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Walk how far to see doctor in Singapore?

Final Project Proposal
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Why? (task)

Inequities in transportation-related factors to healthcare are concerning for disadvantaged population groups, e.g. seniors

Half of seniors ≥65 years old in Singapore are expected to be severely disabled at some point in their lifetime (MOH, 2018)

Having accessibility to transport nodes is insufficient

An inclusive healthcare system should also consider the factors that influence seniors' last-mile travel to healthcare services, such as their transit mode

Why? (task)

Data exploration

1. Where are the healthcare facilities and their nearest bus stop, MRT exit and taxi stand?

2. What is the last-mile walking distance between each healthcare facility and the nearest bus stop / MRT exit / taxi stand?

3. Which healthcare facility has the longest furthest average distance for each transit mode?

4. How does this translate to duration for seniors' walking speed?

5. What is the extent of equity across travel nodes across healthcare facilities?

6. Which healthcare facility has the highest average walking distance regardless of transit mode?
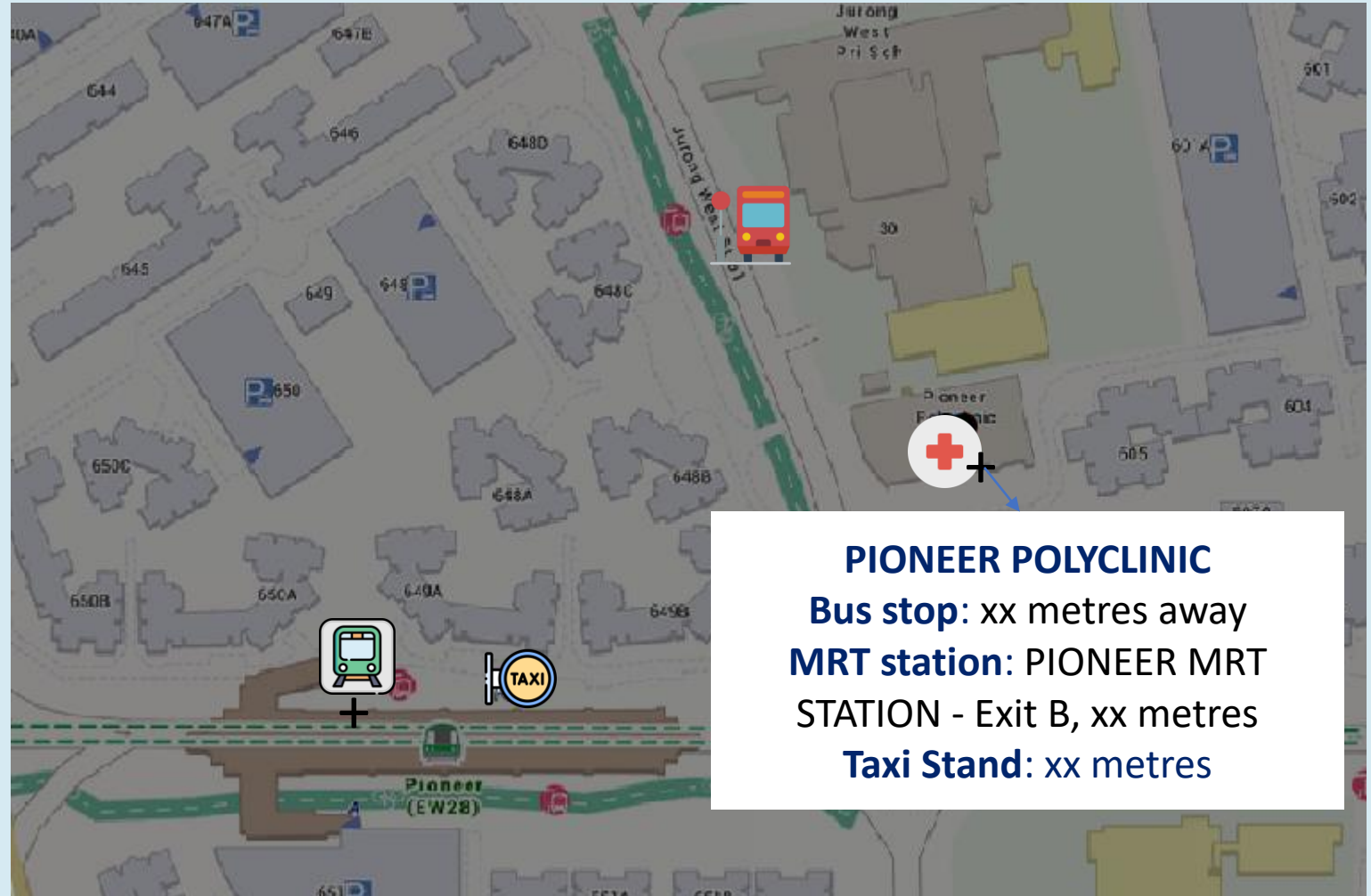
What? (data)

Data	Type of data	Data processing with open-source tools
1. Names and coordinates of healthcare facilities in Singapore	• Nominal • Geospatial	• Scrape healthcare facilities' (polyclinics, restructured hospitals and community hospitals) names and addresses from HCI Directory with Python • Geocode healthcare facilities' postal codes to obtain coordinates with OneMap API
2. Coordinates of each healthcare facility's nearest bus stop, mrt station exit and taxi stand	• Nominal • Geospatial	• Download shapefiles of bus stops, mrt stations and taxi stands from LTA DataMall • Match each healthcare facility to the nearest bus stop / mrt station exit / taxi stand with QGIS software
3. Walking distance between each healthcare facility and nearest travel node	• Ratio	• Calculate walking distance between each healthcare facility and nearest travel node using Google Distance Matrix API
4. Walking duration for each travel node	• Ratio	• Divide walking distance by an average Singaporean ≥65 years old 's gait speed (Lau et al., 2020)

How?

1. Where are the healthcare facilities and their nearest bus stop, MRT exit and taxi stand?

- Interactive map with **markers** for each healthcare facility and transit mode (leaflet.js)
- **Mouseover** for tooltip to show **walking distance** and **travel node information**

PIONEER POLYCLINIC
Bus stop: xx metres away
MRT station: PIONEER MRT STATION - Exit B, xx metres
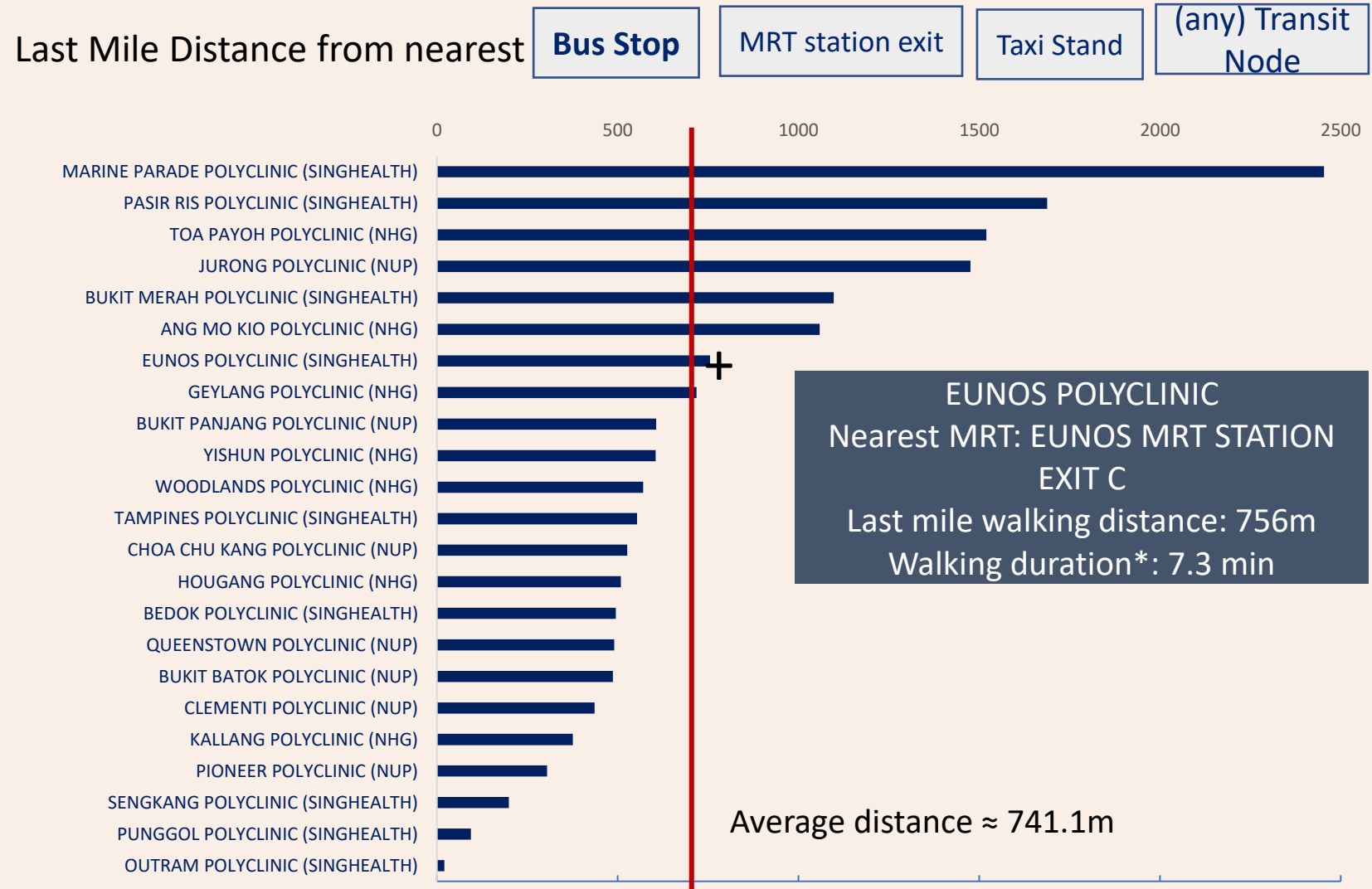**Taxi Stand**: xx metres

2. What is the last-mile walking distance between each healthcare facility and the nearest bus stop / MRT exit / taxi stand?

3. Which healthcare facility has the longest furthest average distance for each transit mode?

4. How does this translate to duration for seniors' walking speed?

- **Bar chart** in terms of walking distance per transit mode, showing **constant average line**
- Interactivity
  - **Mouseover** to show travel distance and travel time
  - **Filter** to see data based on different transit mode
  - **Auto sort** bars based on values

*Among polyclinics, XX Polyclinic has the **highest average walking distance regardless of transit mode***

Last Mile Distance from nearest | Bus Stop | MRT station exit | Taxi Stand | (any) Transit Node

	0	500	1000	1500	2000	2500

MARINE PARADE POLYCLINIC (SINGHEALTH)
PASIR RIS POLYCLINIC (SINGHEALTH)
TOA PAYOH POLYCLINIC (NHG)
JURONG POLYCLINIC (NUP)
BUKIT MERAH POLYCLINIC (SINGHEALTH)
ANG MO KIO POLYCLINIC (NHG)
EUNOS POLYCLINIC (SINGHEALTH)
GEYLANG POLYCLINIC (NHG)
BUKIT PANJANG POLYCLINIC (NUP)
YISHUN POLYCLINIC (NHG)
WOODLANDS POLYCLINIC (NHG)
TAMPINES POLYCLINIC (SINGHEALTH)
CHOA CHU KANG POLYCLINIC (NUP)
HOUGANG POLYCLINIC (NHG)
BEDOK POLYCLINIC (SINGHEALTH)
QUEENSTOWN POLYCLINIC (NUP)
BUKIT BATOK POLYCLINIC (NUP)
CLEMENTI POLYCLINIC (NUP)
KALLANG POLYCLINIC (NHG)
PIONEER POLYCLINIC (NUP)
SENGKANG POLYCLINIC (SINGHEALTH)
PUNGGOL POLYCLINIC (SINGHEALTH)
OUTRAM POLYCLINIC (SINGHEALTH)

EUNOS POLYCLINIC
Nearest MRT: EUNOS MRT STATION EXIT C
Last mile walking distance: 756m
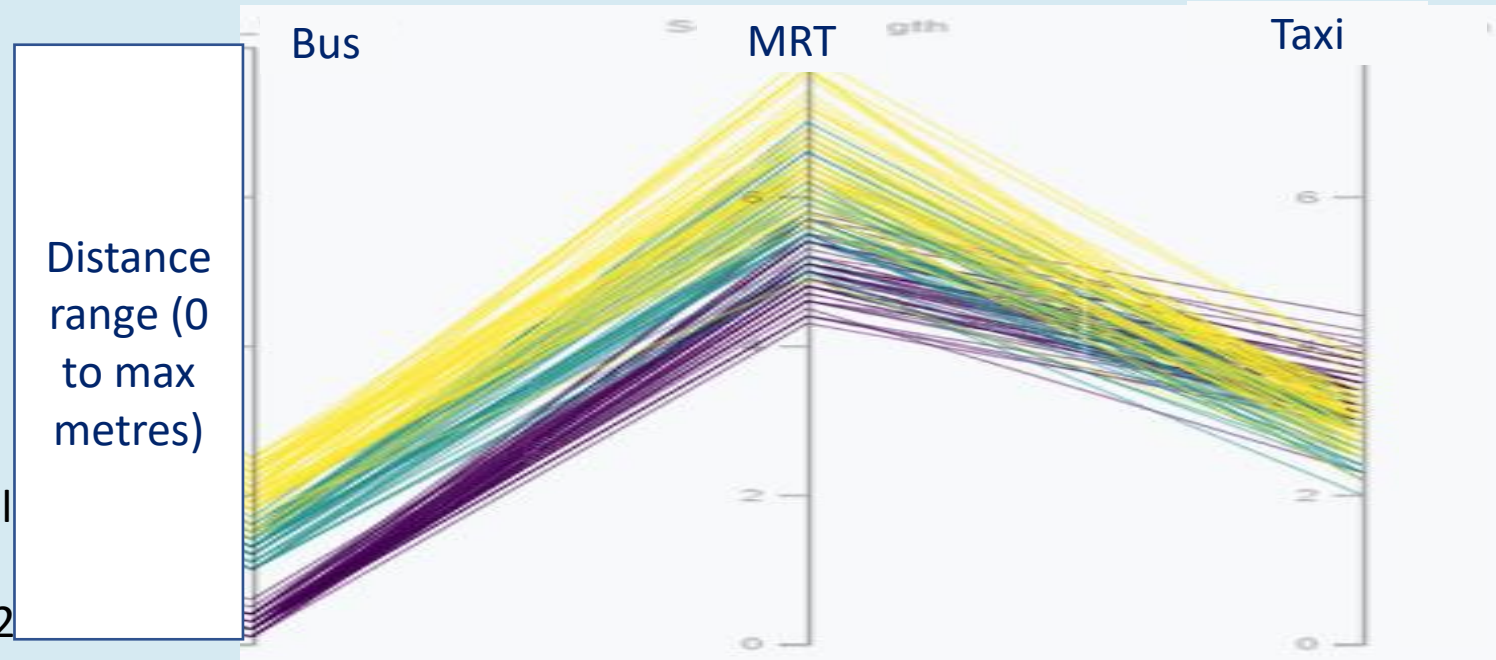Walking duration*: 7.3 min

Average distance ≈ 741.1m

* Assumed gait speed of seniors is xx m/min according to Lau et al., 2020

5. What is the extent of equity across travel nodes across healthcare facilities?

6. Which healthcare facility has the highest average walking distance regardless of transit mode?

- **Parallel chart** (D3.js) to show **direction** and **steepness** of relationship between each travel node
- The steeper the **slope** between 2 modes, the less equivalent
- Also show amount of **variation** for each transport node
- **Mouseover** interaction to show all healthcare facilities of same type (same colour)

Generally, there is greater disparity between XX and other transit modes in terms of walking distance.

Distance range (0 to max metres)

Bus   MRT   Taxi

Each line = 1 healthcare facility
Each colour = type of healthcare facility
Expected direction: bus << MRT > taxi

+ Implications e.g. If Singapore is pushing for the use of more <transit mode>, healthcare facilities become less attractive options for seniors to fulfill medical appointments

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Thank You! ☺