

Fare accessibility

An indicator for Public Transport Affordability

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Utility of a single ticket

People on low incomes say that high public transport fares restrict their mobility and affect their ability to participate in society. Many cannot afford a monthly pass and rely on single tickets^{1,2}. Therefore, out-of-pocket fares play an important role, presumably also alongside the national flat fare "Deutschlandticket" of EUR 49/month, which is a major intervention in 2023.

Accessibility is usually measured in terms of travel time or distance, but rarely in terms of financial costs. This is where the **fare accessibility** comes in. The indicator measures **how many destinations can be reached from one stop with a single ticket**. In combination with socio-economic data, it helps to assess the distributional impact of public transport services. Previous studies in Hamburg

have found no structural disadvantage concerning travel time and public transport service level, although the fare shows a deficit for certain destinations. For example, in Hamburg, 21% of people receiving "Hartz IV" social benefits have to pay at least 3 euros per trip to the nearest food bank¹.

Fare accessibility in Hamburg and Helsinki Metropolitan areas

To complement the studies that cover Hamburg's public transport association service area (hvv), we calculated fare accessibility for the Greater Helsinki Region (Helsingin Seudun Liikenne, HSL), which offers zone fares. We did this as part of a master's thesis with the

following research hypothesis: Due to different spatial structures and different fare systems, HSL offers higher fare accessibility than hvv. The analysis was based on a fare matrix, the distribution of destinations, the distribution of low-income populations and the catchment areas of

public transport. The index is logarithmic and z-transformed to allow comparison between HSL and hvv.

Single fare (EUR)	Telitie	Teollisuustie	Terrisuo	Terrisuontie
Kyläkirkko	4.10	4.10	2.80	4.10
Hanasaan	4.10	4.10	5.70	4.10
Kaupungintalo	4.10	3.20	4.10	3.20
Hämeenlinnanväylä	2.80	4.10	3.20	2.80
Kalliotie	5.70	4.10	4.10	2.80
Kallvikintie	4.10	4.10	4.10	2.80
Kisällintie	2.80	4.10	4.10	5.20

Figure 1: Schematic representation of the fare matrix for the HSL area. Shows the fare (in EUR) between each two stops.

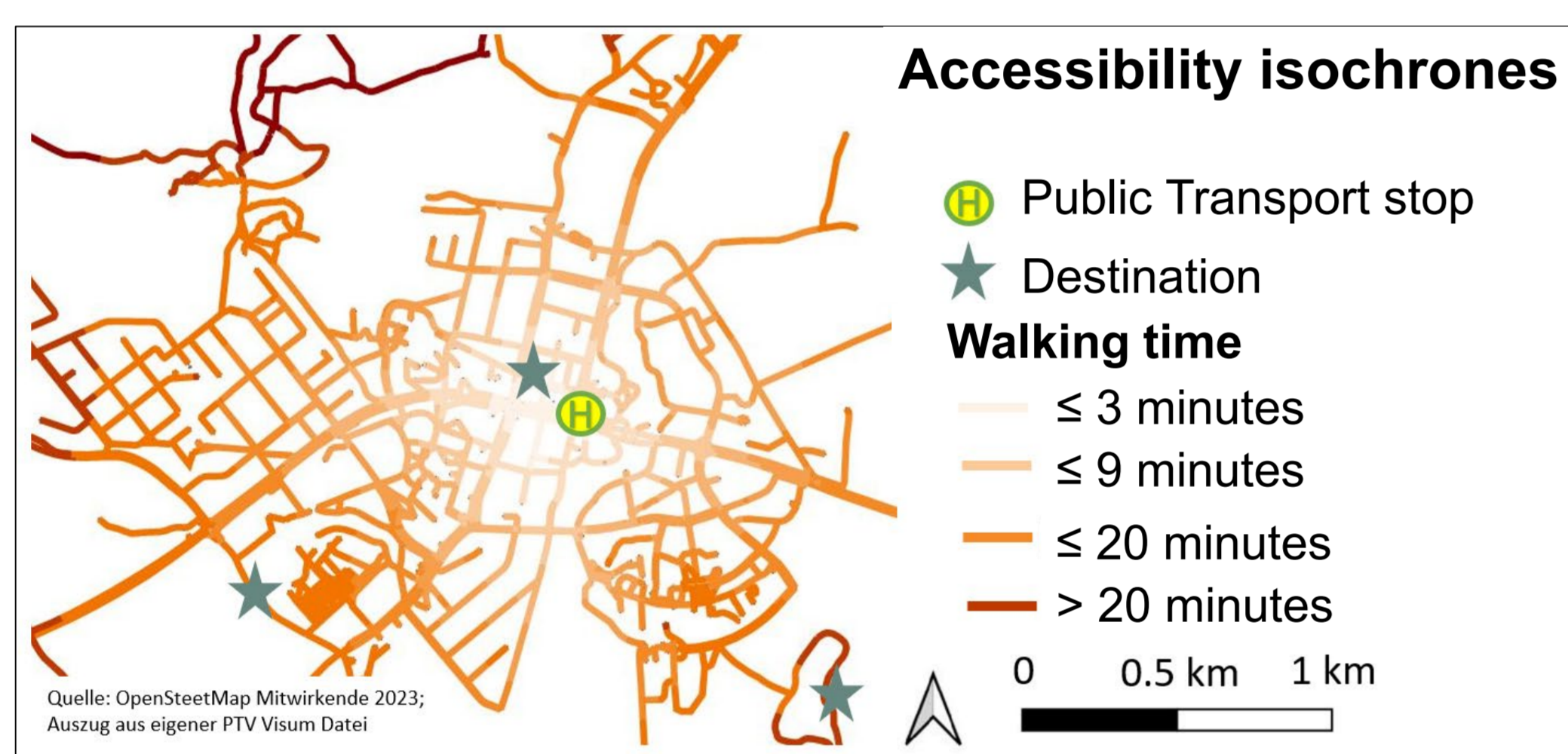


Figure 2: Walking accessibility of destinations measured by walking time from the PT stop.

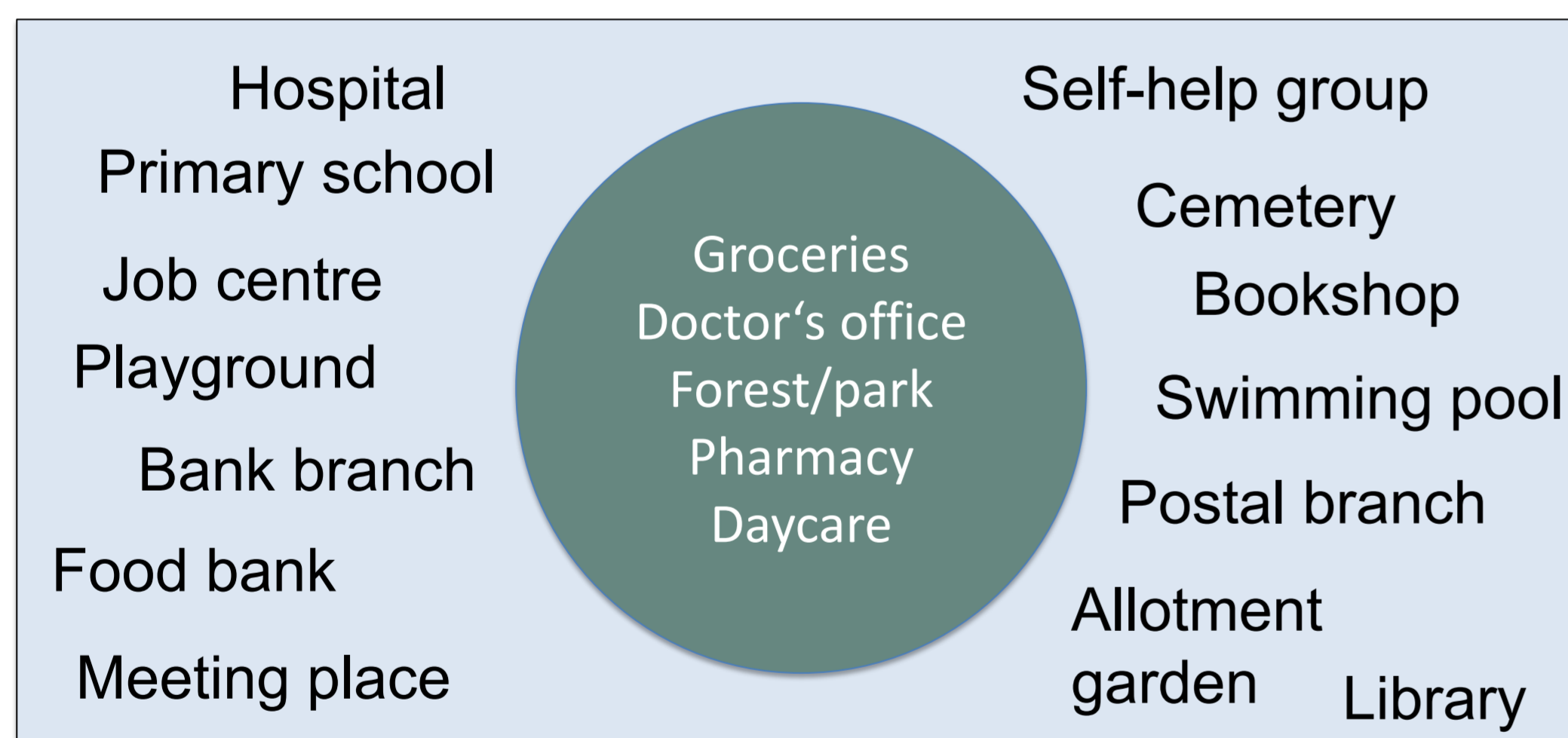


Figure 3: Interview-based selection and weighting of destinations for low-income people. In the circle are the five categories with the highest weights.

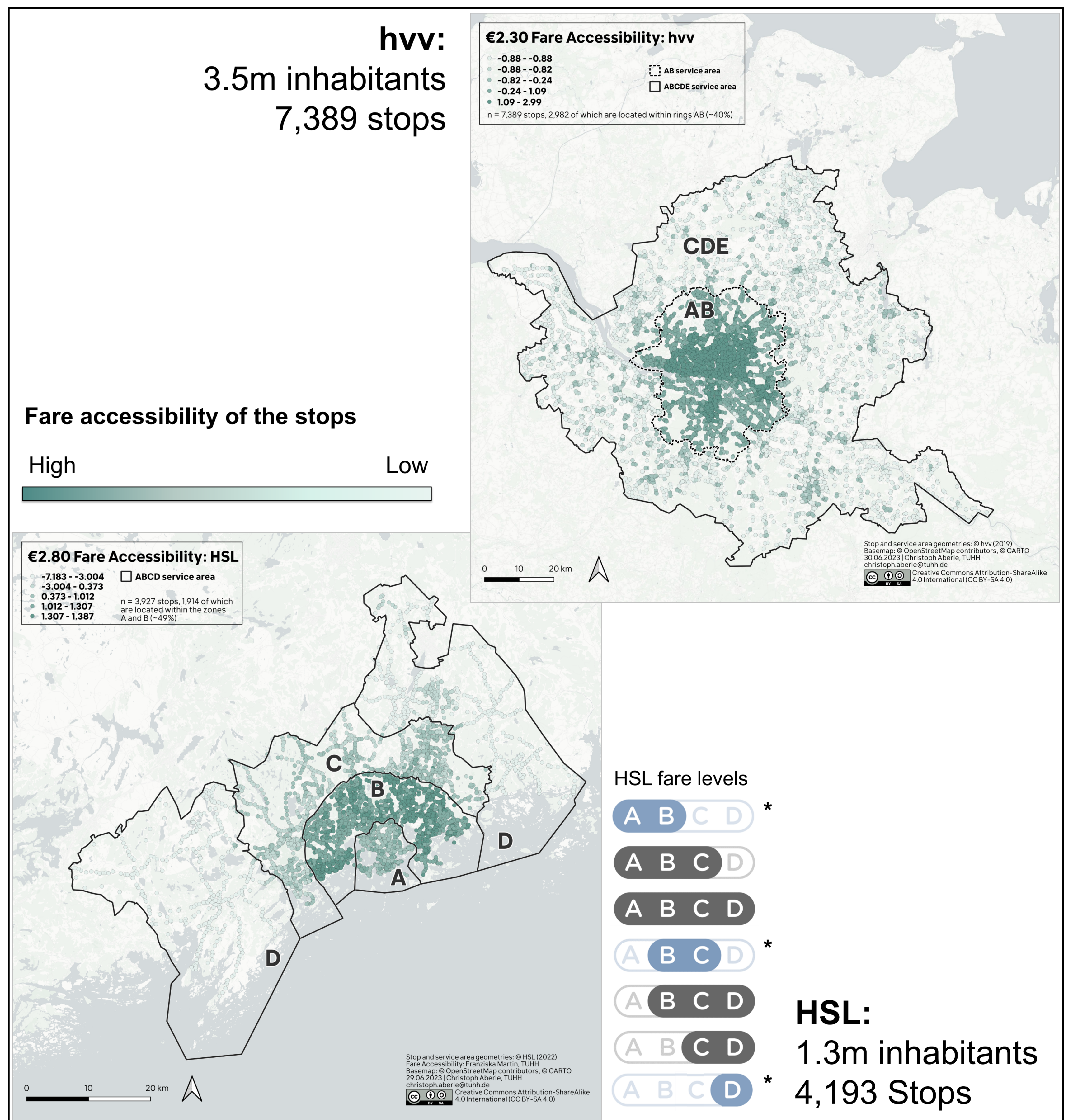


Figure 4: Fare accessibility at stop level in the hvv and HSL areas. For hvv, fares of up to EUR 2.30 EUR are considered (short journey within Hamburg AB: EUR 1.70, Citycard in satellite town: EUR 1.70, one zone in CDE: EUR 2.30; as of 2019). For HSL, fares of up to EUR 2.80 are included (light blue and asterisk * at the bottom right).

Which region offers greater fare accessibility?

In both study areas, fare accessibility is high in the urban centres, but decreases towards the periphery (Fig. 4). The median fare accessibility of HSL is higher than in hvv. We can therefore accept our hypothesis. However, fare accessibility varies between the HSL zones, with zones C and D being notably lower than the hvv median. An analysis based on PTV Visum shows that the HSL routes are centralised towards the agglomerations, especially in zone D, resulting in limited cross-connections in zones C and D, which affects overall accessibility.

Our research is not without methodological caveats, such as the fact that our indicator measures potential access rather than utility per se. The abstract possibility of reaching seven doctors with a EUR 2.30 fare may not reflect the reality of a resident who needs to see *their* doctor but cannot afford the fare. There is also a density bias as we define PT catchment areas according to the density of the immediate area around a given stop. Further research is therefore needed on urban structure, PT accessibility and the impact of fares on marginalised groups.

Overall, we have explored an unconventional method of measuring accessibility as a function of individual fares. Our results for the Hamburg and Helsinki case studies link fare accessibility to urban density, suggesting that there is at least one indicator that is easier to obtain. Nevertheless, fare accessibility can reveal local gaps and thus help PT and regional planners to serve those who depend on an affordable public transport system.

Read more in our upcoming paper:
How much Freedom does a Single Ticket offer?
Measuring Public Transport Accessibility by the Fare System
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