

Demographic profile of pedestrian flows: linking Huq geo-data and SmartStreetSensor footfall data

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Impacts

The research summarised in this case study suggests linking the contextual information derived from geo-data to footfall counts in order to create a comprehensive understanding of the volumes and demographic profile of the ambient population in the retail centres.

Data

Geo-data for this case study was provided by [Huq Industries Ltd.](#) Footfall counts are derived from the [SmartStreetSensor project](#), which is a collaboration between the Local Data Company and the ESRC's Consumer Data Research Centre. The preliminary analysis focused on the retail centres in Brighton & Hove (and Kensington High Street in London for comparison). The data covers year 2018.

Comparing data sources: footfall data and mobile geo-data show similar temporal patterns

We observed a significant positive correlation between Huq's mobile geo-data and the SmartStreetSensor footfall data across the two study areas.

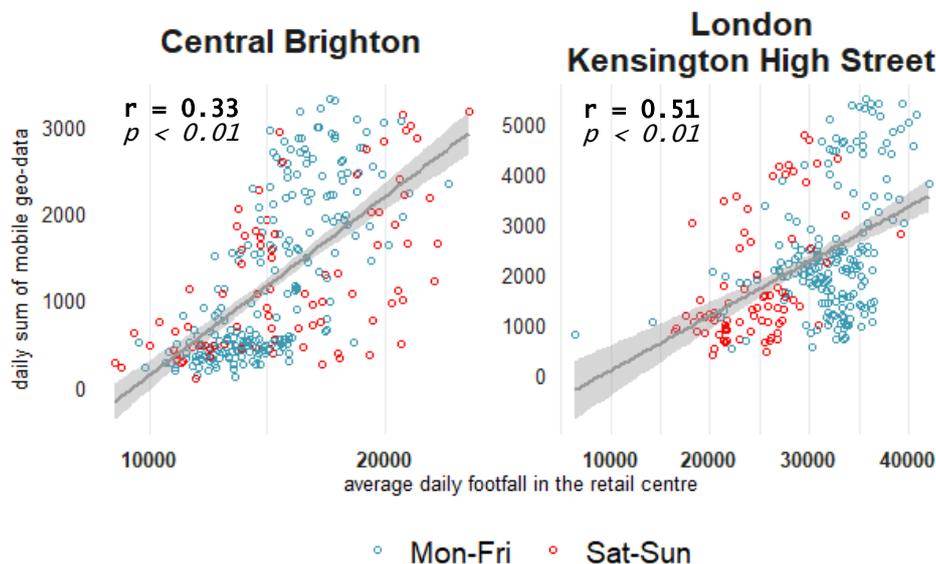
To provide context to the correlation, we also looked at the extent to which the two datasets overlap. We found that mobile geo-data captures around 5.6% of the daily footfall in central Brighton and around 6.4% at High Street Kensington in London. The capture rate was calculated as follows:

The strength of the correlation is visualised in the scatterplot below. The grey line illustrates complete positive correlation ($r = 1$). In other words, the closer the circles are to the line, the stronger is the relationship between the two data sets.

$$\frac{\text{average daily geo-data volume} * 100}{\text{average daily footfall}}$$

Footfall versus mobile geo-data

correlation between daily values



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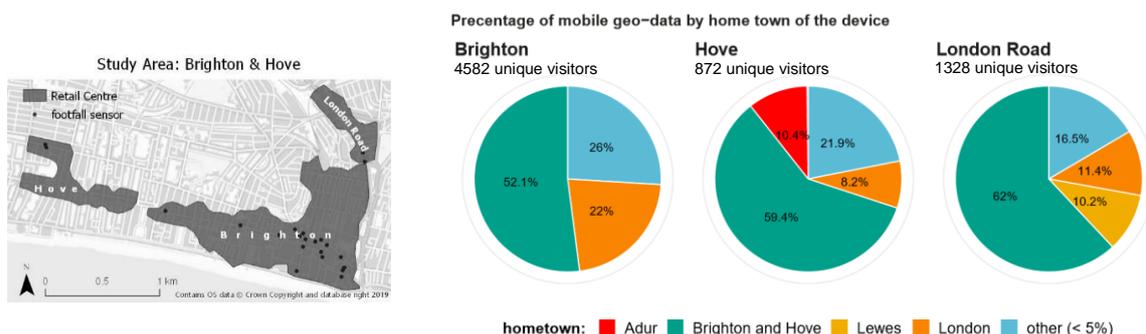
Going further: what can mobile geo-data tell us about the demographic profile of the retail centre visitors?

The longitudinal nature of mobile geo-data means that once we have been able to identify visitors to the study areas, we are then able to traverse through the wider dataset to observe the other places visited by those consumers. One of the most important locations which we can infer from the data is the home location.

The home location of retail centre visitors relative to the study area location provides insights about the catchment and the proportion of visitor types.

For example, we found that 57.8% of visitors to the Brighton & Hove study area were residents of Brighton, and can be considered local. This percentage varies from 62% at the London Road retail centre to 52.1% in central Brighton.

The percentages shown on the graphs below were calculated from the total number of unique visitors in year 2018 to the respective retail centre.



Putting it all together: how does footfall traffic vary according to visitor type?

To recap, we started with the SmartStreetSensor data, and Huq Industries' mobile geo-data. Both datasets covered the same geographic study areas over the same time periods.

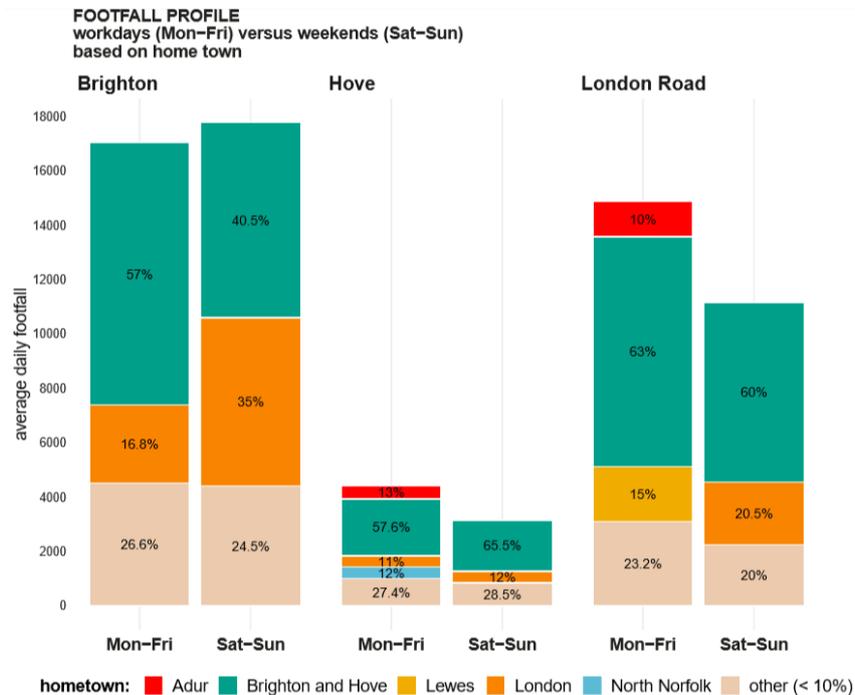
The results of the correlation analysis showed a positive correlation between those two data sources, allowing us to conclude that both datasets show similar temporal patterns.

Using Huq's mobile geo-data we were able to identify the home locations of the visitors to the retail centre in Brighton, which enabled us to classify retail centre visitors into locals and tourists – the results of which are outlined above.

This same classification allows us to inspect how the different groups engage with the retail centres in study areas, in this case on spatio-temporal bases.

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By organising the week into weekdays and weekends, we found that 16.8% of the average daily footfall on work days in central Brighton is created by the people who live in London. On weekends this figure doubles to 35% and there is a slight increase in the average footfall, from 17,000 on work days to 18,000 on weekends. This shows the importance of Brighton as a weekend destination for Londoners and rises further research opportunities for analysing the impact of non-residential population on the services and retail sales in central Brighton.

In the other two retail centres in Brighton - Hove and London Road - the mean daily footfall decreases on the weekends from 4,000 to 3,000 in Hove, and 15,000 to 12,000 in London Road. Further, visitors from parts of the wider Brighton catchment area (Adur, Lewes) are absent from the footfall profile over the weekend. The drop in footfall and the absence of non-local population over the weekend indicate that Hove and London Road are local retail centres where the demand for services and retail is mainly driven by local residential population.

Further research: Flows between retail centres

The longitudinal qualities of mobile geo-data relating the movement of consumers provides for richer and more detailed analyses of how visitors move between and around different retail centres.

The outputs from these analyses can help retailers and real-estate operators for example to address research themes such as:

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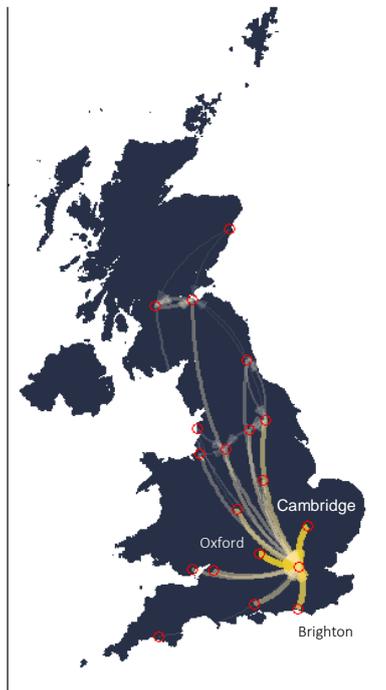
a) For frequent visitors to a given retail centre [x], how likely are they to also visit a different (known) retail centre [y]?

b) Which retail centres are used by local population only, and which retail centres are also popular amongst the non-local population?

Preliminary analysis of the visitor flows between the busiest retail centre in the UK showed that among the densest terminating in Central London are Oxford (46% of consumers observed in the Oxford retail centre have also been observed in the Central London zone), Cambridge (45%) and Brighton (40%).

The map of Brighton below illustrates these retail centres flows on a local level. It reveals – as expected – intense flows of pedestrians from smaller regional retail centres to central Brighton, and it also reveals significant relationships between the smaller retail centres too.

Flows between retail centres



% of population who has travelled to destination 20 30 40

Flows between retail centres in Brighton



% of population who has travelled to destination 20 40 60 80