

# A crash course on Urban accessibility with R

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 @UrbanDemog

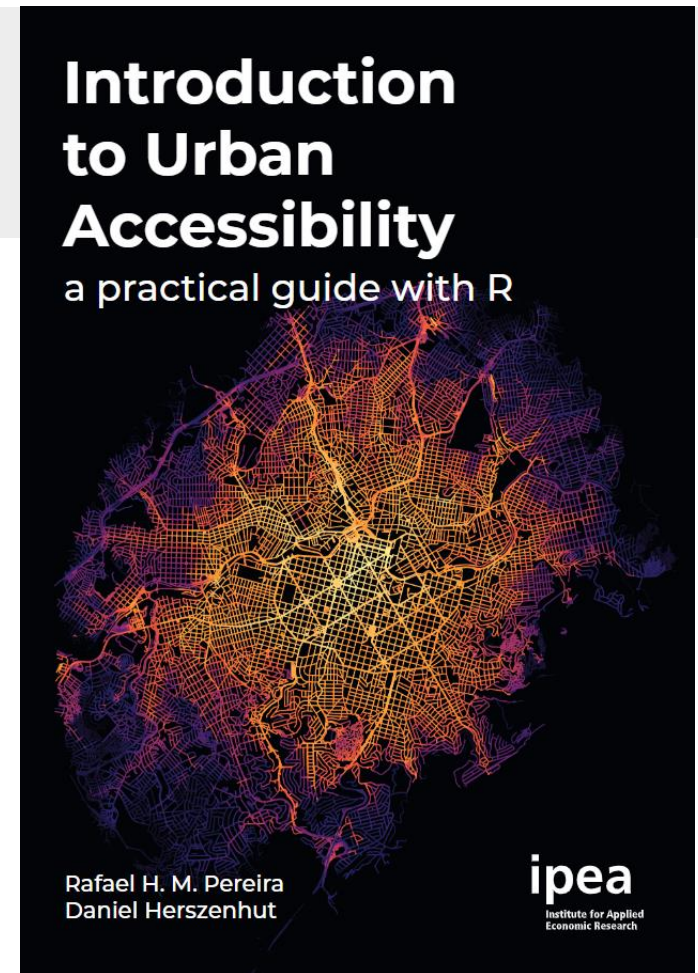
# Core teaching material:

## Aim:

To equip its readers with the fundamental concepts, the data analysis skills needed to perform urban accessibility analyses and and project evaluations

## Hands-on approach:

- Methodology and data analysis guide-book
- Reproducible examples in 
- Open software and data



[https://ipeagit.github.io/intro\\_access\\_book/](https://ipeagit.github.io/intro_access_book/)

# Overview of the book

## Section 1:

Introduction to urban accessibility (concepts)

## Section 2:

Calculating accessibility

## Section 3:

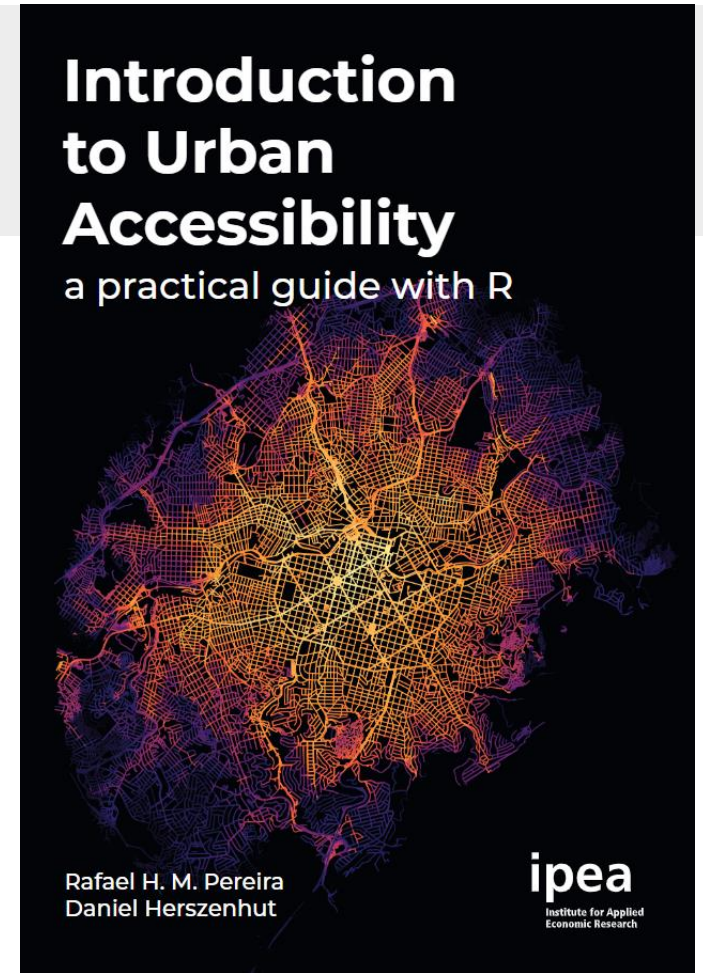
Public transport data in GTFS

## Section 4:

Impact assessment of transportation projects

## Section 5:

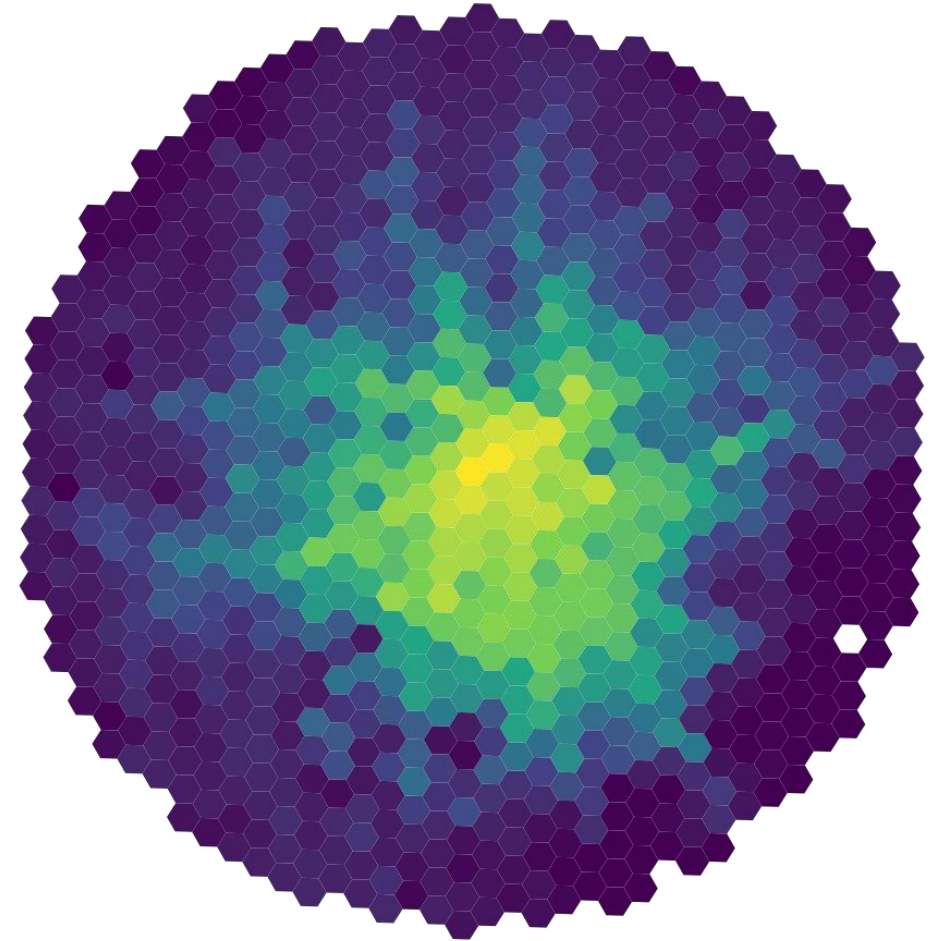
Data from the Access to Opportunity Project (AOP)



[https://ipeagit.github.io/intro\\_access\\_book/](https://ipeagit.github.io/intro_access_book/)

# What we will cover:

- Data and computational requirements
- How to calculate:
  - Travel time matrices
  - Accessibility estimates
  - Accessibility poverty
  - Accessibility inequality





# What we will *\*not\** cover:



Intro-level content we assume you're already familiar with



Advanced topics we will not cover and which are not required to follow the workshop

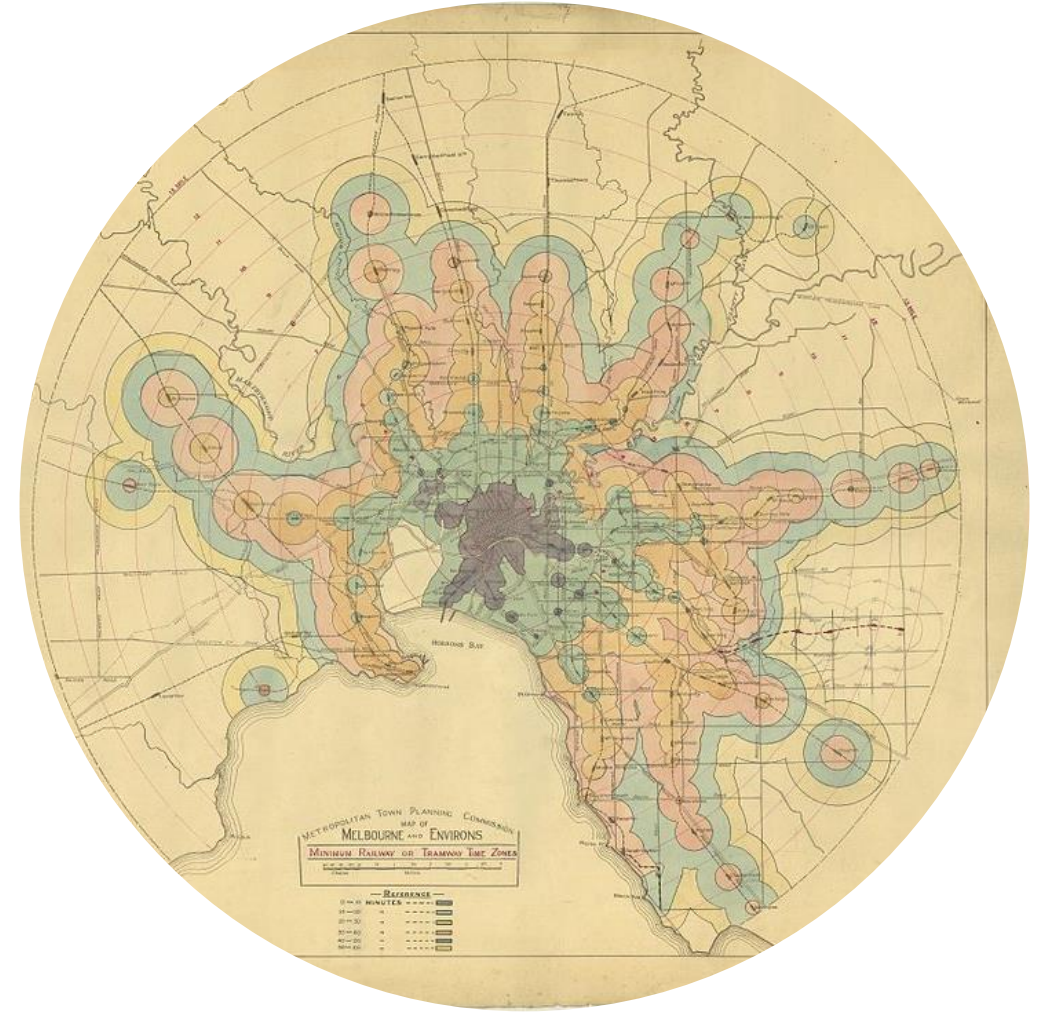


Image: isochrone map of Melbourne by rail,  
1910-1922

# Why does accessibility matter?

the role of access in inclusive and sustainable cities



## Sufficientarian:

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

## Egalitarian:

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

## 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**

# Types of accessibility measures



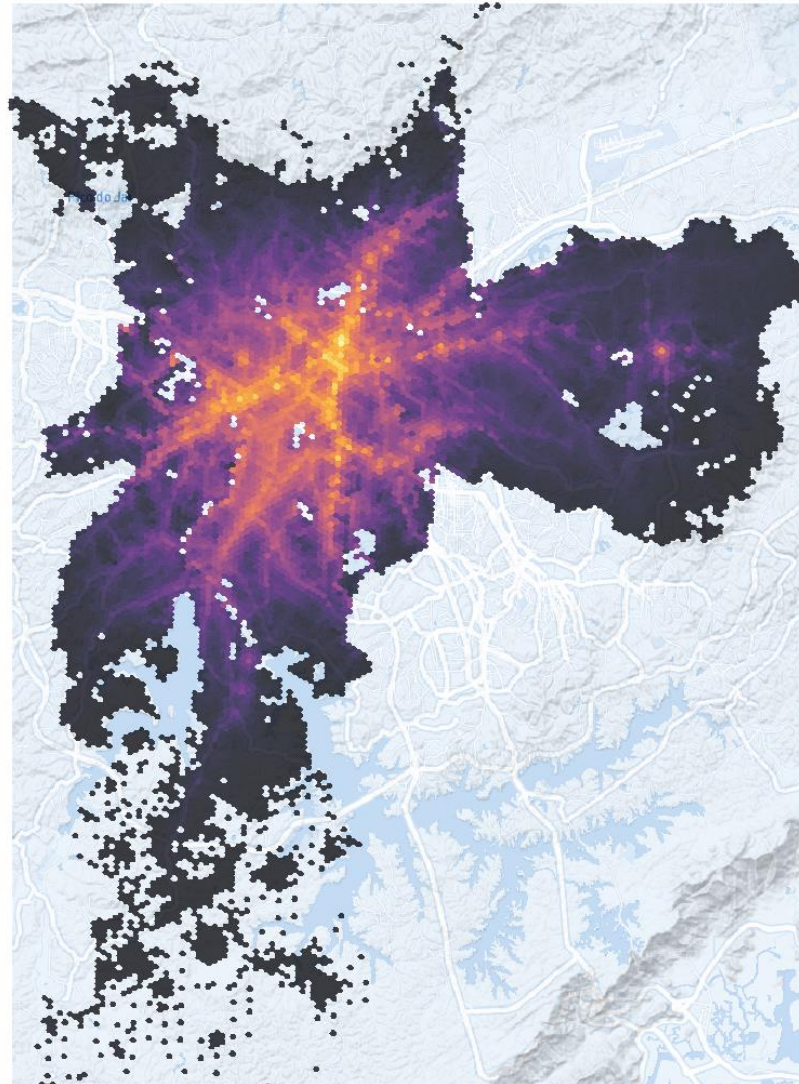
Place-based metrics



Person-based metrics



# Cumulative accessibility metric



## Cumulative opportunity measures:

The number of opportunities that can be reached within a given travel cost limit

### Advantages:

- Easy to calculate and communicate
- Litter data requirements

### Disadvantages:

- Does not consider the competition for opportunities
- Requires choosing a single (arbitrary) travel time threshold
- Ignores cost gradients within time threshold

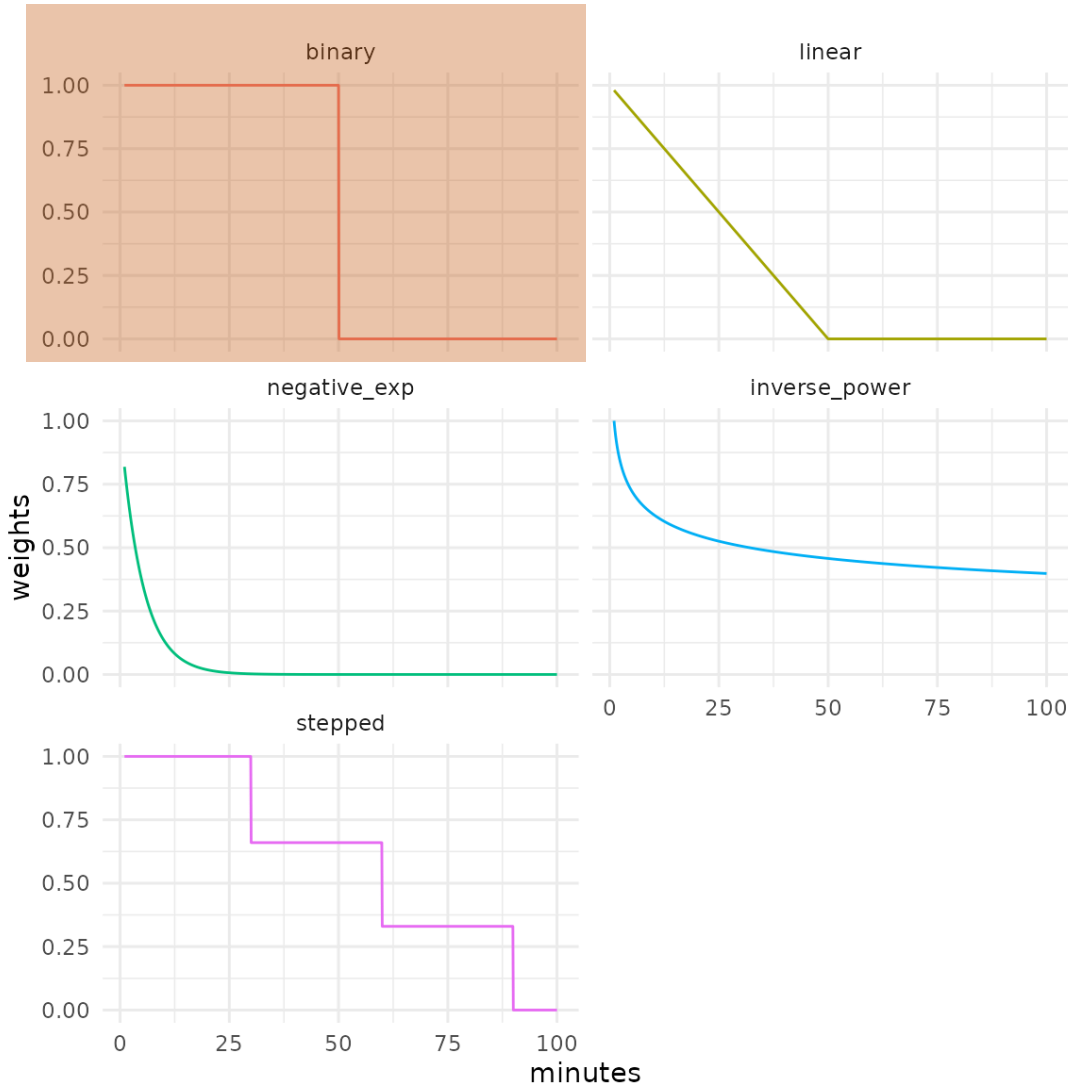


$$A_i = \sum_{j=1}^n O_j \times f(c_{ij})$$
$$f(c_{ij}) = \begin{cases} 1 & \text{if } c_{ij} \leq C \\ 0 & \text{otherwise} \end{cases}$$

in which  $A_i$  is accessibility at origin  $i$ ,  $O_j$  is the number of opportunities at destination  $j$ ,  $n$  is the total number of destinations in the study area,  $f(c_{ij})$  is a binary function that assumes the values 0 or 1, depending on the travel cost  $c_{ij}$  between origin  $i$  and destination  $j$  and  $C$  is the travel cost threshold.



# Access metrics and decay functions



# Advanced topics in accessibility



- Spatial biases - MAUP
- Temporal biases - MTUP
- Access metrics with competition
- Calibration of impedance functions
- Monetary costs
- Single Vs Multiple Cost Measures
- Big (larger-than-memory) data

