Towards Just Neighbourhoods: Leveraging Geospatial Data Science to Understand Night-Time Public Transport Variability in British Cities[*]

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Abstract. Working towards equitable accessibility, sustainable mobility, and the decarbonisation of transport requires a better understanding of the challenges confronted by disadvantaged populations. These communities often rely on public transport, a sustainable form of mobility that is crucial for their daily needs, including commuting to and from workplaces. In the UK, nearly nine million individuals were engaged in night-time work in 2022, with a substantial percentage occupying low-paid positions (ONS, 2023). Coupled with the significant trend of poverty suburbanising in major British cities (Bailey & Minton, 2018)—areas typically less accessible than central locations—it is critical to investigate the impacts of public transport accessibility on these demographics, particularly during off-peak hours. However, the variability of public transport services at night in British cities remains poorly understood. This raises the question: How do night-time public transport service variations impact disadvantaged urban communities?

To address this question, we exploited the increased availability of computational resources, open-source software like `R` and the `R5R` package (Saraiva et al., 2021), as well as open-access data. These tools enabled the computation of detailed travel time matrices, allowing us to compare public transport service variations in larger British cities. We computed travel times from each lower super output area (LSOA) in England and Wales, or data zone (DZ) in Scotland, to all others during two periods: morning peak (7-10 a.m.) and night-time (9 p.m. to midnight). Later, we stratify these changes by disadvantaged community groups and model the accessibility poverty risk in a logistic regression.

Our results confirm an expected overall decrease in night-time public transport services compared to daytime levels. Specifically, all subgroups within 'Industrious' and 'Hard-pressed' communities are at higher risk of experiencing accessibility poverty at night than 'Other groups' in British cities. This particularly affects 'Endeavouring social renters' and 'Hard-pressed flat dwellers' who have an odds ratio almost three times that of

the rest of the urban population. Moreover, the odds for 'Primary sector workers' are ninefold.

These findings underscore the importance of further understanding disadvantaged communities' dual exclusion—firstly, by their geographic locations and secondly, by limitations restricting their participation in the night-time economy via public transport. It also highlights the critical role of advances in geospatial data science, open-source software and their communities in supporting the development of effective net-zero policies for equitable neighbourhoods and sustainable communities.

Keywords: Night-time economy · Equitable accessibility · Sustainable transport · Open tools.

References

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