Inequity in transit

Evaluating public transport distribution through accessibility measurements in São Paulo, Rio de Janeiro, Curitiba and Recife, Brazil

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RESEARCH AIM

Increasing attention is given to public transport services in cities of the Global South as a tool to enhance social inclusion and support economic development.

Against this background, developing and evaluating indicators that quantify the distribution of public transport services from a social equity perspective is essential.

The aim of the study is, therefore, to assess the equity of public transport services in four metropolitan regions in Brazil with two commonly used indicators of public transport provision.

DATA AND STUDY AREAS

Study areas:

Four regions were selected based on data availability. All municipalities within the metropolitan regions are included in the analysis.

Unit of analysis:

The analysis is conducted based on the census tract geographical units. Non-urban census tracts are excluded from the analysis.

Data sources:

Data is obtained from three main data sources:

2010 demographic census

Google maps

2010 Relação Anual de Informações Sociais

Characteristics of the metropolitan regions

	São Paulo	Rio de Janeiro	Curitiba	Recife
Population (million inhab.)	19,136,063	11,784,888	2,866,058	3,555,431
Number of jobs*	5,221,492	2,287,911	730,077	620,922
Metropolitan region area (km²)	7,946	6,738	16,580	2,772
Urban area (km²)	2,844	2,869	1,033	723
Urban census tracts (#)	28,837	19,346	3,752	4,348
RT Modes	BRT, HR	BRT, HR	BRT	BRT, HR
RT network length (km)	333	334	75	70
RT network stations (#)	260	261	119	61

^{*} Formal jobs in the private sector

INDICATORS

Public transport indicators:

Proximity to rapid transit Within 1km of a rapid transit station Accessibility to jobs by public transport Number of jobs within 60 minutes of travel time

Socio-economic indicator:

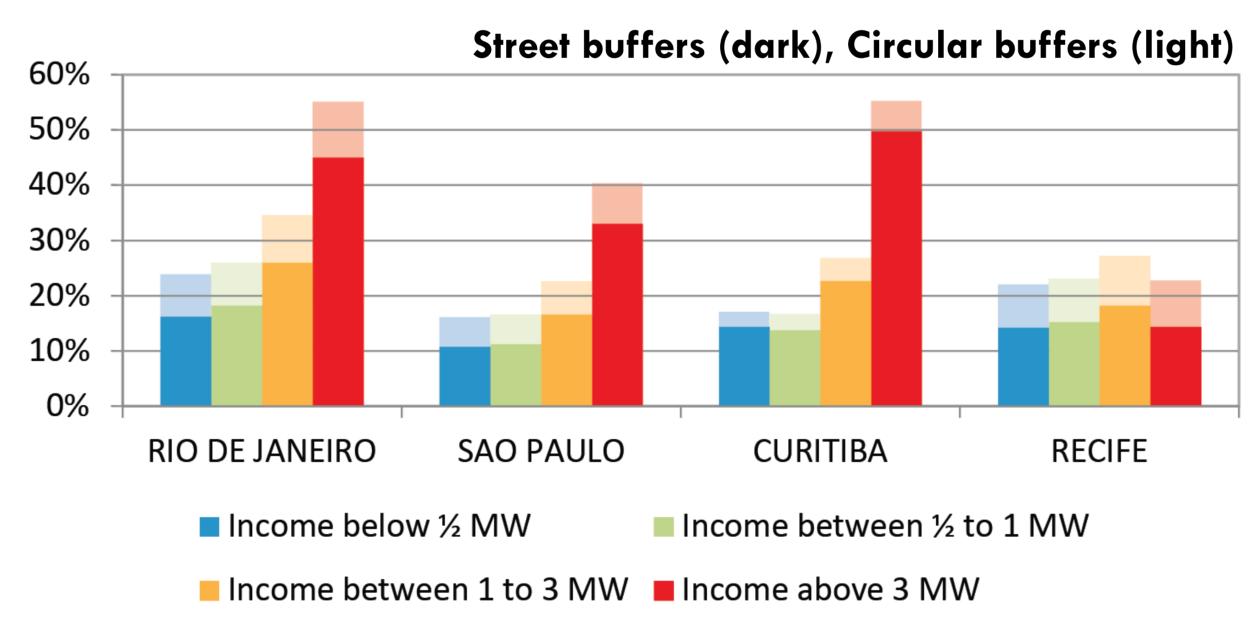
Household income

Below 1/2 minimum wage Between $\frac{1}{2}$ and 1 minimum wage Between 1 and 3 minimum wage Above 3 minimum wage

RESULTS

Proximity to rapid transit

Proportion of households near rapid transit stations by income category:

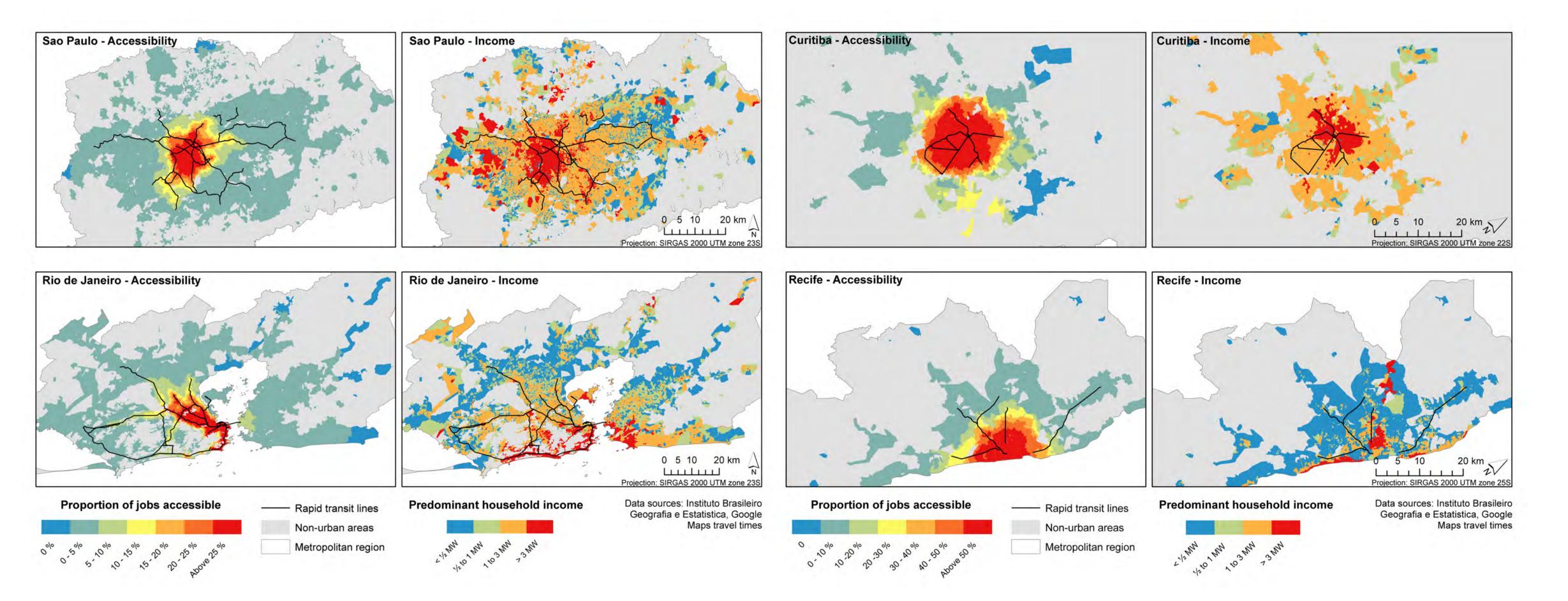




RESULTS

Accessibility to jobs by public transport

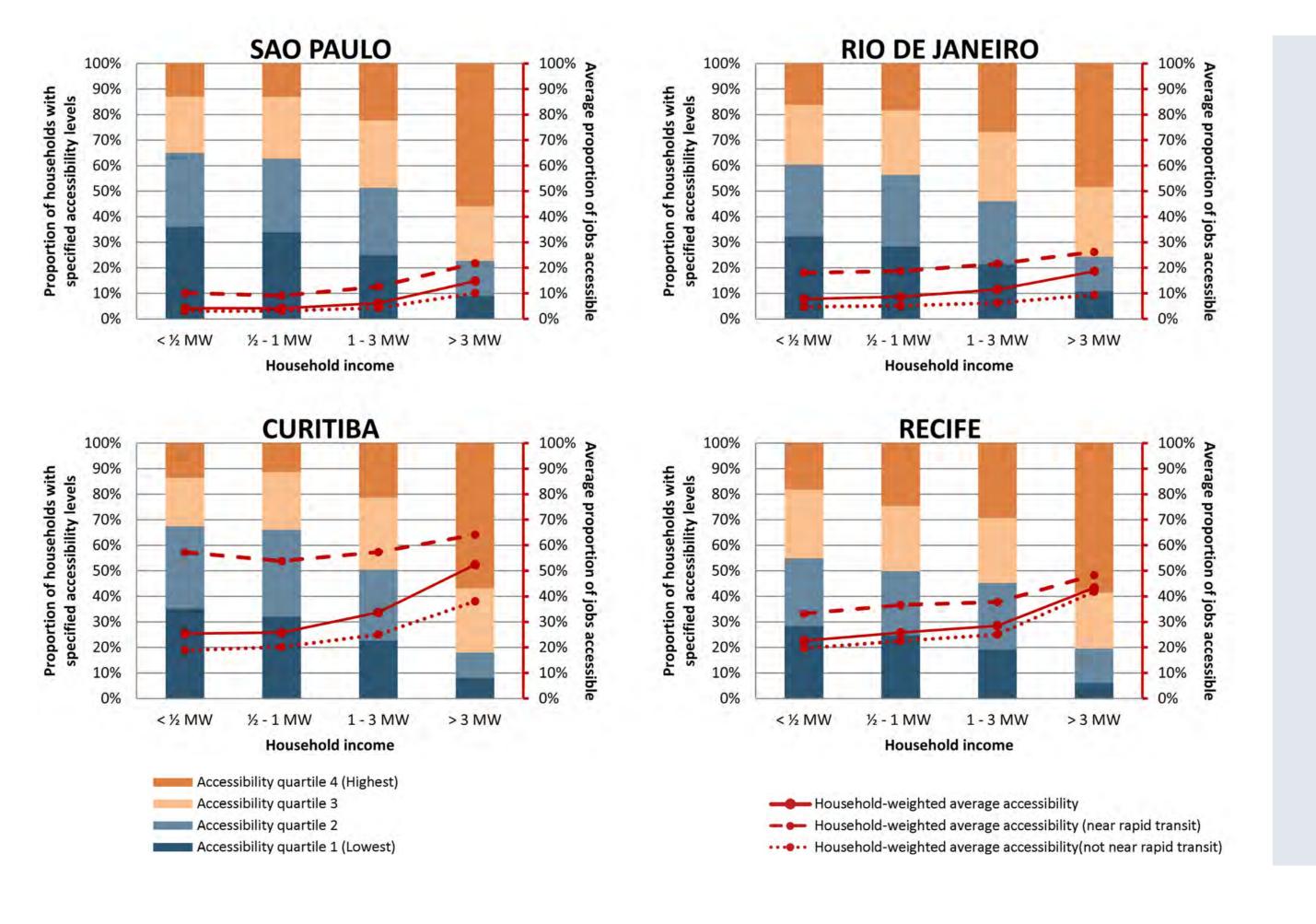
Accessibility to jobs by public transport and predominant household income:



RESULTS

Accessibility trends across income categories

Proportion of households in specified accessibility quartile and household-weighted average accessibility, by income category:



Inequity in transit:

A lower household income is associated with a larger proportion of households in the lowest accessibility quartile.

Lower-income households experience, on average, lower accessibility to jobs by public transport.

Proximity vs accessibility:

The use of proximity to rapid transit indicators are limited in capturing the benefits provided by the public transport systems.

CONCLUSION

The results show a clear trend of inequitable public transport provision in all four metropolitan regions:

- (i) a lower proportion of low-income households (below $\frac{1}{2}$ MW and between $\frac{1}{2}$ and 1 MW) live near rapid transit compared to higher-income households
- (ii) a greater proportion of low-income households experience lower accessibility to jobs by public transport.

The study demonstrates the contribution of accessibility indicators in evaluating equity in public transport services and contributes to the literature on equity and accessibility in Latin America by providing some improvements to previous methodologies.

The study also stresses the importance of developing GTFS data and making them fully accessible. While a Google API was used in this study, openly available GTFS data would allow a broader implementation of accessibility indicators.



ACKNOWLEDGMENTS

This research was partially funded by the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Social Sciences and Humanities Research Council of Canada (SSHRC). The authors would like to thank Guillaume Barreau for his

patience and help in generating the travel metropolitan regions. We would also like to thank all the colleagues from McGill and elsewhere who provided feedback and comments on this study.

