

MASS e Desigualdades Socio-territoriais

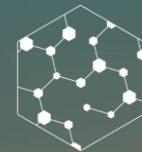
Lisboa, Fev 2025

Transportation Equity and access to opportunities

Rafael H. M. Pereira

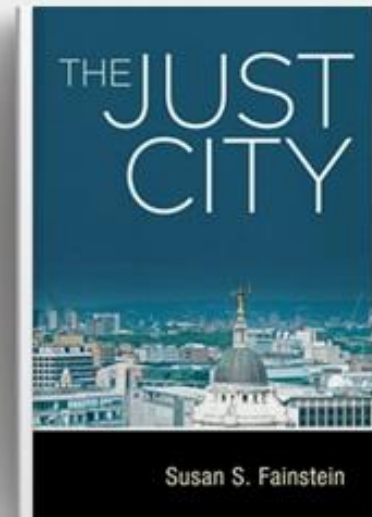
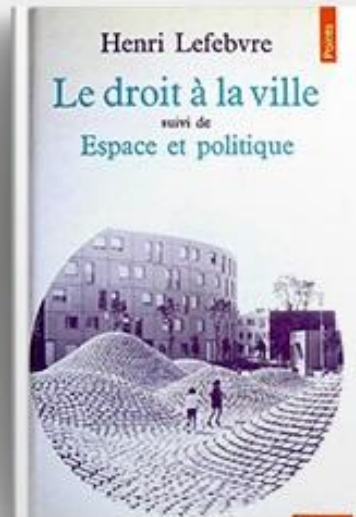
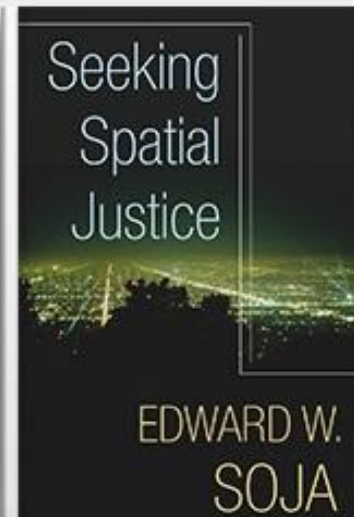
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Access to Opportunities Lab

Transport inequalities within a broader concern with Justice in Urban Planning



Transport Justice

1. Democracy

Procedural justice, Fairness of the political / decision making processes

2. Diversity

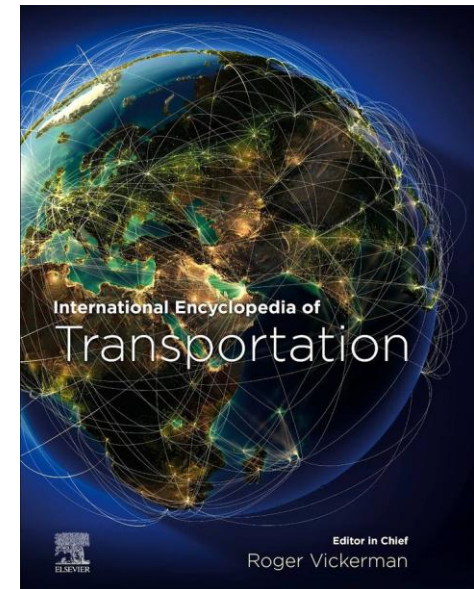
Recognition of group-based differences/ identities and power relations, rights and entitlements

3. Equity

Distributive justice, how institutions shape the distribution of benefits and burdens

Pereira & Karner (2021) **Transportation Equity**
In: Vickerman (eds.) *International Encyclopedia of Transportation*.

<https://doi.org/10.1016/B978-0-08-102671-7.10053-3>





São Paulo, BR
U\$ 86 mi







implicit equity issues
policy makers prioritize scarce resources

Equality of What?

AMARTYA SEN

THE TANNER LECTURE ON HUMAN VALUES

Delivered at
Stanford University

May 22, 1979

implicit equity issues policy makers prioritize scarce resources

Equity

is not about the allocation of resources per se,
but rather how this allocation affects the lives of
different groups in terms of:

- *access to opportunities*
- *generation / exposure to environmental externalities*

Pereira, Schwanen, Banister (2017)
Distributive justice and equity in
transportation
doi.org/10.1080/01441647.2016.1257660



Some of the greatest
Benefits and **Burdens**
of transport systems

Access to opportunities

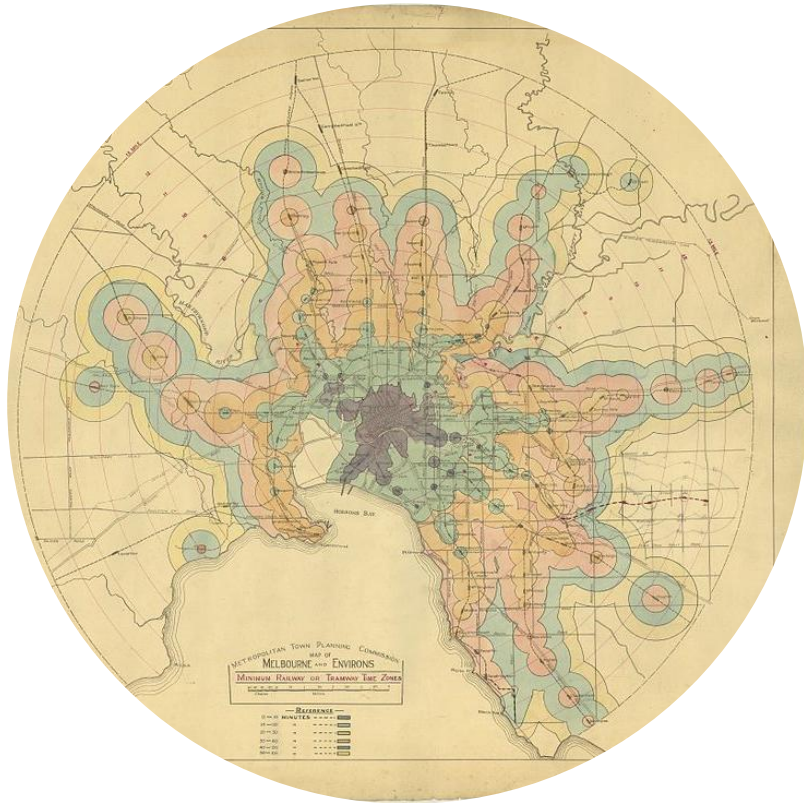


Image: isochrone map of Melbourne by rail, 1910-1922

Crashes



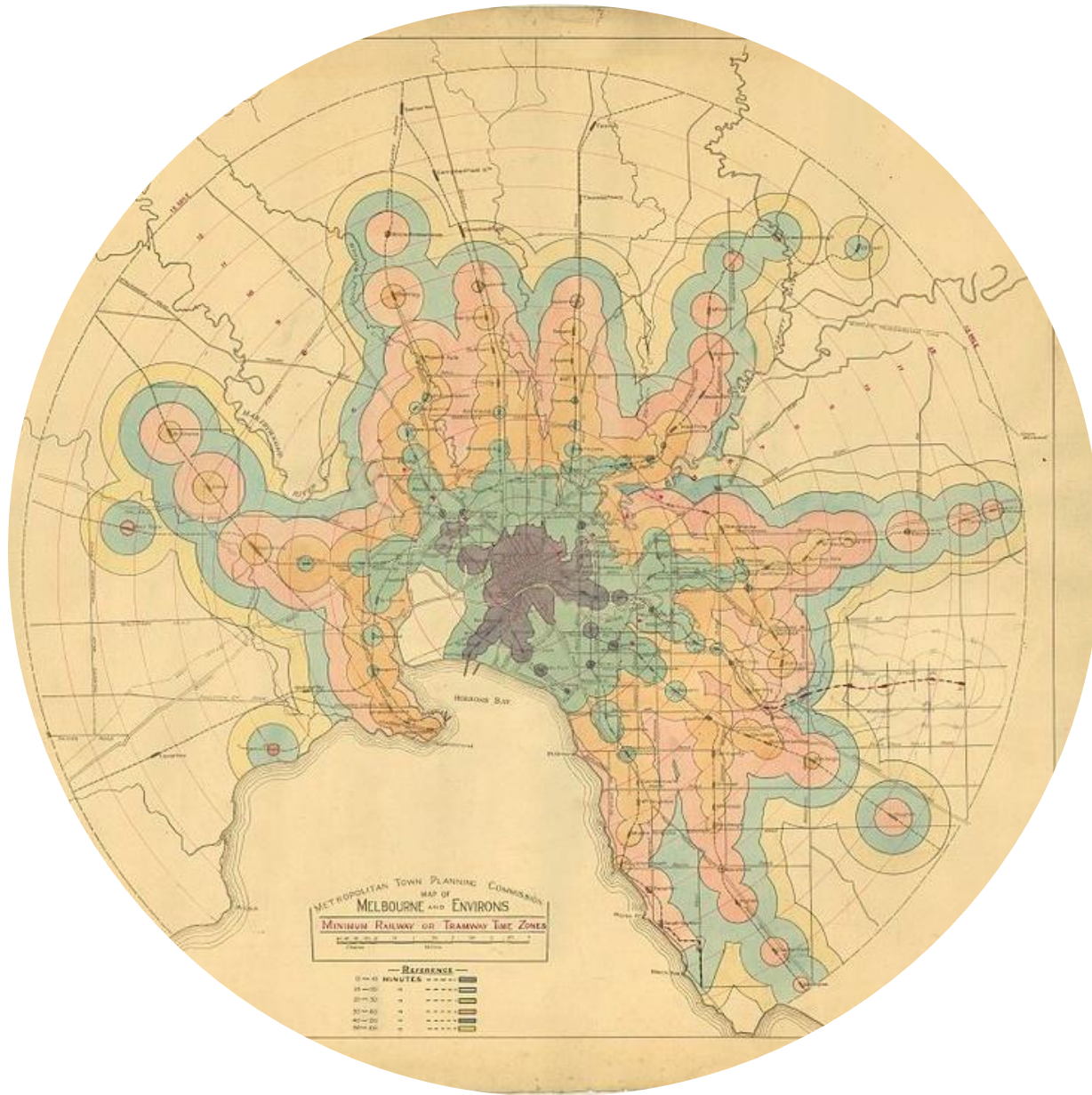
Image: Olof Werngren

Pollution

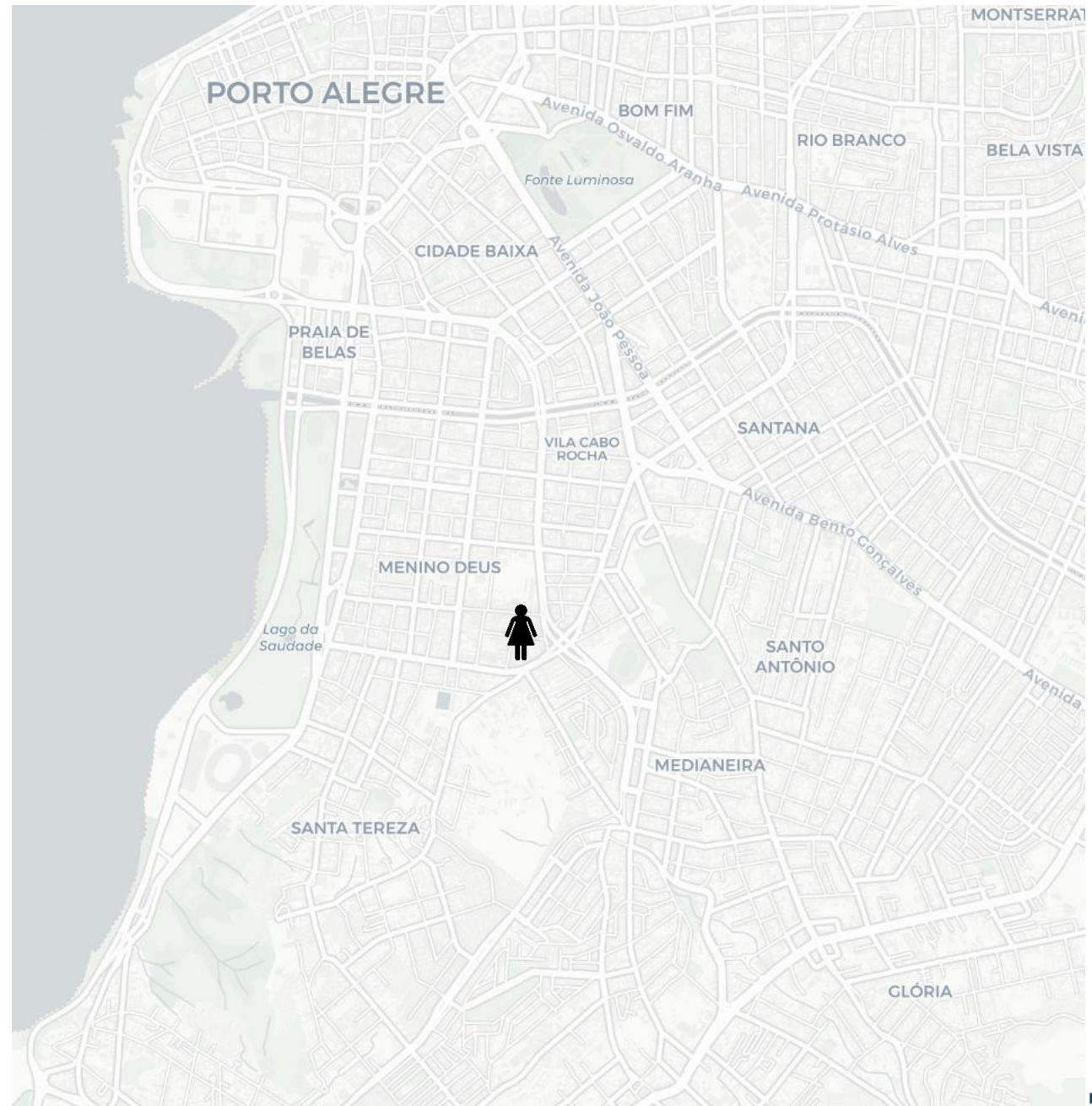


Image: Tony Margiocchi

What is accessibility?



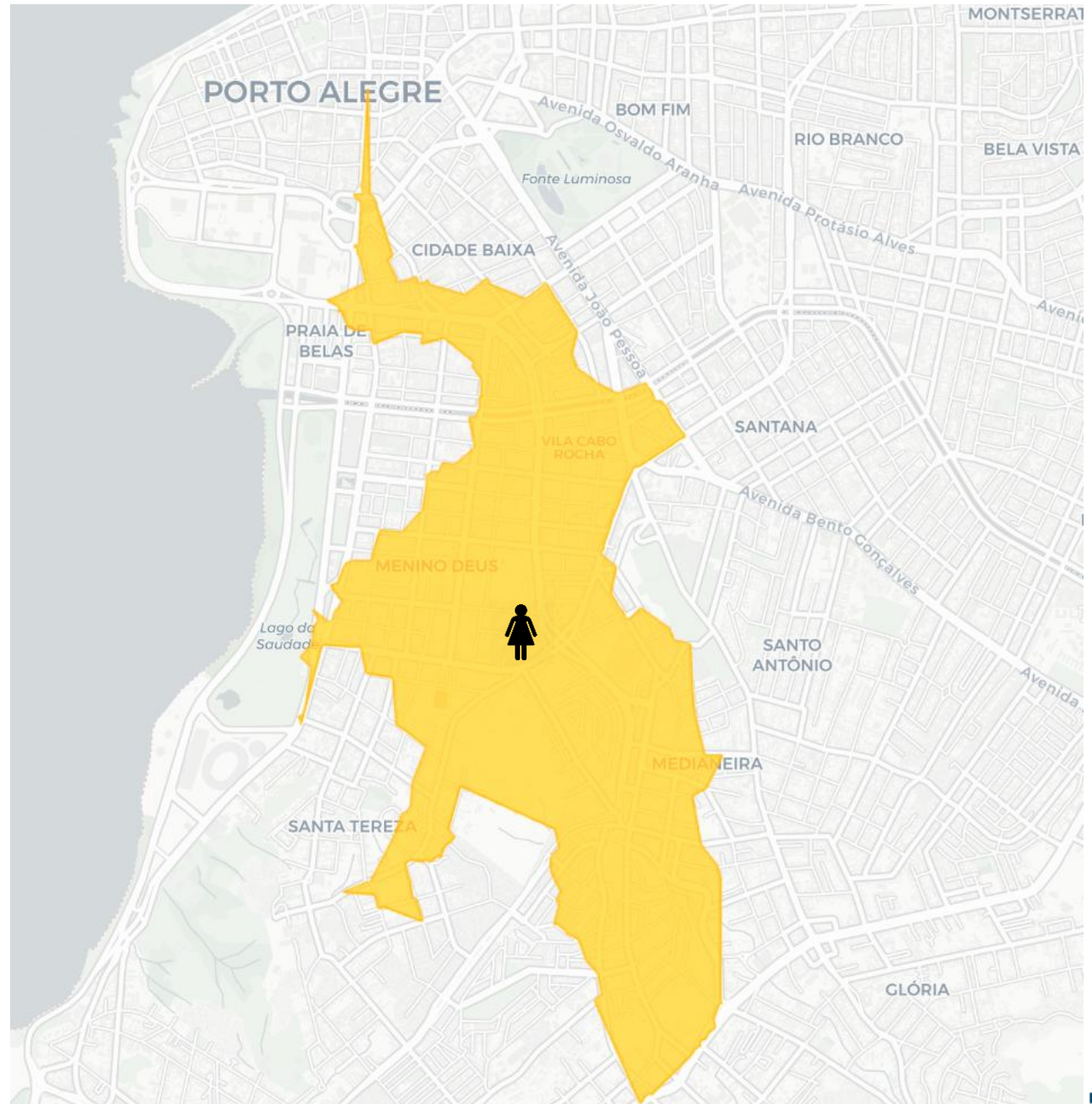
Here is a person



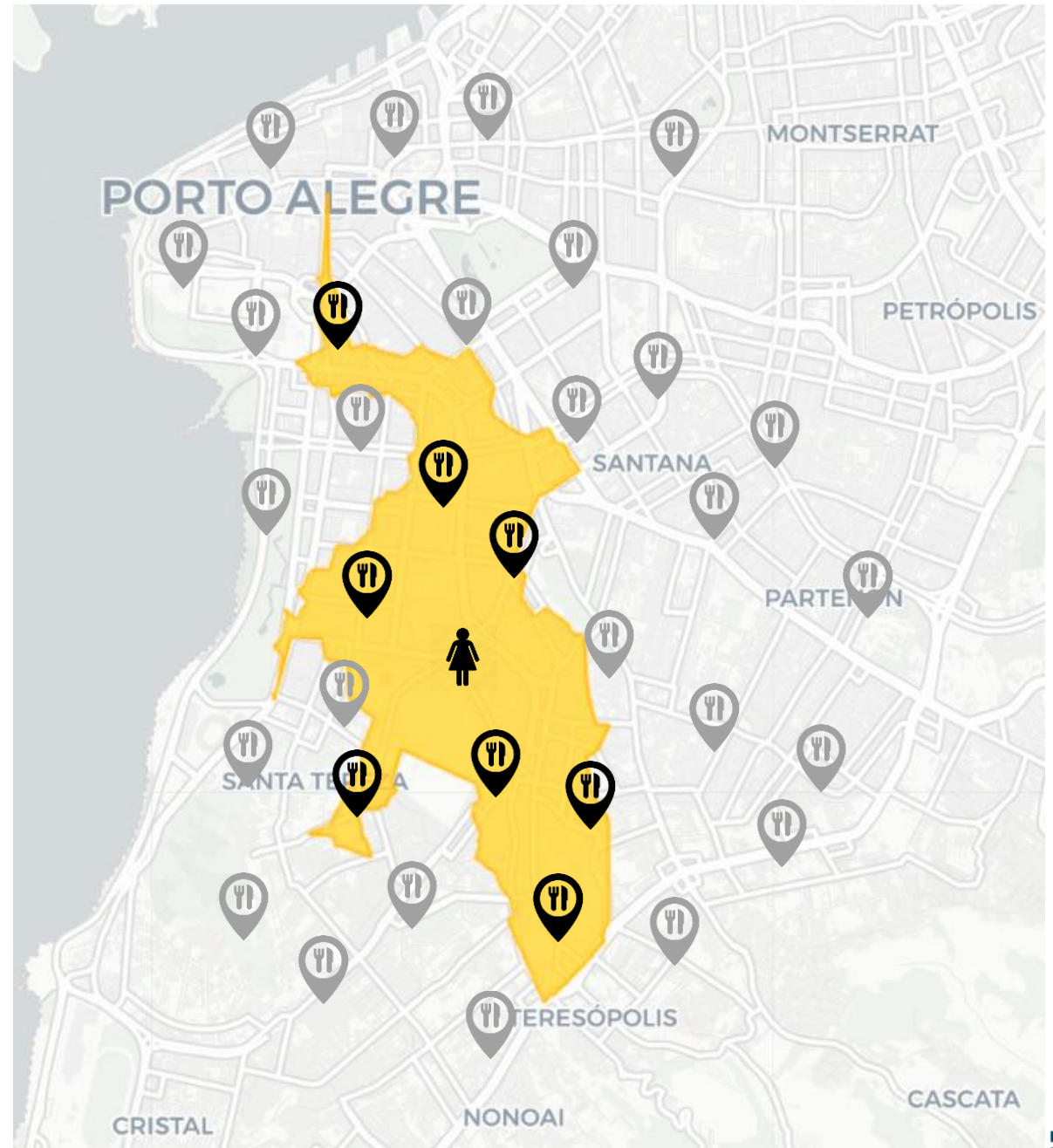
In a city full of possible options



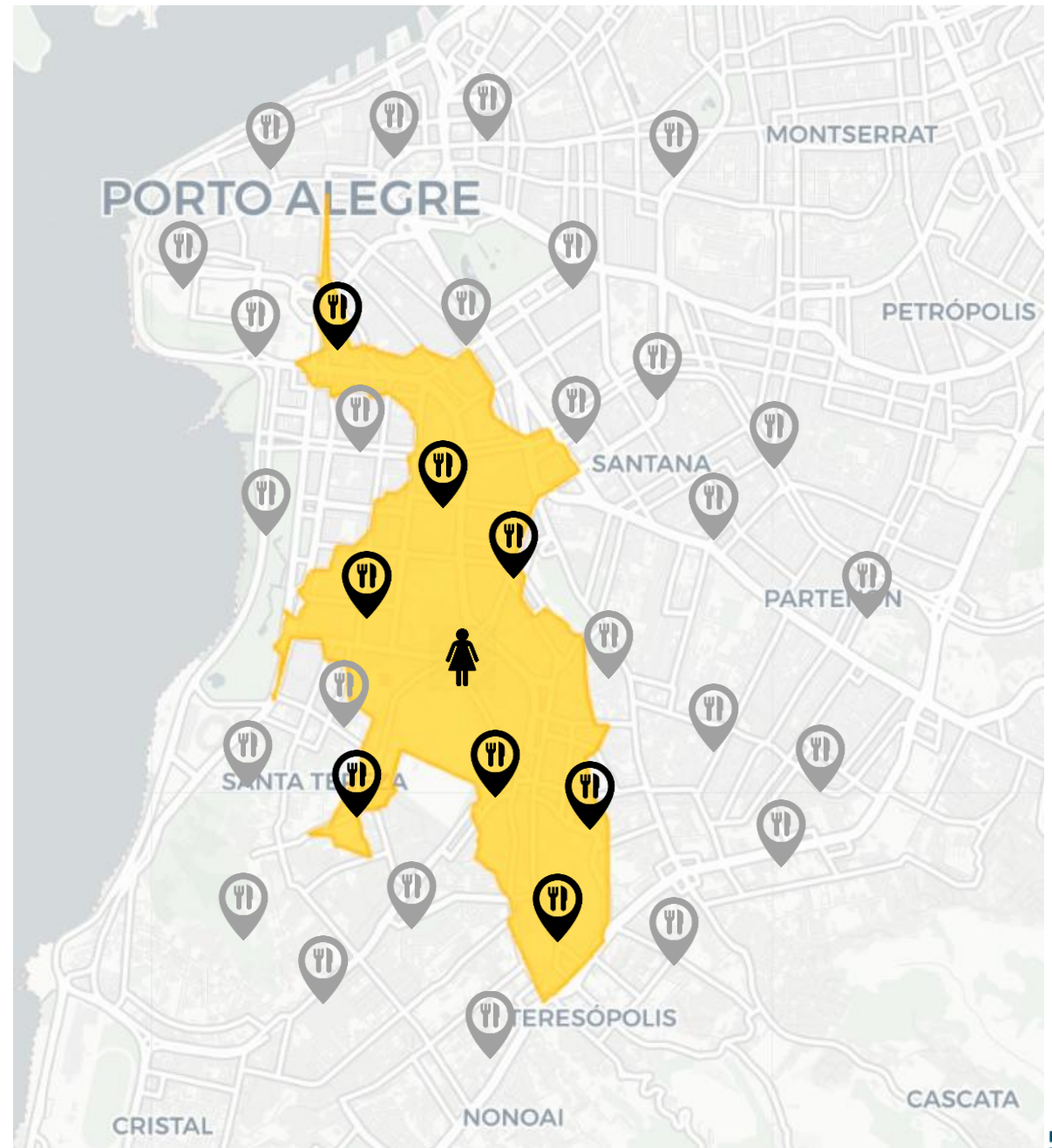
In **30 minutes**
she can get
anywhere in the
highlighted area



Her **accessibility** level reflects how easy it is for her to reach those activities



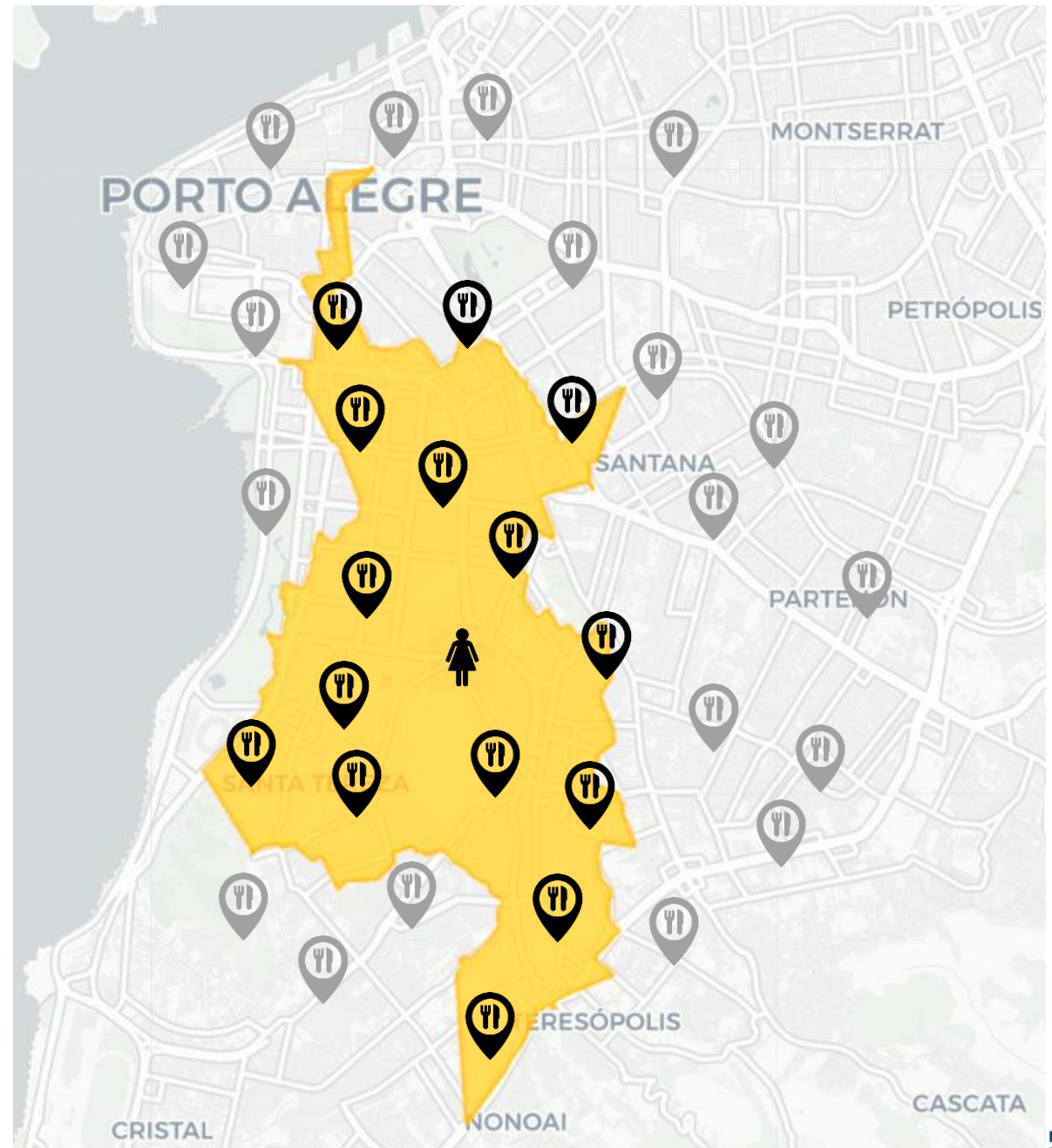
Different ways to expand accessibility



Different ways to expand accessibility

Expand the accessible area:

- Network connectivity
- Service frequency
- Speed



Different ways to expand accessibility

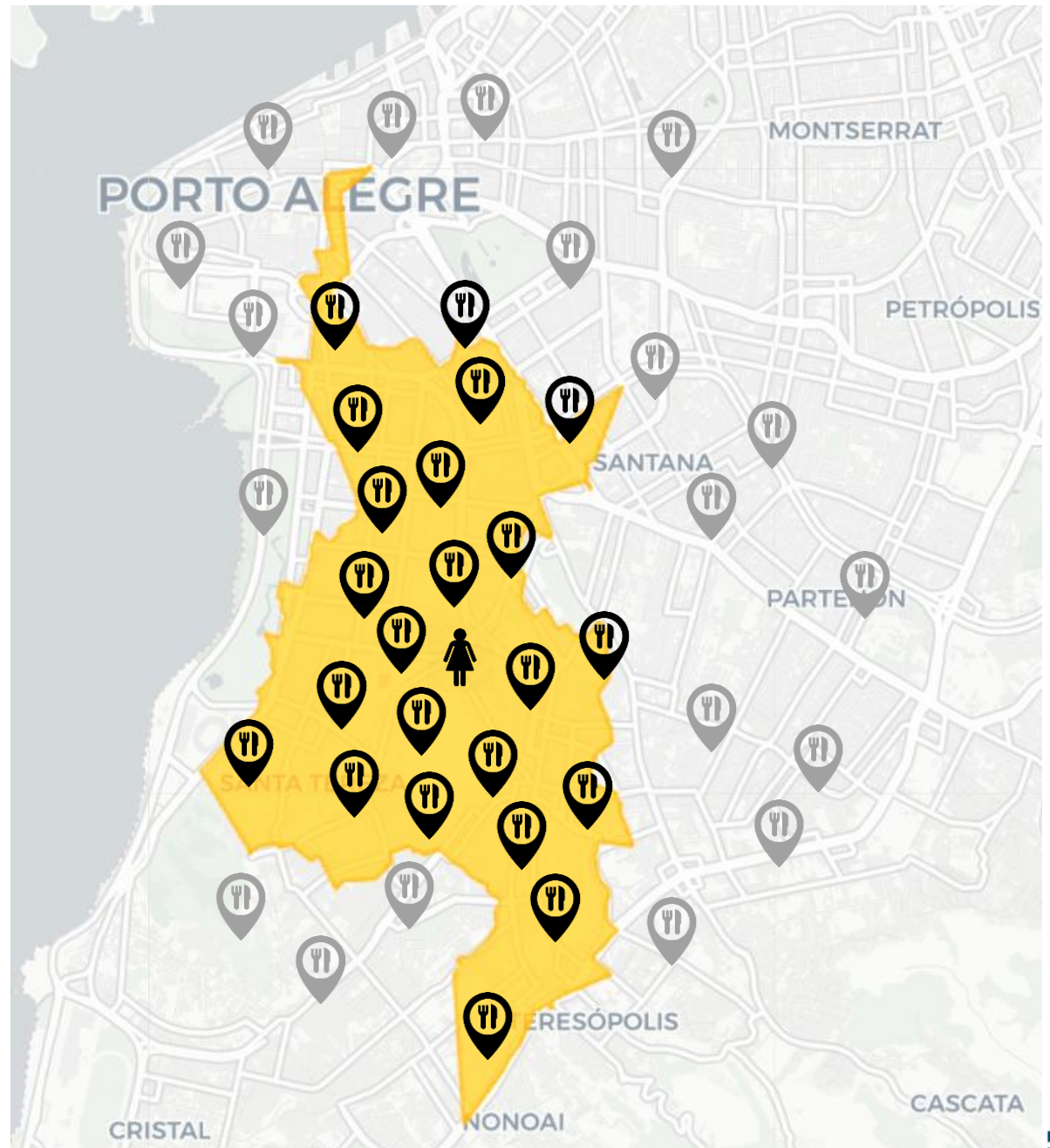
Expand the accessible area:

- Network connectivity
- Service frequency
- Speed

Increase proximity:

- Pop density in the CBD
- Density of activities
- Land use mix

**Cheaper
Greener**



Why does accessibility matter?

the role of access in inclusive and sustainable cities

Human development:

It provides the **freedom** necessary to **participate in activities and develop other human capabilities**

Environmental:

It shapes travel choices towards more (or less) **sustainable mobility patterns**

Sufficientarian:

It is essential for the satisfaction of **basic needs**

Egalitarian:

It reveals the spatial dimension of **inequality of opportunities**

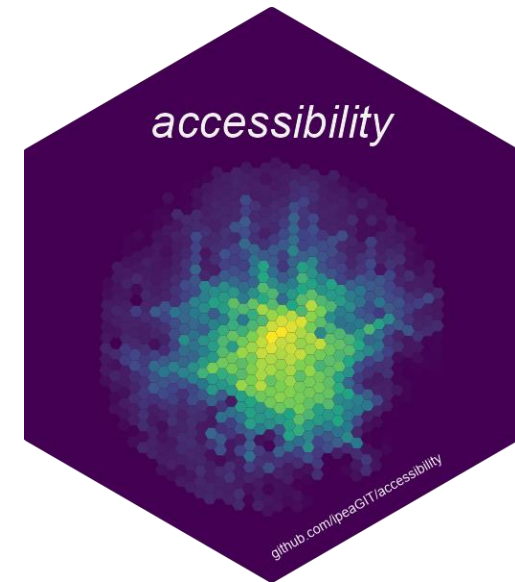
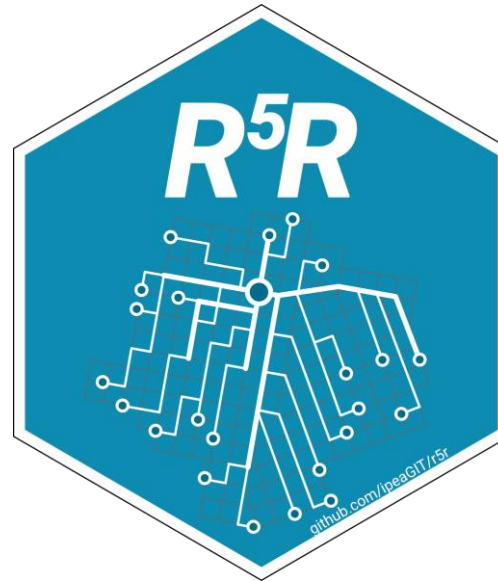
Inequalities in Access to Opportunities



How can we measure transport inequalities ?

R packages to

- Calculate travel costs
- Urban accessibility
- Accessibility poverty
- Accessibility inequality



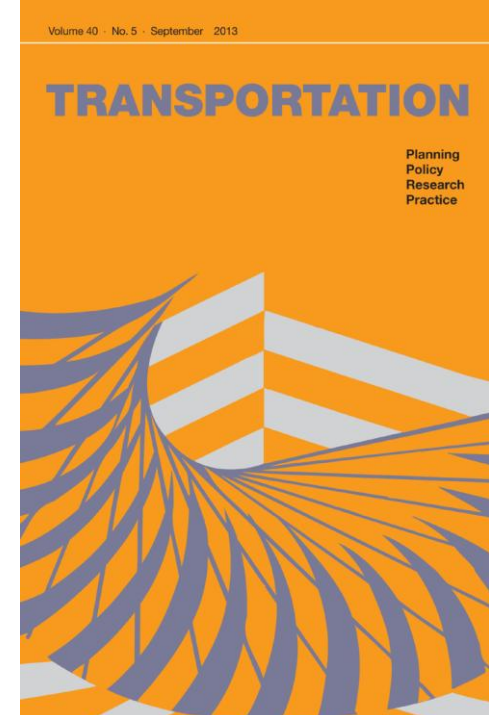
How ***should*** we measure transport inequalities ?

Karner, A., Pereira, R. H., & Farber, S. (2024). **Advances and pitfalls in measuring transportation equity.** [Transportation](#)

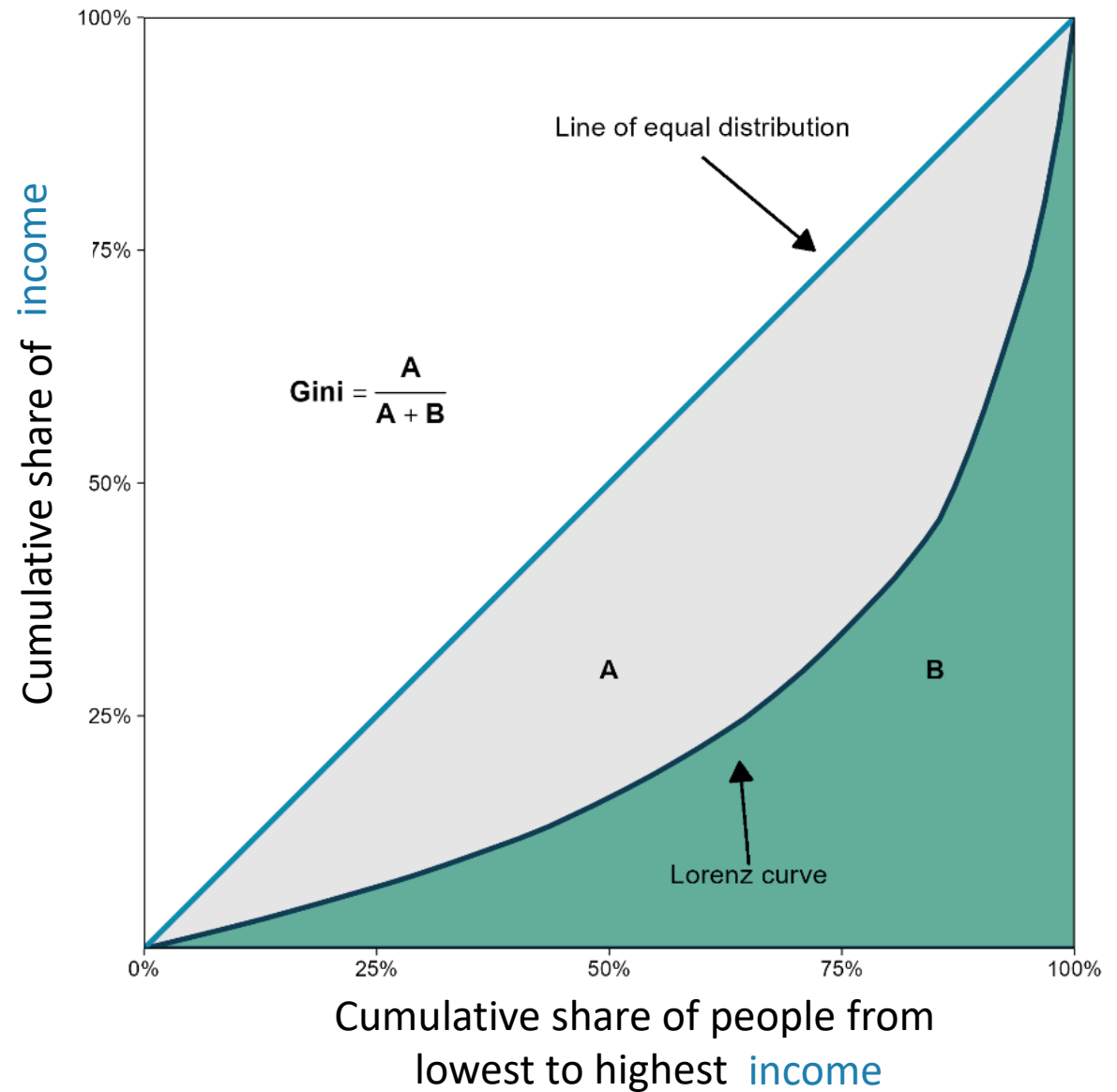
Inequality indicators:



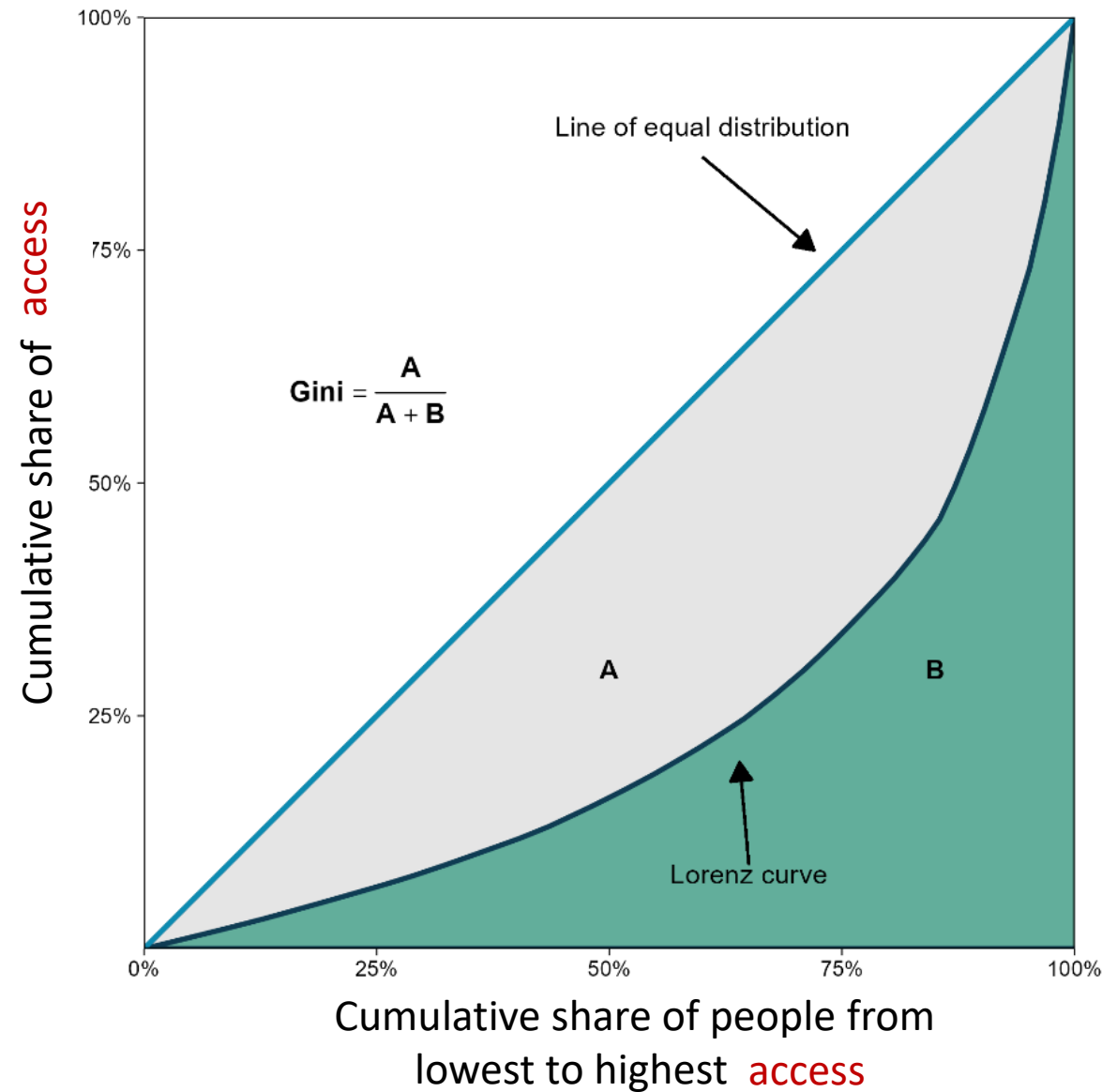
1. ~~Gini index~~ it ignores groups' rankings*



Lorenz curve / Gini



Lorenz curve / Gini



Gini/Lorenz limitations

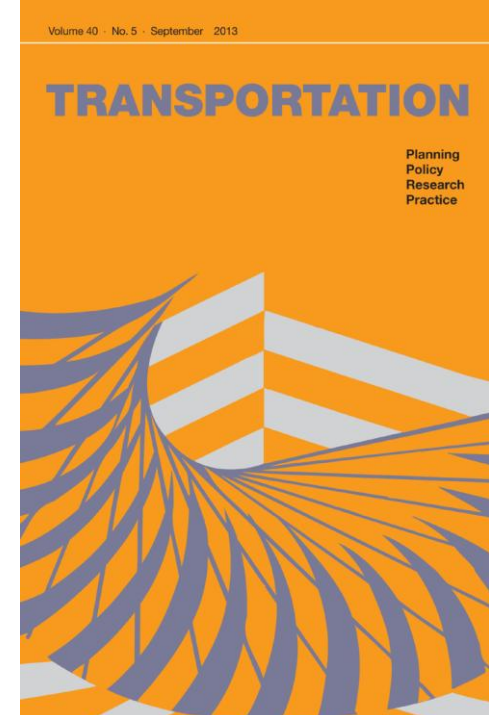
1. Comparisons are unordered
2. Ambiguous direction of inequality
3. Measuring within-group rather than between-group inequality
4. Equality and equity are not the same

Karner, A., Pereira, R. H., & Farber, S. (2024). **Advances and pitfalls in measuring transportation equity.** [Transportation](#)

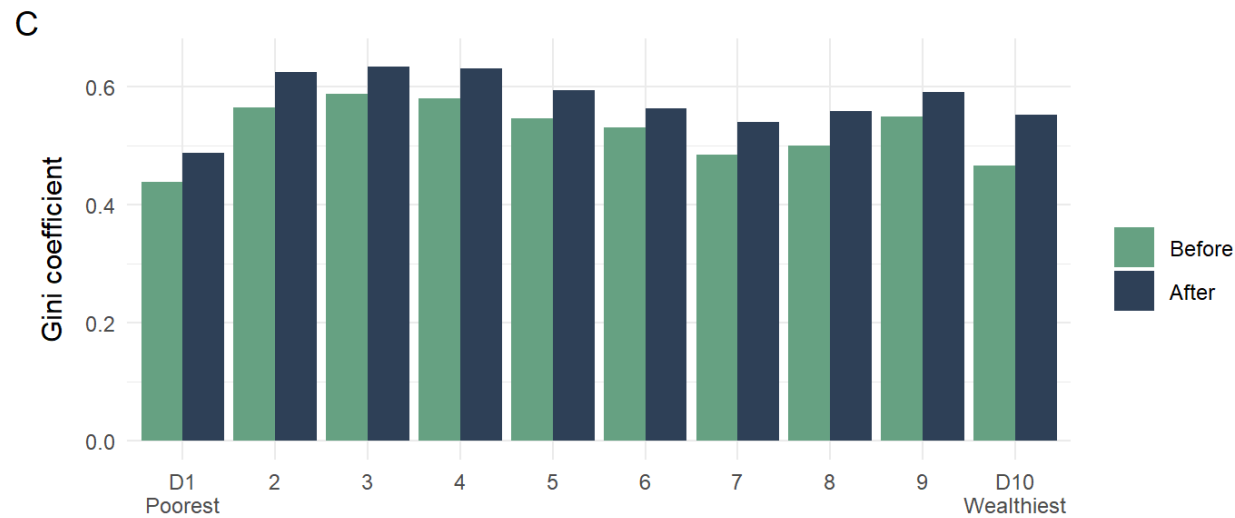
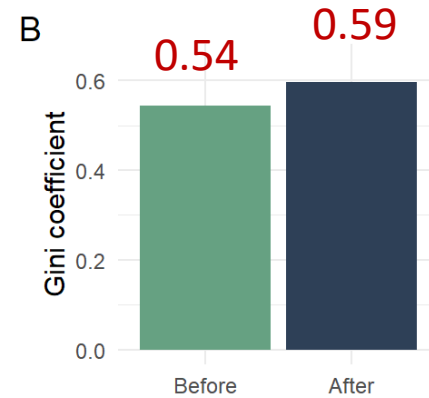
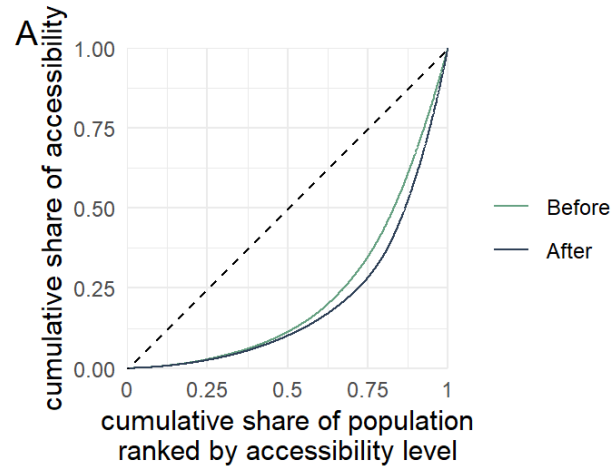


Inequality indicators:

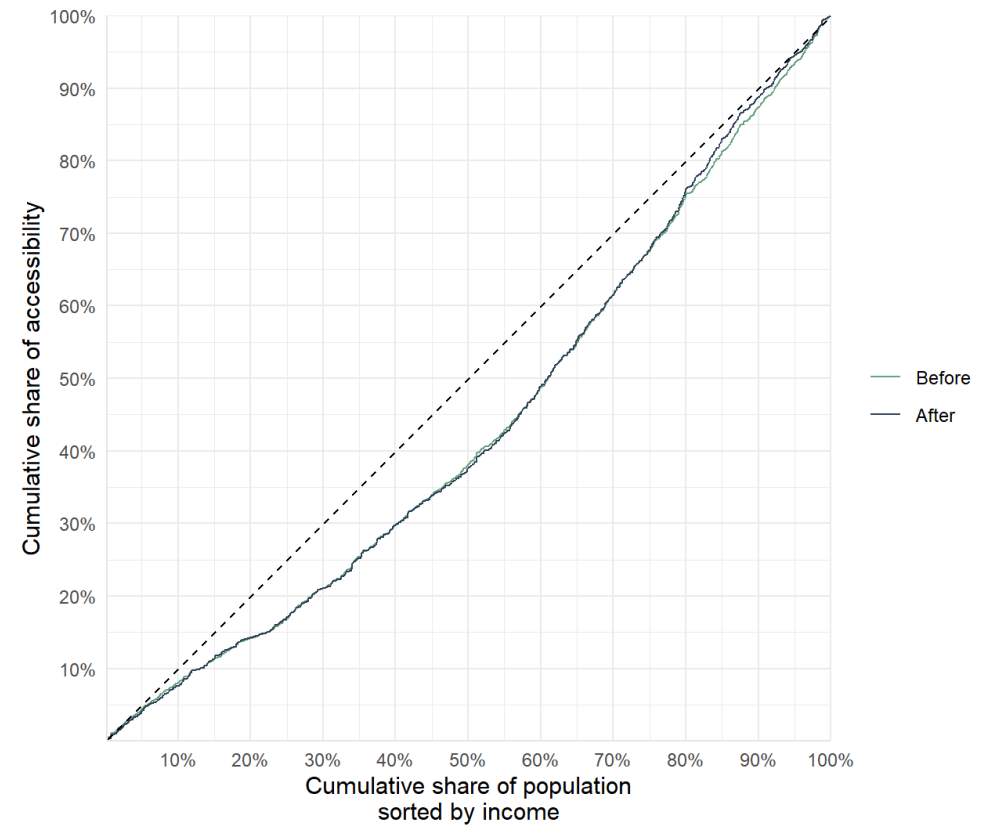
1. ~~Gini index~~ it ignores groups' rankings*
2. Theil index ! only Ok for categorical groups*
3. Palma ratio ignores variations within groups
4. Concentration index
 - Same intuition as Gini/Lorenz *but* population along the x-axis is ordered by a socioeconomic variable
 - Varies from -1 to 1



Misleading results from Gini/Lorenz

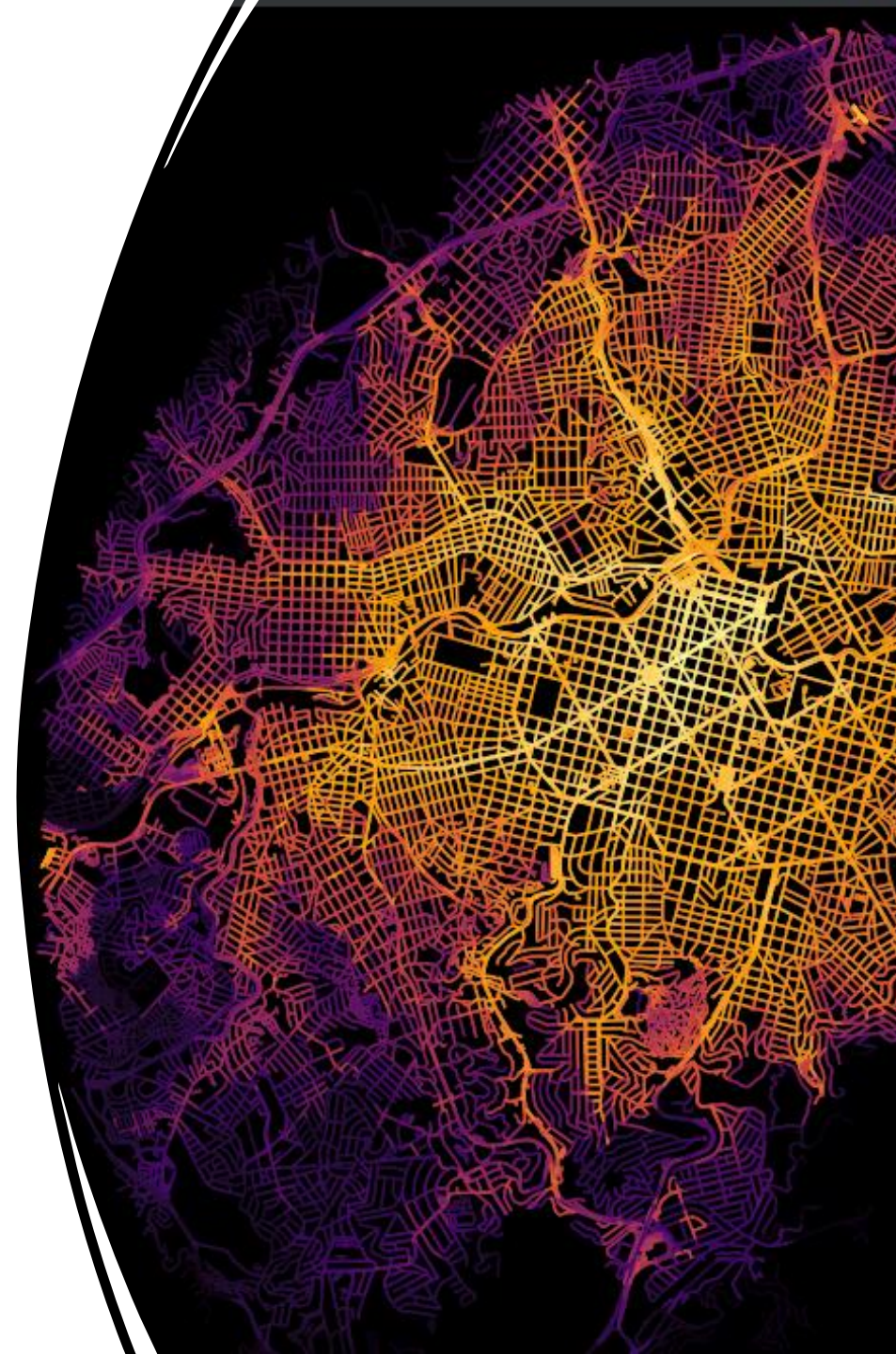


Concentration index: **Before After**
0.10 0.08



Three key topics

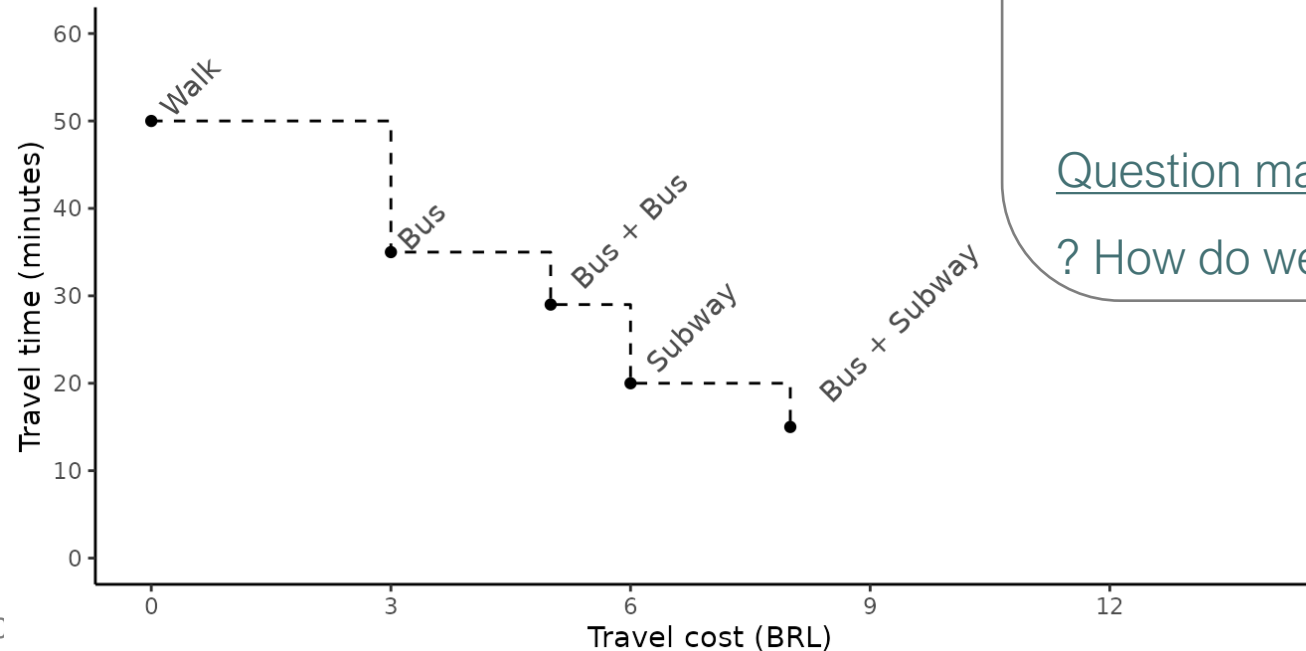
1. Trade-off of time Vs monetary costs
2. AI and Data-driven MaaS
3. The impact of access on outcomes



1. Trade-off of time Vs monetary costs

1. Beyond travel time
2. Beyond generalized travel cost

Pareto frontier of alternative routes from A to B
Hypothetical example



Transp. Equity & Discrete choice

Big plus:

+ Heterogeneity of agents

Question mark:

? How do we incorporate it ?

2. AI and data-driven MAAS

Increasing use of:

- On-demand TNCs and transit services
e.g. flexible routes, micro transit
- AI and predictive modelling to inform and automate the planning and allocation of services

Growing concerns over:

- algorithmic bias that reproduce and reinforce societal biases
- implications for who gets access, when and how



3. The impact of access on outcomes

From inequality of opportunities to inequality of outcomes



3. The impact of access on outcomes

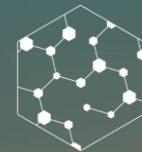
- Examine how variations in accessibility impact socioeconomic and health outcomes and ultimately social mobility
- **Challenges:**
 - Endogeneity
 - Dynamic transport and land use feedback
 - Panel data
- **Examples of external shocks:**
 - Housing lotteries and evictions
 - Closures or openings of healthcare facilities and schools*
- **Quai-experimental methods:** diff-in-diff, regression-discontinuity, IV, Causal ML

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