

Does the 'x-minute city' Model Limit Freedom of Choice?

Amenity Distribution in Urban Areas Across the UK

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Motivation and Background:

The *15-minute city* model, devised by *Carlos Moreno* [1], defines an urban area to be "accessible" if all essential services can be reached with a 15-minute walk. However, little to no academic attention has been devoted to the idea of "choice" of amenities in the urban data science field.

Imagine you live in an accessible city, and your closest restaurant is 10 minutes away. Under the original definition, this is perfect. But what if you don't like the cuisine they offer, or you've been so many times you want something different; what if you instead want a café, or a pub? This shortcoming can also manifest with other service categories.



London Legible "Monolith D" Wayfinding Sign [4]

This project addresses this issue by:

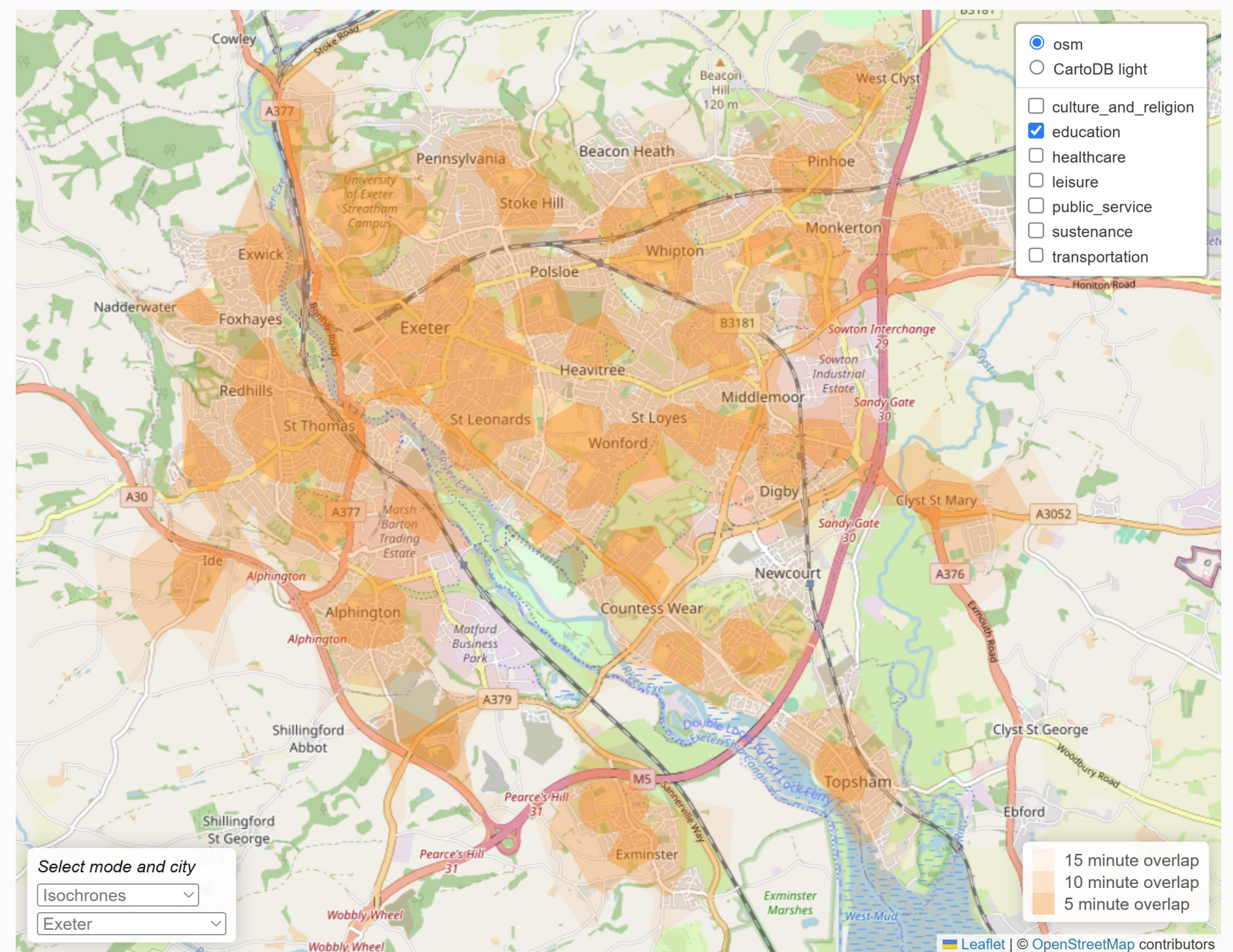
- Defining a metric for measuring "choice", based on the distribution of both amenities and residents
 - Amenity locations from OpenStreetMap (see figure below right)
 - Population from Global Human Settlement Layer (GHSL), similar to the work of *Nicoletti* [2]
- Comparing 25 "accessible" UK cities across 7 amenity categories

Key to this work is the concept of isochrones [3] - these encapsulate an area accessible (on foot) within a set time frame

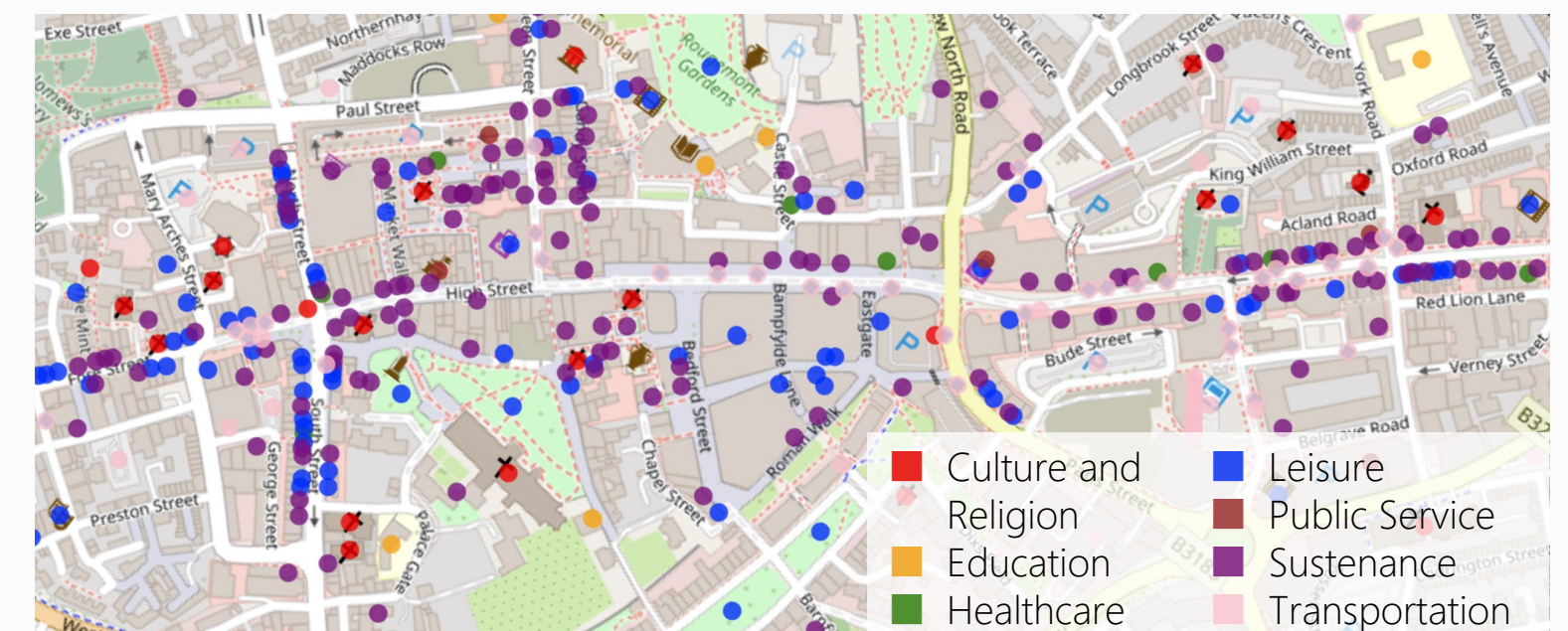
- The white circle on the figure to the left approximates this polygon using distance "as the crow flies"
- The figure to the right shows the union of many such polygons, each centred on a randomly sampled POI

References

- Moreno, Carlos. La ville du quart d'heure: pour un nouveau chrono-urbanisme!
- Nicoletti, Leonardo and Sirenko, Mikhail and Verma, Trivik. Disadvantaged communities have lower access to urban infrastructure. In *Environment and Planning B: Urban Analytics and City Science* 50, 3 (2023), pp. 831–849.
- Scalas, Mattia. "Pedestrian Isochrones Facilities Overlapping with Openrouteservice. An Easy, Fast and Opensource Indicator in Novara, Italy". In *International Conference on Computational Science and Its Applications* (2023), Springer, pp. 293–307.
- Transport For London, "Maps & Signs" <https://tfl.gov.uk/info-for/boroughs-and-communities/maps-and-signs> "Legible London Product Range" <https://content.tfl.gov.uk/legible-london-product-range.pdf> [Accessed 19/03/25]

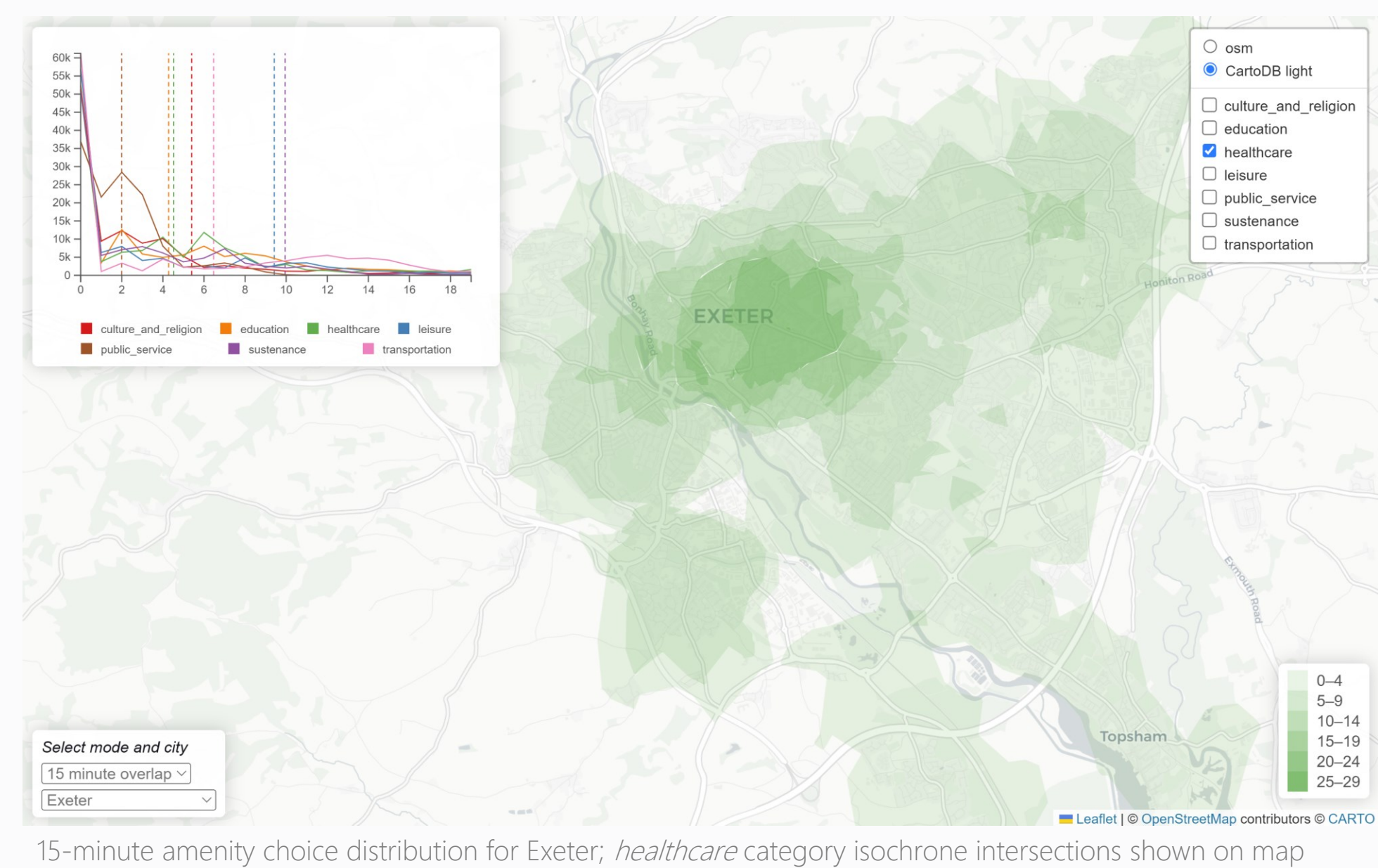
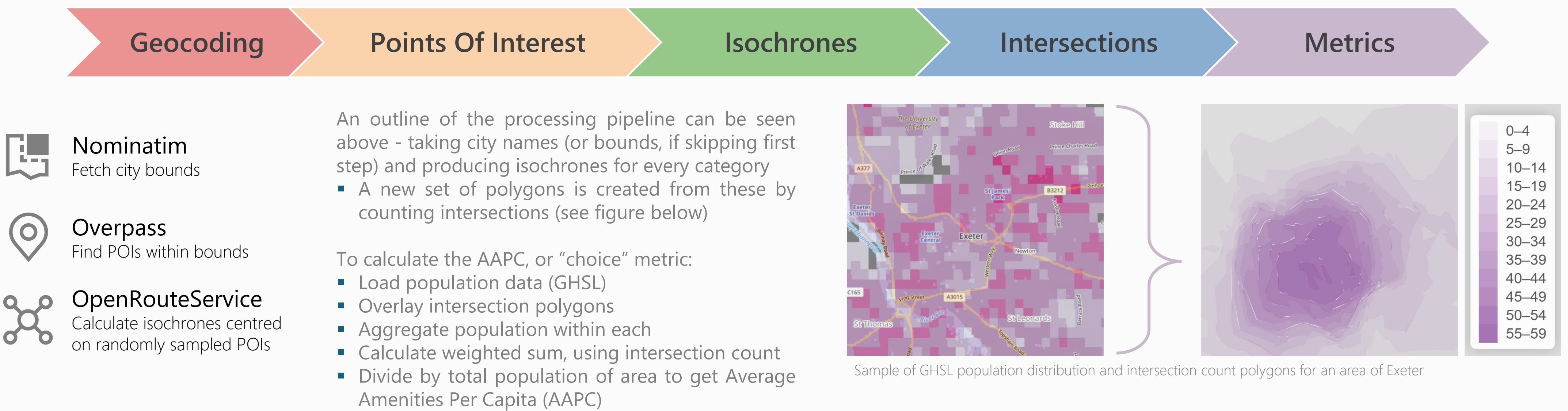


Isochrones for the education category in Exeter, overlaid onto a map



Points of Interest on Exeter High Street; fetched from OpenStreetMap with Overpass API

Data Processing:



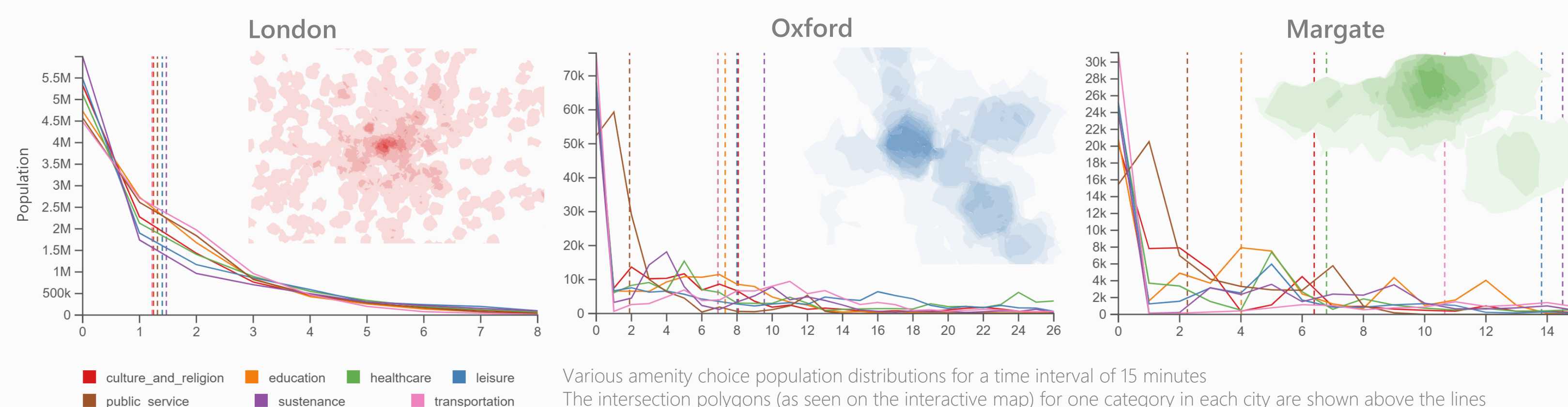
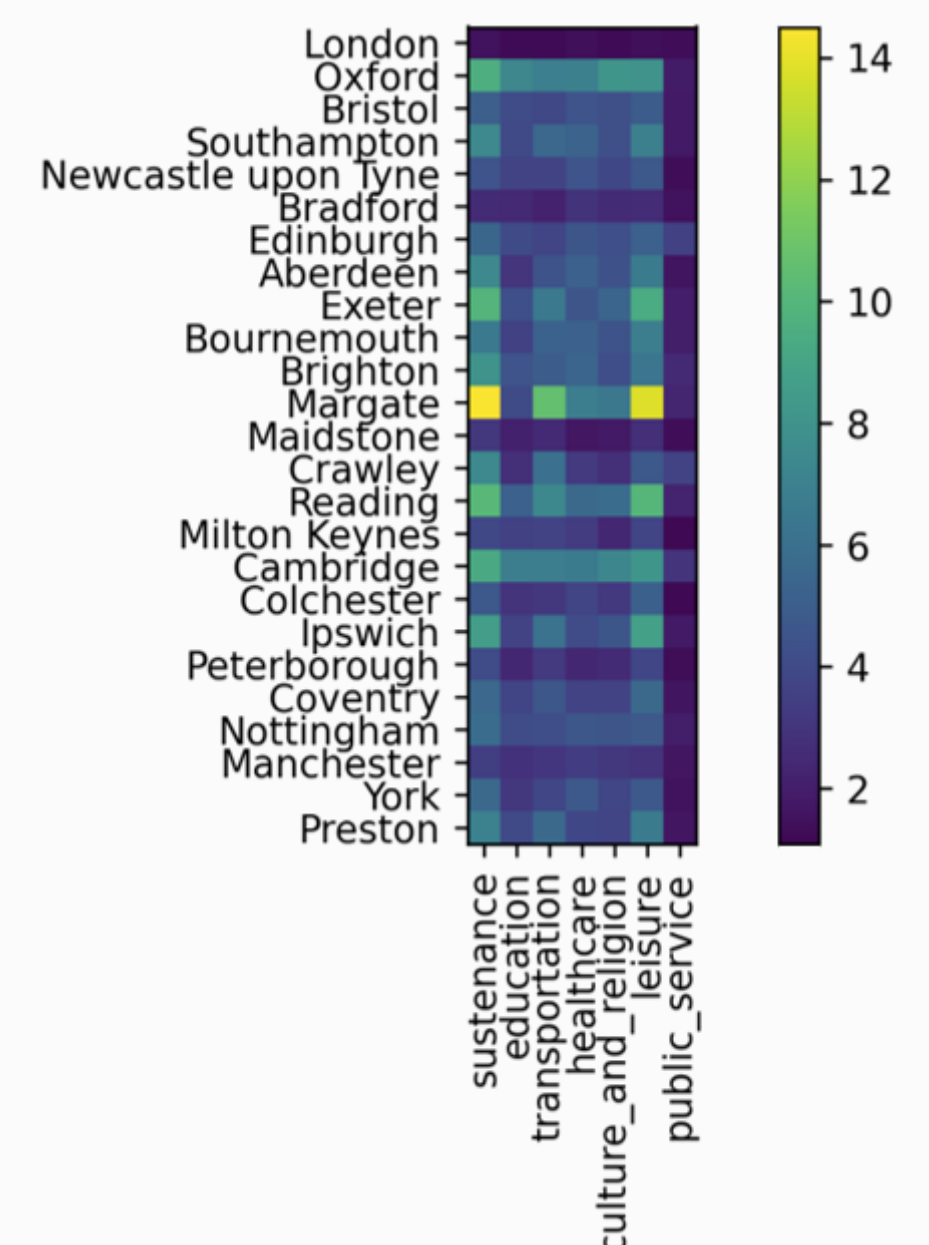
15-minute amenity choice distribution for Exeter; healthcare category isochrone intersections shown on map

Results and Evaluation:

The key findings can be split into city-wise observations and behaviour by category.

- Greater London scores worst across all studied cities**
 - Its large population is distributed across the city, while its services are concentrated in the centre – an area not accessible (on foot) to the majority of the city's population
 - Complexity of data processing imposed a limit on the number of samples that could be taken, producing a slightly misrepresentative result
- The highest AAPC values are found in Margate, in the *sustenance* and *leisure* categories
 - Having the smallest population of the case studies might have influenced this; a Pearson correlation study between AAPC and population found a moderate negative (≈ -0.4) correlation, so this conclusion retains its significance
- Areas like Oxford were consistently high – excluding the *public_service* category, all metrics were 8 ± 2

Heatmap of AAPC metric values across cities and categories (within 15 minutes)



Various amenity choice population distributions for a time interval of 15 minutes. The intersection polygons (as seen on the interactive map) for one category in each city are shown above the lines

- The *public_service* category scored lowest; despite containing over 3 times as many tags as the smallest category (*culture_and_religion*)
- sustenance* and *leisure* were on average the two highest scoring categories, with *transportation* third