MOTIVATE: Incorporating social norms into a configurable ABM of the decision to perform commuting behaviour

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Background

- Active travel policies frame walking & cycling as 'good', cars as 'bad'!
- Perceptions of acceptable commute method vary by groups.
- Social norms may explain this difference.

Expand congestion zones and tolls to force drivers out of cars, says Boris Johnson adviser

Infrastructure tsar urges ministers to push commuters on to public transport

By **Oliver Gill,** CHIEF BUSINESS CORRESPONDENT
30 June 2022 • 10:01am

A low traffic neighbourhood in Manchester, the likes of which Sir John Armitt would like to see extended | CREDIT: PAUL COOPER

Daily Telegraph, 30th June 2022.

Question & model overview

- **Research question**: What interventions may be successful at increasing active travel?
- Need to better understand the decision-making process for commuters!
- Not about traffic flow!
- Incorporate:
    - peer/neighbour effects;
    - choice/habit; and
    - access and support.
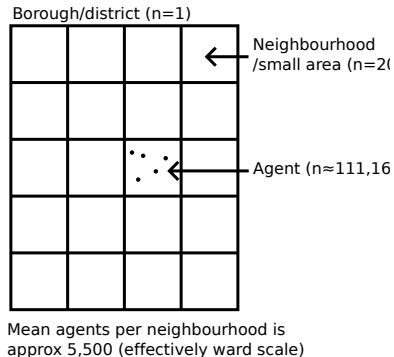- Fully configurable model to allow for parameter space exploration/adaptation.

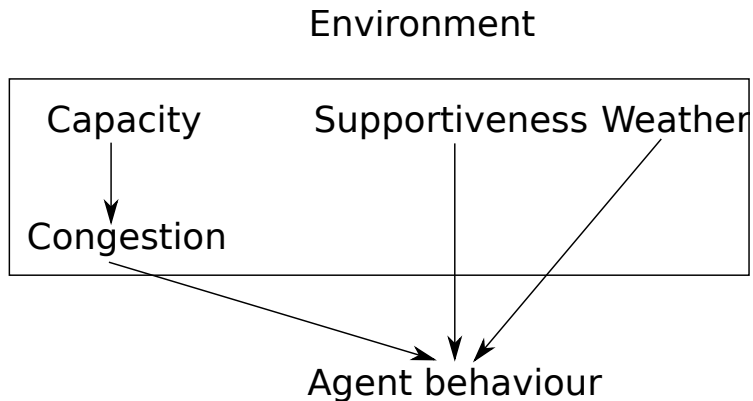# Methods

Waltham Forest, London
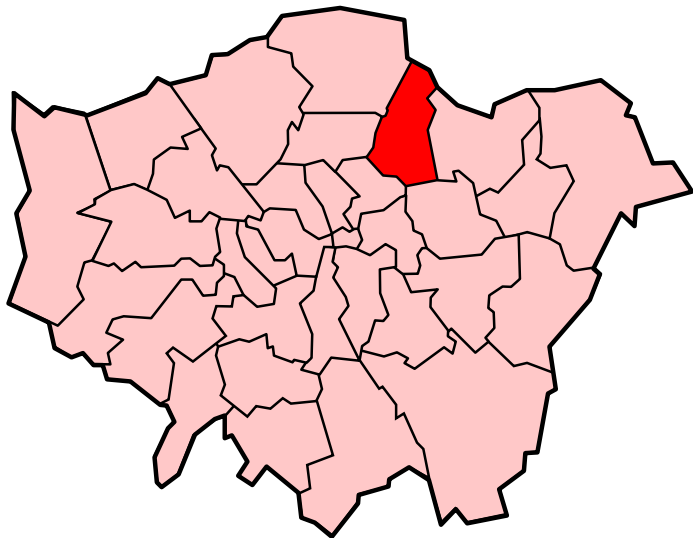
Waltham Forest by Morwen and Richtom80 (https://bit.ly/3yYFzLF)

Some assumptions
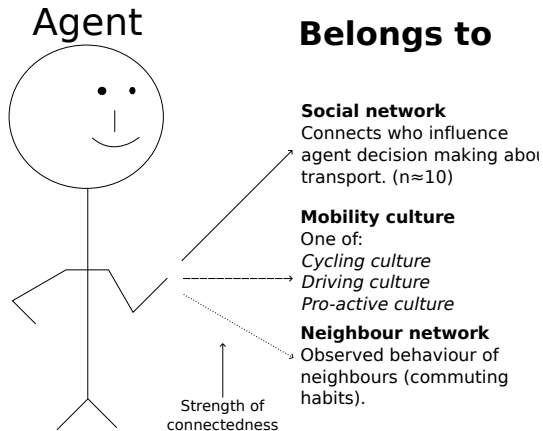
▶ 4 options at every time step: walk, cycle, public transport, or drive.

▶ Modelled loosely on Waltham Forest, a North Eastern London Borough.

▶ Used a microsimulation approach to ensure wards (neighbourhoods) matched real life on things such as car ownership and commute distance. This used data from the UK Household Longitudinal Survey and 2011 Census population data.

Borough/district (n=1)

Neighbourhood /small area (n=2(

Agent (n≈111,16

Mean agents per neighbourhood is approx 5,500 (effectively ward scale)

Environment

Agent assumptions

Agent

Belongs to

Social network
Connects who influence agent decision making about transport. (n≈10)

Mobility culture
One of:
Cycling culture
Driving culture
Pro-active culture

Neighbour network
Observed behaviour of neighbours (commuting habits).

Strength of connectedness

Model initialization

- Agents are created and assigned a range of characteristics:
  - a commute to fulfil (local, city, or beyond);
  - a neighbourhood, social network, and mobility culture; and
  - some psychological variables:
    - suggestibility to friends and neighbours;
    - adherence to norms;
    - inertia/resistance to change; and
    - weather sensitivity.
- Neighbourhoods are assigned a supportiveness and capacity.

# A model run

- Each agent goes to work every weekday.
- Each weekday, each agent calculates a *budget* of how much they are willing to commute by a given mode (norm + habit + congestion). This is then ranked.
- They also calculate a *cost* for each mode (distance + environmental supportiveness + weather). This is ranked in reverse (higher cost = lower ranked cost).
- Max of budget rank + reverse cost rank.

Experimentation

Modelling car-free days

- ▶ **Experiment**: After year 1, cars were banned on Wednesdays. The simulation was run for 4 more years.
- ▶ 200 runs.
- ▶ **Result**: More instability, but more active commutes.
- ▶ In the control, for every inactive journey, there were 0.091 active journeys (the odds) (89% HPDI: [0.091, 0.091]).
- ▶ The odds were 77.7% greater in car-free days scenario (89% HPDI: [77.7%, 77.7%]).
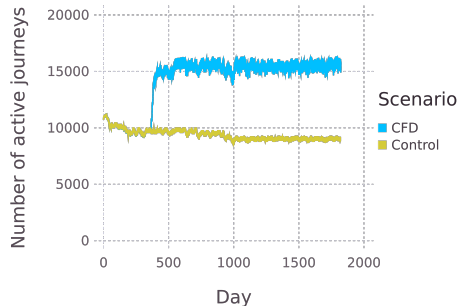
Conclusion

Summary

- ► Thinking about norms and habits are key to understanding the decision to commute.
- ► In our sample intervention, habits and norms allow us to destabilize the convention of commuting by car. We disrupt this convention by preventing the effect of habit (on car-free days); this then leads to a change in norm.
- ► Useful as a simulator of potential policies that may affect commuting-related norms.

Limitations / Future work

- ► The model currently does not use calibrated build environment data => extend it!
- ► Personal journeys not considered.
- ► Process of changing bike / car ownership.

Any questions?

- Full paper available in the workshop proceedings.
- The model is available under a permissive license at https://gitlab.com/ragreener1/Motivate. The specific version used is available at https://doi.org/hvpd.
- The model is easily configurable using open standards (YAML) to define its parametrization.

Acknowledgements