024, 113 LTNs covering 40km^2 had been implemented in London (see Figure 1: LTN dataset available from the University of Westminster (2024)). 27 of these 113 LTNs were since removed, typically after public protest, negative public consultation responses, or changes in the political leadership of the area. The boundary roads of these LTNs are defined in the University of Westminster dataset as the nearest external roads which might experience LTN-related traffic displacement. We believe these boundary roads cover the vast majority of junctions that are the central focus of this study, i.e. junctions where a minor road inside an LTN meets a surrounding main road.

We examined the impact of these LTNs on major-minor road junctions in London. First, we identified all major-minor junctions in Greater London using node data from Ordnance Survey (2023) MasterMap data. Major-minor junctions were defined as any node that had three or more associated road links where at least one road link was an 'A' or 'B' road (major) and at least one road link was 'C' or 'Unclassified' (minor). We intersected the constituent road links with our LTNs and boundary roads shapefiles. Each junction was then defined, for each month of each year, as a) a 'boundary to LTN' junction; b) an 'other boundary road' junction; c) an 'internal LTN' junction; d) 'other' junction (i.e. never a), b) or c)). Figure 2 illustrates these different junction types for an example LTN.

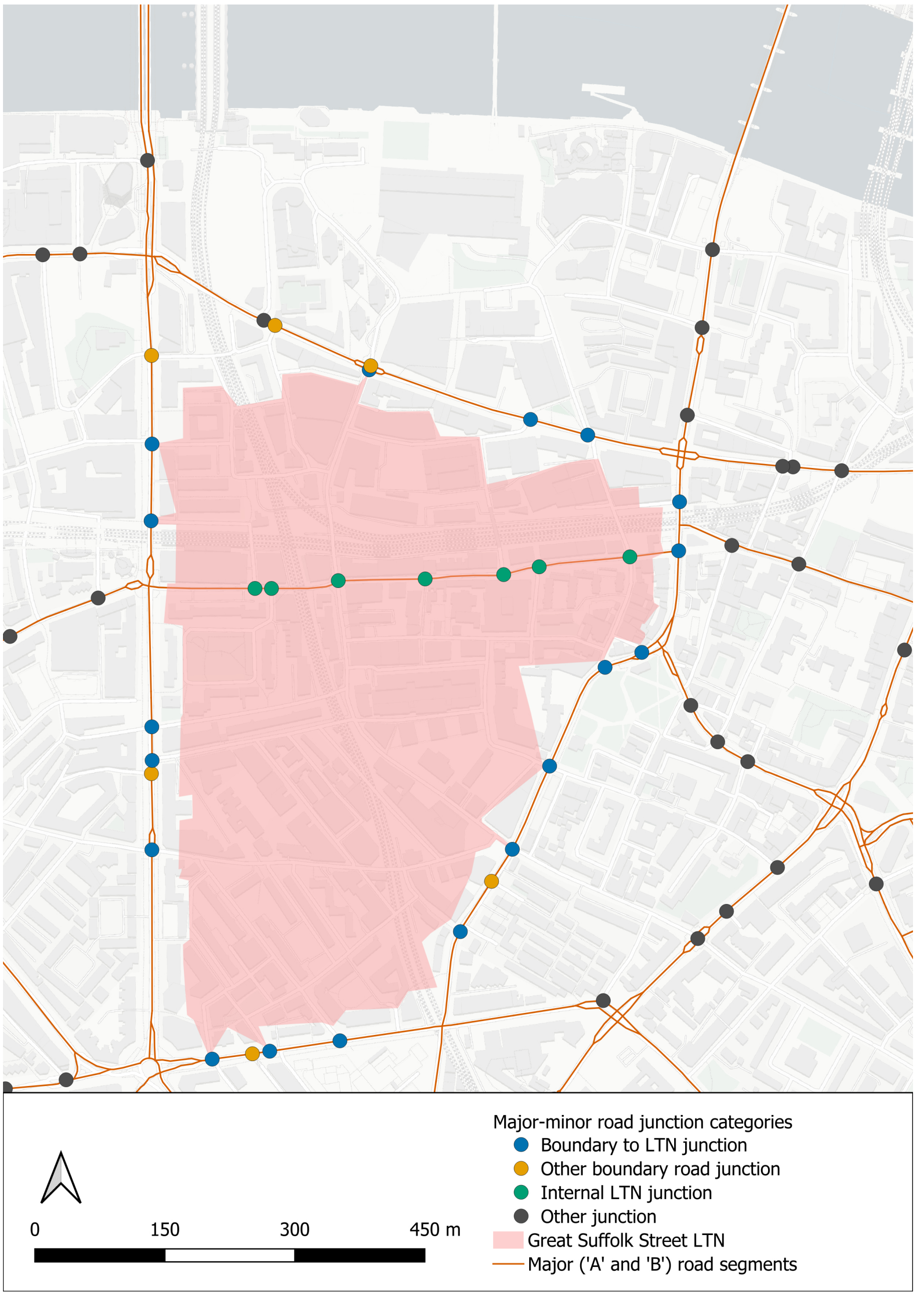

Figure 2. Major-minor junctions as of June 2024 in the area around the Great Suffolk Street LTN

To this dataset, we joined the number of police-reported road traffic casualties[1] for each month from January 2012 to June 2024 (Department for Transport 2025). Figure 2 outlines the process of data cleaning and dataset creation in more detail, and additional details can be found in Supplemental Material 1.

We estimated the impact of LTNs by fitting conditional fixed-effects Poisson regression models, using junction ID as the panel variable. In this approach each junction serves as its own control, and the regression model estimates

1 Note that a casualty in the dataset and in this analysis refers to each person injured in a road traffic crash, irrespective of injury severity.

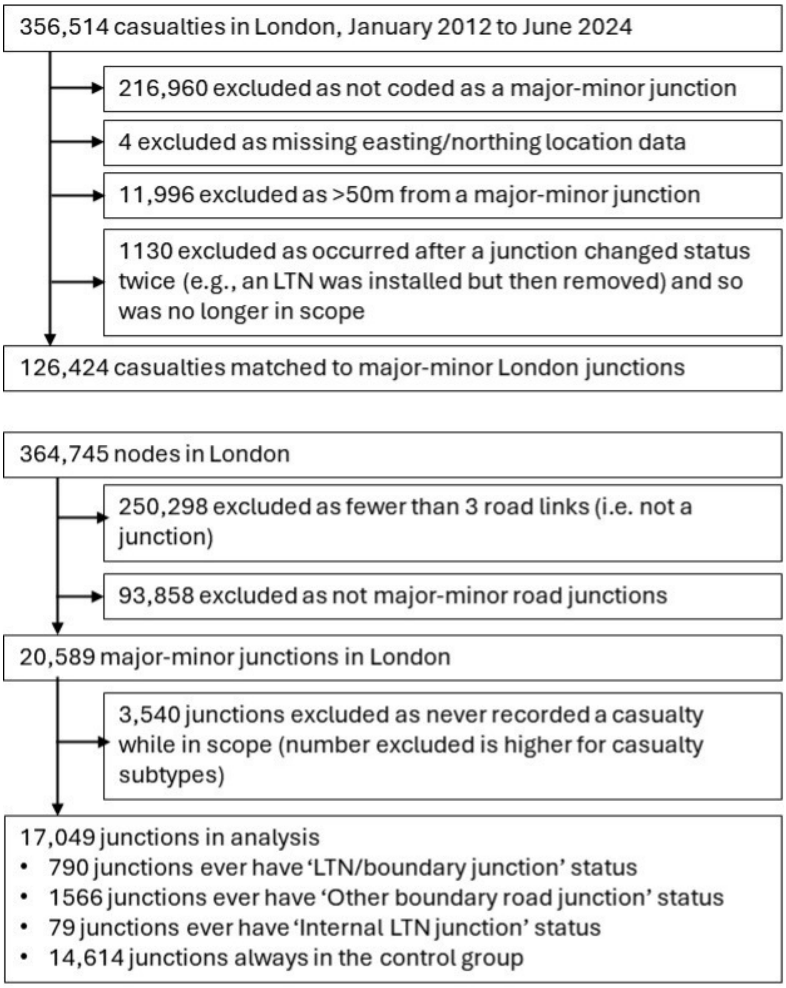

Figure 3. Flowchart illustrating data processing and dataset creation

the change in casualty numbers *across the same junction* pre- and post- LTN implementation. Broader temporal trends (e.g. improving road safety over time) were controlled for by including the rest of London's junctions in the analysis as a background control group, and by adjusting for year-month as a fixed effect. Our analyses used StataSE14.2.

Our primary outcome was the total number of casualties of any severity by any travel mode. We also present analyses stratified by injury severity, casualty travel mode, LTN implementation timing and location, and according to whether the junction was traffic-light controlled.

3. Findings

Table 1 shows the number of junctions of different types, and also the total number of casualties at each junction. As Table 1 shows, our sample sizes were relatively limited for internal LTN junctions (which are less common, as most LTNs do not filter major roads) and for Killed and Seriously Injured (KSI) casualties.

Table 1. Numbers of junctions and total numbers of casualties (2012-2024) across intervention and control junctions

	Became a 'boundary to LTN' junction during study period	Became an 'other boundary road' junction during study period	Became an 'internal LTN' junction during study period	Always control area
Number of junctions	790	1,566	79	14,614
Total number of casualties	7,822	13,241	496	104,865
Slight casualties	6,873	11,729	435	92,942
KSI casualties	949	1,512	61	11,923
Pedestrian casualties	1,506	2,598	153	17,142
Cyclist casualties	2,132	3,228	181	19,557
Motorcyclist casualties	1,808	2,993	81	23,607
Car, van and other motor vehicle occupant casualties	2,376	4,422	81	44,559
Casualties from crashes at junctions with traffic lights	1,427	3,047	190	20,586
Casualties from crashes at junctions without traffic lights	6,395	10,194	306	84,279
Casualties in Waltham Forest LTNs, 2015-2019	418	486	14	104,865†
Casualties in Inner London LTNs, 2020-2024	5,410	8,126	480	
Casualties in Outer London LTNs, 2020-2024	1,994	4,629	2	

KSI = killed and seriously injured. LTN = Low Traffic Neighbourhood. †The full set of control casualties was used as the comparison group for this analysis.

Table 2 reports the impact of LTN implementation on numbers of casualties. LTN implementation was associated with 14% (95% CI -21% to -8%; $p<0.001$) reduction in all casualties at 'boundary to LTN' junctions. There was no evidence that the magnitude of these effects differed according to injury severity, casualty travel mode, whether the junction was traffic-light controlled, or the area and timing of LTN implementation (all $p\geq0.3$ for heterogeneity).

In contrast to this consistent evidence of benefits at 'boundary to LTN' junctions, there was no convincing evidence of a change in numbers of casualties at 'other boundary road' junctions (e.g. change +0.6%, 95% CI -5% to +7%, for our primary outcome). The boundary road benefit was thus specific to junctions where the side road had been filtered and was not observed at immediately adjacent junctions where the side roads had not been filtered. This supports the interpretation that the observed benefits at 'boundary to LTN' junctions were caused by the LTNs themselves, rather than reflecting any separate improvements to the boundary roads.

Table 2. Results from the statistical models estimating the impact on road traffic casualties of a junction becoming a 'Boundary to LTN', 'Other boundary' or 'Internal LTN'

	Boundary to LTN junctions	Other boundary road junctions	Internal LTN junctions
All injury severities	-14% (-21%, -8%)***	+0.6% (-5%, +7%)	-42% (-55%, -24%)***
Slight casualties	-16% (-22%, -9%)***	-0.04% (-6%, +6%)	-43% (-58%, -24%)***
KSI casualties	-10% (-23%, +5%)	3% (-9%, +17%)	-30% (-66%, +45%)
p-value for heterogeneity by casualty severity	p=0.48	p=0.65	p=0.59
Pedestrian casualties	-8% (-20%, +5%)	-2% (-13%, +10%)	-56% (-69%, -38%)***
Cyclist casualties	-20% (-29%, -11%)***	+0.6% (-8%, +11%)	-25% (-47%, +8%)
Motorcyclist casualties	-22% (-32%, -10%)**	-13% (-21%, -3%)*	-70% (-83%, -46%)***
Car, van and other motor vehicle occupant casualties	-19% (-30%, -6%)**	+3% (-8%, +15%)	-40% (-73%, +31%)
p-value for heterogeneity by casualty mode	p=0.36	p=0.14	p=0.04
Casualties from crashes at junctions with traffic lights	-17% (-33%, +1%)	3% (-9%, +16%)	-51% (-66%, -31%)***
Casualties from crashes at junctions without traffic lights	-14% (-20%, -7%)***	+0.6% (-6%, +7%)	-33% (-54%, -3%)*
p-value for heterogeneity by traffic light status	p=0.70	p=0.72	p=0.22
Casualties in Waltham Forest LTNs, 2015-2019	-14% (-31%, +8%)	+16% (-11%, +51%)	[-69% (-94%, +59%)]
Casualties in Inner London LTNs, 2020-2024	-17% (-24%, -9%)***	-4% (-11%, +3%)	-41% (-55%, -22%)***
Casualties in Outer London LTNs, 2020-2024	-6% (-17%, +7%)	+10% (-1%, +22%)	[+128% (-86%, +3548%)]
p-value for heterogeneity by timing and area	p=0.30	p=0.05	p=0.47

KSI = killed and seriously injured. LTN = low traffic neighbourhood. *p<0.05, **p<0.01, ***p<0.001. Values in square brackets are based on fewer than 20 casualties (see Table 1) and should be treated with caution.

Finally, for the small number of major/minor junctions inside an LTN we found a 42% reduction in casualty numbers (95% CI -55% to -24%, p<0.001). This is consistent with the 35% reduction in total casualty numbers observed inside LTNs in general (Furlong et al. 2025).

In conclusion, we find that LTNs improve safety at the junctions where filtered side roads meet boundary roads. This likely reflects fewer turning movements made by motor vehicles at these junctions. This suggests that filtering side roads not only reduces injuries on the modally filtered roads themselves (Furlong et al. 2025), but can also reduce road danger on surrounding major roads.

Conflict of Interest Statement

AG lives in a former LTN in South London. It is not one of the LTNs studied in this paper, having been introduced (and subsequently removed) more recently than June 2024, which is the end date of this study. From time to time, AG volunteers in a personal capacity with local healthy streets and safe routes to school groups.

Acknowledgements

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SUPPLEMENTARY MATERIALS

Supplemental material

Download: https://findingspress.org/article/143455-removing-through-traffic-on-minor-roads-reduces-road-danger-at-junctions-with-surrounding-major-roads/attachment/298832.pdf