Developing a suite of tools to measure community severance
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**H1. Street audit**

PERS (Pedestrian Environment Review System)
Links & Crossings

**H2. Space syntax**

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**C. Participatory mapping**

**D. Self-completion questionnaire**

Community Severance Measurement Toolkit

A. Introduction
B. Evidence summary
C. Participatory mapping / street surveys
D. Health & Neighbourhood Mobility questionnaire
E. Valuation tool
F. Walkability models
G. Video surveys
H. Other tools
  - Street audits of pedestrian environment
  - PERS, Living Streets
  - Space syntax

**E. Stated preference survey to develop valuation tool**

Option A
  - Cross at closest point
  - (not at pedestrian crossing)
  - Adds x mins to your journey

Option B
  - Use covered over road
  - Avoid crossing

Option C
  - Avoid crossing

**F. Walkability model**

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G. Video surveys

- Motor traffic flows
- Pedestrian flows
- Crossing behaviours

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Introduction
There is a lack of tools to identify and measure community severance caused by large roads and motorized traffic, despite evidence of the negative impacts on local communities. We report the development of a suite of tools to measure community severance, undertaken for the Street Mobility and Network Accessibility research project.

Community severance\textsuperscript{a} occurs when transport infrastructure and/or the speed or volume of traffic interferes with individuals’ ability to access goods, services, and personal networks (1). The concept has been defined in many ways since the 1960s, usually emphasizing the barrier effect of roads on the movement of pedestrians (2; 3). However, severance is a broader phenomenon, impacting on what people do - or do not do - and on how they feel (1). Despite being often mentioned in both the transport and health literatures, community severance and its potential impact on health and wellbeing have been little studied (2). One difficulty has been identifying and measuring severance. A number of methods have been proposed (4) but none have been operationalized. Following an extensive, multidisciplinary literature review, we proposed a broader definition to account for wider spatial and social processes which shape the impact of community severance on an area over time.

Aim
The aim of the Street Mobility and Network Accessibility project (www.ucl.ac.uk/streetmobility) was to develop a suite of tools to measure community severance and its impacts. This paper summarizes development of these tools and their validation through triangulation of findings in a case study of an arterial road. Triangulation is the combination of methods in the study of the same phenomena. This technique is particularly useful because convergence of results from methods using different approaches provides evidence that the results are valid, not artefactual. It also provides a more complete picture. The observation of elements of both the built environment and human behaviour using a combination of qualitative and quantitative methods allows for a broad understanding of the causes and consequences of community severance.

Summary of methods used to develop the toolkit

\begin{itemize}
  \item Participatory mapping
  \item Health and neighbourhood mobility survey
  \item Video survey
  \item Street audits
  \item Stated preference survey

designed to use a combination of qualitative and quantitative methods.

\textbf{Methodology details:}

\textbf{Transport-related community severance is the variable and cumulative negative impact of the presence of transport infrastructure or motorised traffic on the perceptions, behaviour, and well-being of people who use the surrounding areas or need to make trips along or to cross that infrastructure or traffic. (3)}

\textbf{Results}

We summarise a selection of the findings, by theme

**Walkability and connectivity**

Space syntax showed that Finchley Road is structurally important for pedestrian activity. The walkability model shows that Finchley Road is one of the peak walkability areas in London. However, traffic flow data showed that it is also the arterial with the highest motorised traffic levels and non-motorised users. Heavy traffic and high walkability suggests community severance will be high. Free text comments from participants confirmed this.

**“Typically road is probably the most congested, dangerous, noisy, dirty road in the world.”** (Male, 65-74, Health and neighbourhood mobility survey)

\textbf{Mobility and accessibility**}

Motor traffic flows are high (39,500-46,500 vehicles 07:00-24:00), with a high proportion of heavy goods vehicles and buses/coaches! Almost half the survey participants reported that volume or speed of traffic at least occasionally affected their ability to walk round their local area (Table 1); there were greater problems for those living closer to the busiest road (Table 2). The mapping of PEIRS scores of pedestrian links also revealed that there are clusters of links with poor pedestrian environment in other parts of the study area, away from Finchley Road, decreasing the connectivity between the different neighbourhoods.

\textbf{Table 2: Relationship between travel or health factors and network distance from the busiest road (age-standardised across categories of network distance)*}

\begin{tabular}{|c|c|c|c|}
\hline
\textbf{Characteristic} & \textbf{Network distance from the busiest road} & \textbf{p value} \\
\hline
 & \textbf{≤100m} & \textbf{>100 to ≤200m} & \textbf{>200 to ≤400m} & \textbf{>400 to ≤800m} \\
\hline
\textbf{N} & 46 & 24 & 53 & 60 \\
\hline
\textbf{Self-reported health and wellbeing} & & & & \\
\hline
\textbf{Poor self-reported health (%)} & 0 & 1 & 5 & 2 & 0.321 \\
\hline
\textbf{Limiting longstanding illness (%)} & 16 & 36 & 14 & 9 & 0.125 \\
\hline
\textbf{Lowest decile of wellbeing (%)} & 19 & 0 & 5 & 0 & 0.007 \\
\hline
\textbf{Problems often or always affecting ability to walk around the local area} & & & & \\
\hline
\textbf{Speed of traffic (%)} & 25 & 18 & 6 & 8 & 0.031 \\
\hline
\textbf{Volume of traffic (%)} & 25 & 18 & 7 & 7 & 0.040 \\
\hline
\end{tabular}

\textbf{Crossing the road**}

Crossing Finchley Road is a major challenge for pedestrians. Street audits revealed that crossing is not physically possible along the section with highest pedestrian flows due to the existence of ‘guaranteed crossings and walls. The number of signalised crossings is insufficient, with long waiting times (up to 2 minutes) to cross at the few crossings. 18% of survey participants mentioned lack of crossing points as a difficulty they encountered; 25% said the signalised crossings did not allow adequate time to cross. Most existing formal crossing points had a negative street audit score, mainly due to delay, poor legibility, and gradient.

\textbf{Health and wellbeing}

People living closer to the busiest road had lower wellbeing (Table 2).

\textbf{Noise and air pollution}

These were mentioned by 38% of survey participants as barriers to walking around their local area. It was more common among those living closest to their busiest road (p<0.001). The mean NO\textsubscript{2} level for the year 2014/15 was 61\textmu g/m\textsuperscript{3}, 21\textmu g/m\textsuperscript{3} more than the EU annual limit (40 \textmu g/m\textsuperscript{3}).

\textbf{Conclusion}

Analysis shows coherence between findings from the different measurement tools applied individually and also reveals interconnections between factors which contribute to severance, demonstrating overall reliability of the suite of tools for assessing community severity in urban areas.

\textbf{References}


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