

A red double-decker bus is shown from a side profile, parked on a wet cobblestone street. The bus features a large white text advertisement. In the background, several Gothic-style buildings with spires and scaffolding are visible under a grey, overcast sky. A few people are standing near the rear of the bus.

What if the buses are better?

Utilising real-time bus location data to understand the impacts of travel time inaccuracies on socio-spatial accessibility inequalities and the potential applications in transport appraisal

Let's take evidence-based decisions.

#BetterBuses

Muhammad Khalis Bin Samion

Image generated by ChatGPT
Slides designed by Claude Design

MOTIVATION

The Context in England

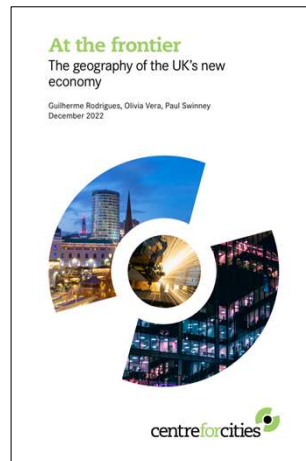
01

PT services never run as scheduled, but almost every research on accessibility makes use of published timetable data



02

City centres are where the most productive jobs are clustered



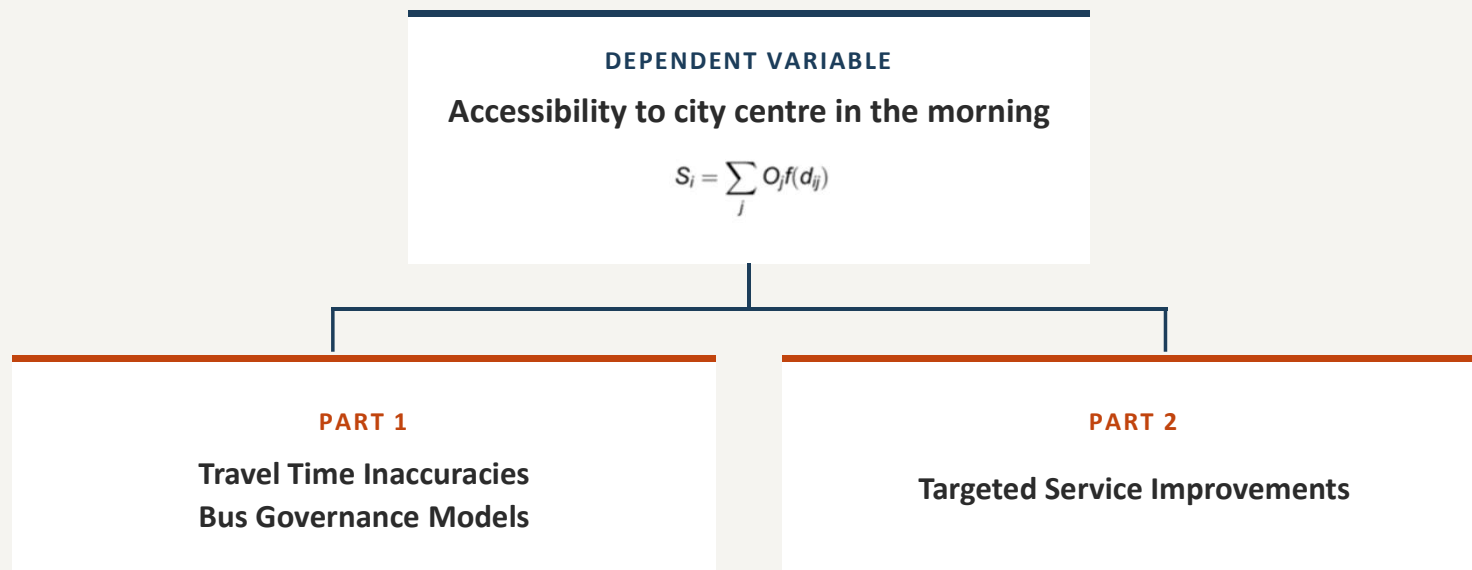
03

Local government reorganization, rail re-nationalization and bus franchising powers open an opportunity for local leaders to reshape local transport



RESEARCH QUESTION(S)

How does travel-time inaccuracies within different bus governance models impact accessibility to the city centre during morning peak hours, and how might this change due to targeted service improvements?



METHOD

General Methodology

- 1 Convert GTFS-RT data on a **specified date** from BODS Data Archive into a retrospective GTFS for each study area, using the *rt2gtfs* package
- 2 Edit the retrospective GTFS to develop the different targeted improvement scenarios
- 3 Run *r5py* travel time modelling from origins to destinations for the retrospective data, scheduled data, and each scenario/subscenario
- 4 Use median retrospective travel time, *Locomizer* OD flow data and mid-2024 population estimates to find beta based on unconstrained SIM principles
- 5 The calibrated *beta* value is used to calculate potential accessibility from origin MSOAs to the city centre

FINDINGS — CASE STUDY 1

Manchester TTWA

Overall, most MSOAs have **faster median travel times** based on retrospective data for **17 June** vis-à-vis scheduled data.

GENERAL POPULATION

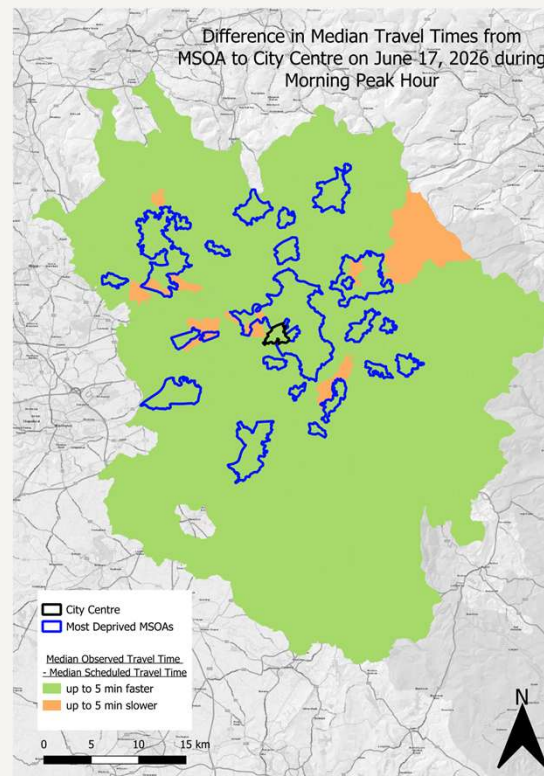
Scheduled potential accessibility score is

1.4% lower

than observed potential accessibility score

Scheduled potential accessibility score = **3.019**

Observed potential accessibility score = **3.060**



MOST DEPRIVED MSOAS

Scheduled potential accessibility score is

4.5% lower

than observed potential accessibility score

Scheduled potential accessibility score = **0.6892**

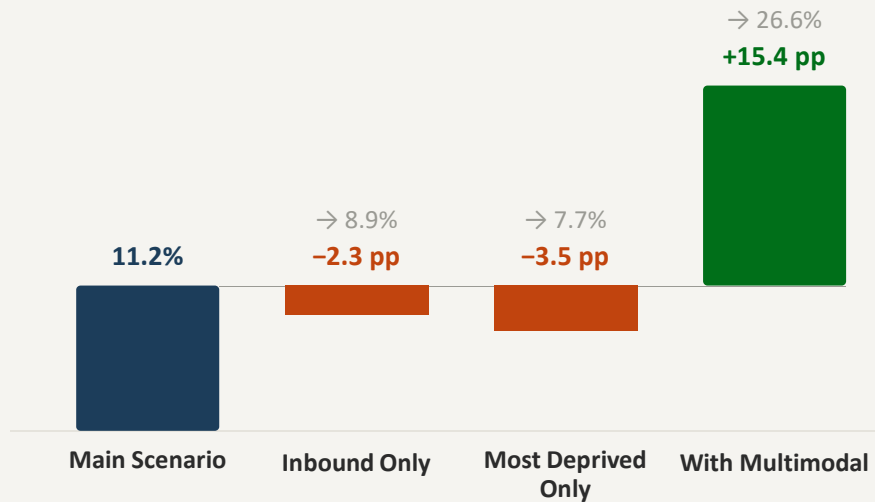
Observed potential accessibility score = **0.7216**

FINDINGS — CASE STUDY 1

Manchester — Targeted Improvement Scenarios

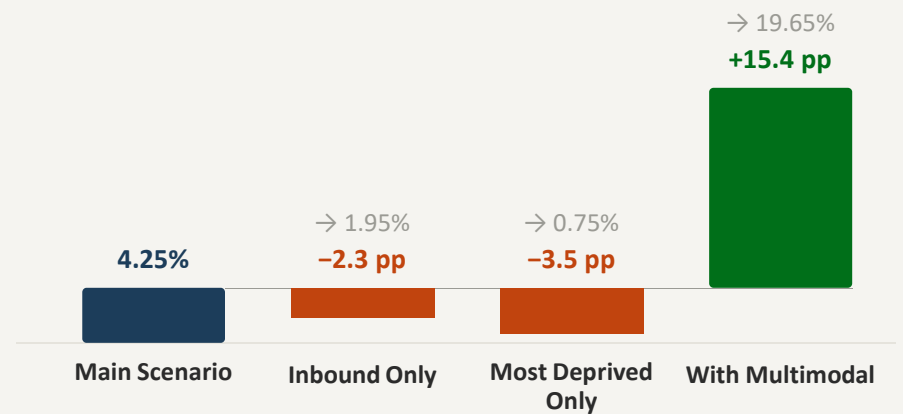
REDUCED TRAVEL TIMES

Main scenario max % change: 8% – 14.4%



HIGHER FREQUENCY

Main scenario max % change: 2.4% – 6.1%



FINDINGS — CASE STUDY 2

Bristol TTWA

Overall, most MSOAs have **slower median travel times** based on retrospective data for **17 June** vis-à-vis scheduled data.

GENERAL POPULATION

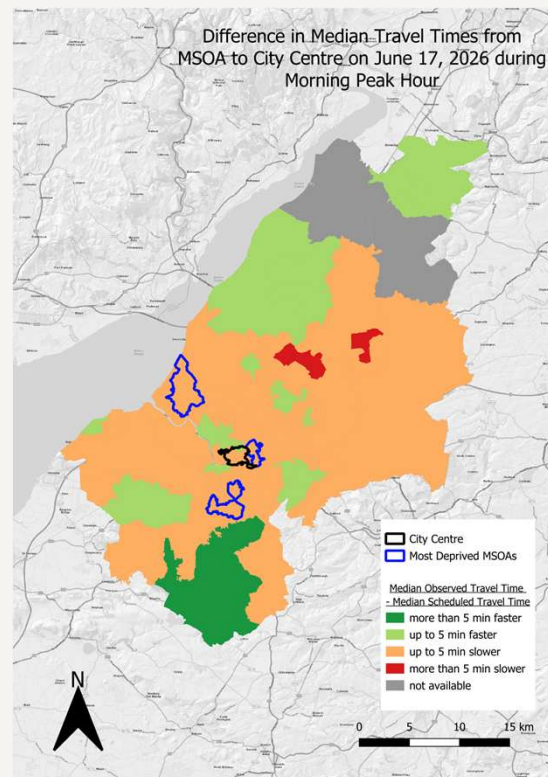
Scheduled potential accessibility score is

7.3% higher

than observed potential accessibility score

Scheduled potential accessibility score = **30.2127**

Observed potential accessibility score = **28.1469**



MOST DEPRIVED MSOAS

Scheduled potential accessibility score is

8.7% higher

than observed potential accessibility score

Scheduled potential accessibility score = **1.5867**

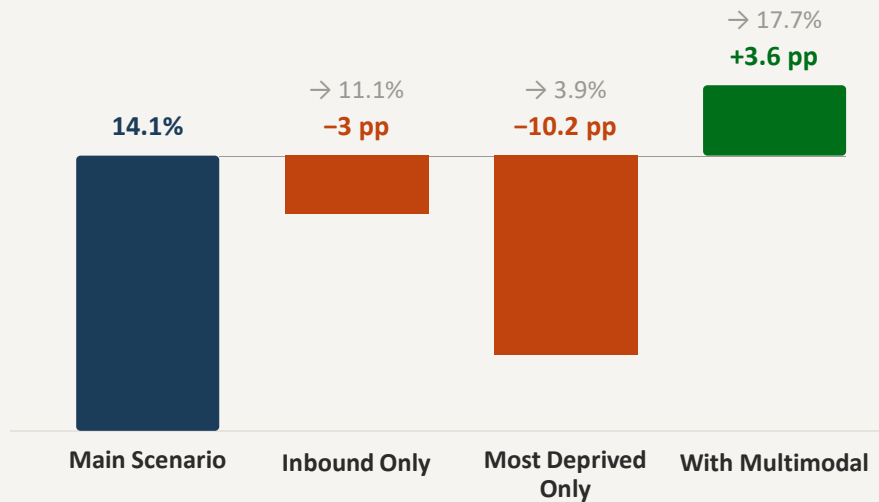
Observed potential accessibility score = **1.4601**

FINDINGS — CASE STUDY 2

Bristol — Targeted Improvement Scenarios

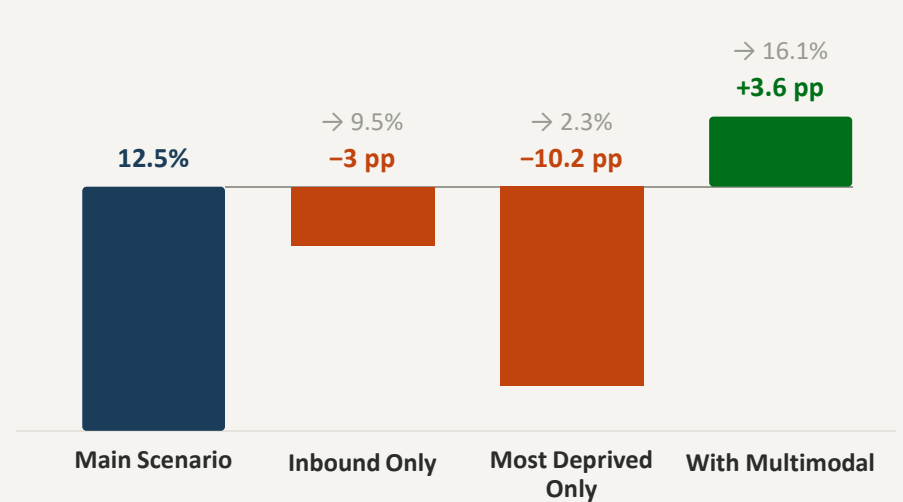
REDUCED TRAVEL TIMES

Main scenario max % change: 12.7% – 15.5%



HIGHER FREQUENCY

Main scenario max % change: 11% – 14%



■ CONCLUSIONS *for now...*

Travel time inaccuracies manifest differently across different bus governance contexts — causing differences in accessibility.

It seems to suggest that reducing travel times offers greater benefits than increasing bus frequencies.

Benefits from encouraging multimodal journeys depend on the extensiveness of the rail/tram network.

SCOPE

Limitations

WHAT I WILL DO

Socio-spatial inequalities: compare observed vs. scheduled accessibility for the least deprived MSOAs too

It's the morning peak hour for only one day: re-attempt the analysis for all other Wednesdays (AM peak) in June 2026

The grey MSOAs in Bristol: find out why *r5py* can't connect north-east MSOAs to the city centre even at a 3-hour *max_time* parameter

I will update my findings in my dissertation diary!



BEYOND MY SCOPE

The costs of implementing targeted improvement scenarios are not factored into the GTFS editing phase

We don't have quality nationwide OD data at least until 2033

This only looks at changes in accessibility — not a full SIM, and certainly not a LUTI study