BRAZILIAN BIKE-SHARING

A SOCIAL CHARACTERIZATION OF USERS AND TRAVELS IN 5 STATE CAPITALS

Sponsor's message

Itaú Unibanco is the largest bank in Latin America. With more than 56 million customers, Itaú offers the best experiences in financial products and services for individuals and companies from all segments in 18 countries.

In addition, Itaú is committed to developing the communities where we operate and aims to generate shared value and promote the power of transformation on people.

As an essentially urban bank, we recognize the importance of valuing active transportation for the sustainable development of cities. We define urban mobility as an investment mainstay within our ESG platform. We support the improvement of transit-bike integration culture in cities, jointly with government and civil society, promoting public policies that endorse the use of bicycles in people's daily lives.

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Introduction

Bike-Sharing Systems (BSS), especially in Brazil, are embedded in urban contexts crossed by inequalities of income, race, gender, age, and access to the city. Although BSS are present in specific areas of cities, their use generates positive externalities experienced in urban mobility, economy, health, and the environment.

This publication presents findings concerning a survey conducted with Bike Itaú* users, present in Porto Alegre, Recife (Jaboatão dos Guararapes and Olinda), Rio de Janeiro, Salvador, and São Paulo.

understand which social characteristics differentiate its users in comparison with the state capital population in which the system is inserted. To do so, we analyzed race, income, gender, age, and housing location. We also explored trip features and their possible impacts on local urban mobility, in addition to seizing their benefits to the economy, environment, and health.

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* Bike Itau is a BSS sponsored by the mentioned bank, present in 5 Brazilian state capitals (Sao Paulo, Rio de Janeiro, Pernambuco, Porto Alegre, and Salvador), as well as Santiago (Chile), Buenos Aires and Nordelta (Argentina).

Methodology

The research was conducted following these steps:

Collection of data from users who use the systems for transport

Survey conducted with Bike Itaú users in state capitals Porto Alegre, Recife (including Olinda and Jaboatão dos Guararapes *), Rio de Janeiro, Salvador, and São Paulo.

The sample selection was formed by users who had accessed Bike Itaú services from Monday to Saturday and made a trip with different pick-up and drop-off stations. These criteria were used to prioritize a use pattern of commuting.

Data collection was carried out at Bike Itaú stations when the bicycle was returned. The interviews were conducted between July 25 and August 10, 2021, and distributed based on trip volume and users of each station.

City	System	Interviews	Margin of error
Porto Alegre	Bike PoA	300	5.5%
Recife	Bike PE	304	4.5%
Rio de Janeiro	Bike Rio	403	4.9%
Salvador	Bike Salvador	303	5.6%
São Paulo	Bike Sampa	355	5.1%

State Capitals data collection

To compare the data collected in the survey with socio-demographic information of each city, we used the 2021 Continuous National Household Survey (Continuous PNAD) (2nd quarter), the 2019 Continuous PNAD (annual), and the 2010 Census. For mobility data, we used the Origin and Destination Surveys (OD Surveys) conducted in Recife (2018), São Paulo (2017), Salvador (2012), Porto Alegre (2003), and Rio de Janeiro (2018).

* From here, we will only use the word Recife to refer to the three cities where the system is located: Recife, Olinda and Jaboatão dos Guararapes

How to read the data?

In most analyses, we use the **Location Quotient (LQ)** index to compare BSS features with each city's characteristics.

The LQ index is a proportion of these two data that informs, with its result, if each system is more or less representative of its city.

$$LQ_{ij} = \frac{\dfrac{E_{ij}}{E_{\bullet j}}}{\dfrac{E_{i\bullet}}{E_{\bullet\bullet}}}$$

Location Quotient of variable i and system j

E_{ij} — Frequency of the analysis category of variable i in system j

$E_{\bullet j}$ — Total frequency of all categories of variable i in system j $= \sum_j E_{\bullet j}$

$E_{i\bullet}$ — Category value frequency analysis of variable i in the municipality $= \sum_i E_{i\bullet}$

$E_{\bullet\bullet}$ — Total frequency of all categories of variable i in the municipality $= \sum_i \sum_j E_{ij}$

Representativeness

LQ less than 1	LQ equals 1	LQ greater than 1
Variable is less representative in BSS than it is for the municipality	Variable is equally representative in BSS and municipality	Variable is more representative in BSS than it is for the municipality

0 — 1 — +

Example

To measure the representation of women in BSS and the city, we used the LQ index for the category of women in the gender variable. If the LQ value is less than 1, it means that the system has proportionally fewer women than the city. If the LQ value is 1, the city and BSS have the same proportion of women. If the LQ value is greater than 1, the system has proportionally more women than the city.

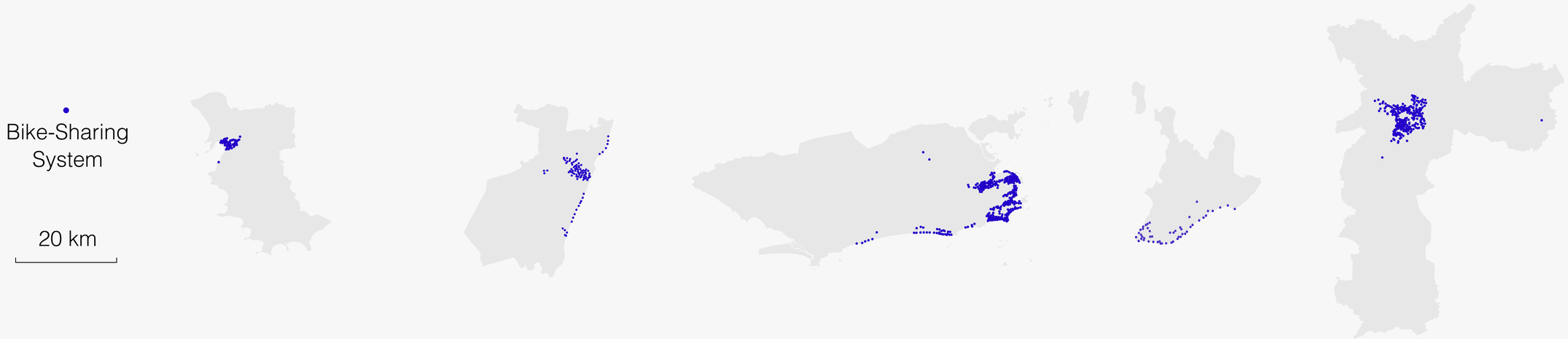
$$LQ_{ij} = \frac{\frac{E_{ij}}{E_{\bullet j}}}{\frac{E_{i\bullet}}{E_{\bullet\bullet}}} = \frac{\frac{\text{Women users of BSS}}{\text{Total users in BSS}}}{\frac{\text{Women in municipality population}}{\text{Total residents of the municipality}}}$$

Representativeness

LQ less than 1	LQ equals 1	LQ greater than 1
0	1	+
Proportionally, there are fewer women in BSS than in the city.	There is the same proportion of women in BSS and the city	There are more women in the system than in the city, proportionately
Women are **underrepresented**	Women have the **same representation** in the city and the system	Women are **overrepresented**

What are the analyzed systems?

More concentrated bike-sharing systems (BSS) tend to have shorter trips, while more dispersed BSS tend to have longer trips.



Bike-Sharing System	Porto Alegre	Recife	Rio de Janeiro	Salvador	São Paulo
Stations	41	90	304	50	260
Average distance to the nearest station	346 m	413 m	318 m	611 m	302 m

Executive summary

There is no “right” public to access a bike-sharing service. Considering their goal is to serve as an efficient mode of transport connection to the city, it is expected that their bicycles will be used by the widest possible range of people. It is also true that bike-sharing systems are great opportunities to introduce people to urban cycling, as well as to strengthen the cycling culture in cities.

The use of Bike Itaú for commute and transport has features that allow us to understand how this service is used by the population of the cities where it is present.

Use by men still predominates in BSS, though the proportion of women using the system is higher than the percentage of women observed in cyclist counts. People with income up to 2 Brazilian minimum wages have a significant use of the system, and it is as expressive as the use by people who declare themselves black and brown.

On the other hand, all systems showed low usage by people aged 40 years and over, when compared to the segment of the 40+ population in each city. Regarding usage habits, intermodal mobility is something that varies between systems. A greater or lesser volume of intermodal mobility is associated with the site of the systems, the city’s transport network and how services, jobs, housing, and leisure are structured in the urban fabric. Thus, having intermodal mobility depends on factors that are often beyond the service management and are of a structural nature of the city’s constitution.

São Paulo systems stand out in this manner, with 71% of intermodal mobility, and Recife, with 67%. On the other hand, Salvador has only 37% of intermodal mobility. The main reason for the origin or destination of travel is commuting, which is significant in all cities. Besides this usage, Porto Alegre emerge with higher use of the BSS for leisure activities and Recife for shopping.

Bike-sharing systems offer a service that increases transit possibilities and produce positive impacts, both personal and social. Considering the environment, the volume of trips carried out with Bike Itaú which substitutes individual motorized vehicles journeys have saved, approximately 1.72 thousand tons of CO_2 emissions per year.

BSSs also produces health benefits for their users. According to the World Health Organization (WHO), regular physical activity is essential to reduce the chance of several diseases (diabetes, heart disease, depression, etc.). Those who use Bike Itaú to get around the city, perform 50% to 70% of the physical activity necessary for a healthy adult to be considered active by cycling with Bike Itaú.

Financial benefits of BSSs result in average annual savings above a minimum wage, considering the expenses that users would have with transport if they did not use the Bike Itaú. Considering that most users earn up to 2 Brazilian minimum wages, this sum is quite significant.

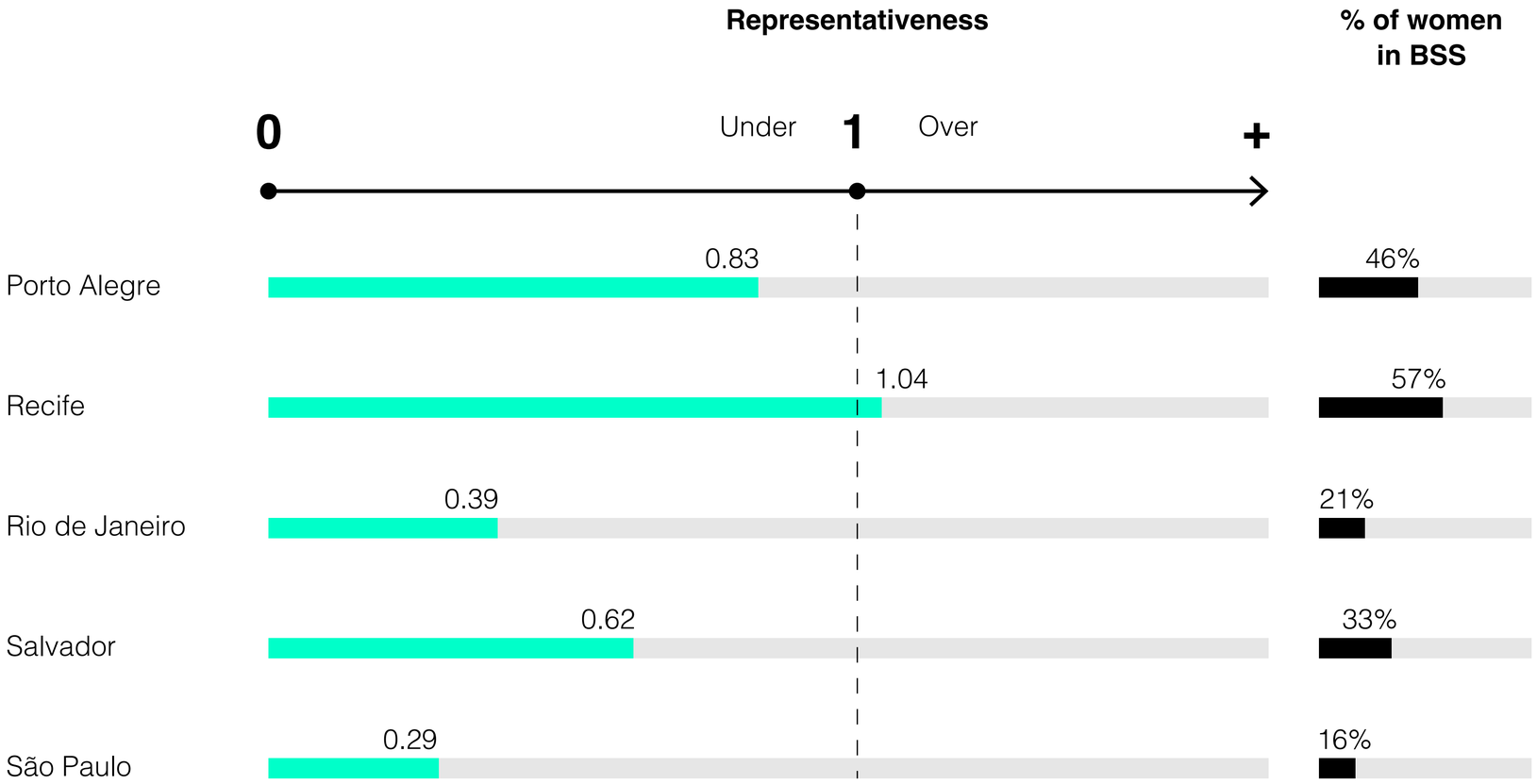
Finally, Bike Itaú systems, operated by Tembici, offer an important mobility service in the cities where they are present. In a moment when cities are looking for ways to become more sustainable and humane, bike-sharing systems play a role to the development of a cleaner, more agile, economic, and healthy mobility, even with a coverage restricted to specific areas in cities.

Who are the users in the 5 state capitals?

Observing gender, race, income, age, and housing patterns of those who transit with shared bikes

Gender

The proportion of women using BSS is lower than the proportion of women residing in most cities. The exception is Recife, where they are in greater represented in the system.

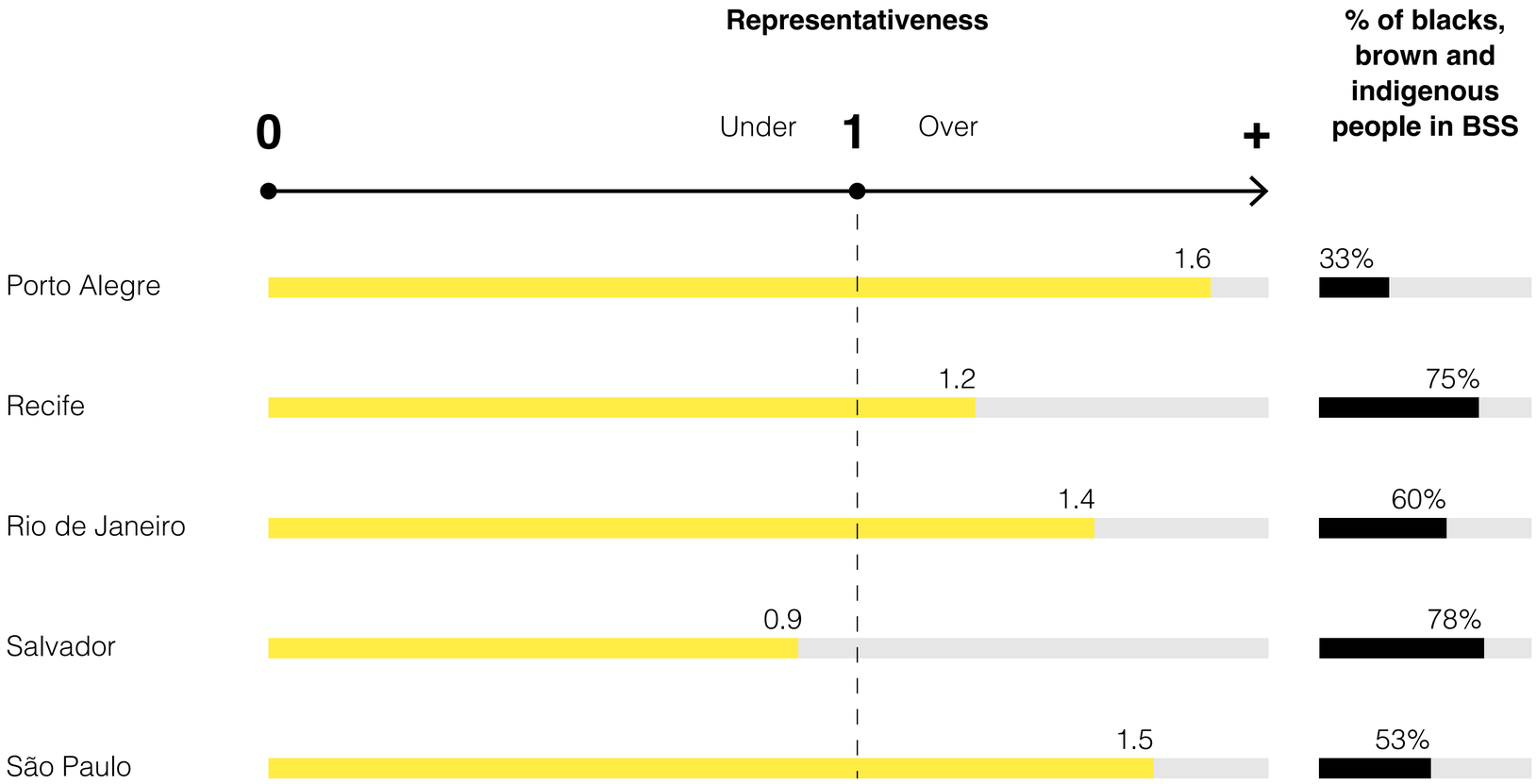


The proportion of women using the systems is higher than the proportion found in overall cyclist counts.

The highest percentage of women in cyclist counts studies do not exceed 13%. The bike-sharing rides can attract more women than urban cycling in general.

Race

For LQ index analysis of this variable, two groups were separated: (i) black, brown, and indigenous, and (ii) white and yellow*. In general, there are more blacks and browns using the systems than the percentage found in cities.



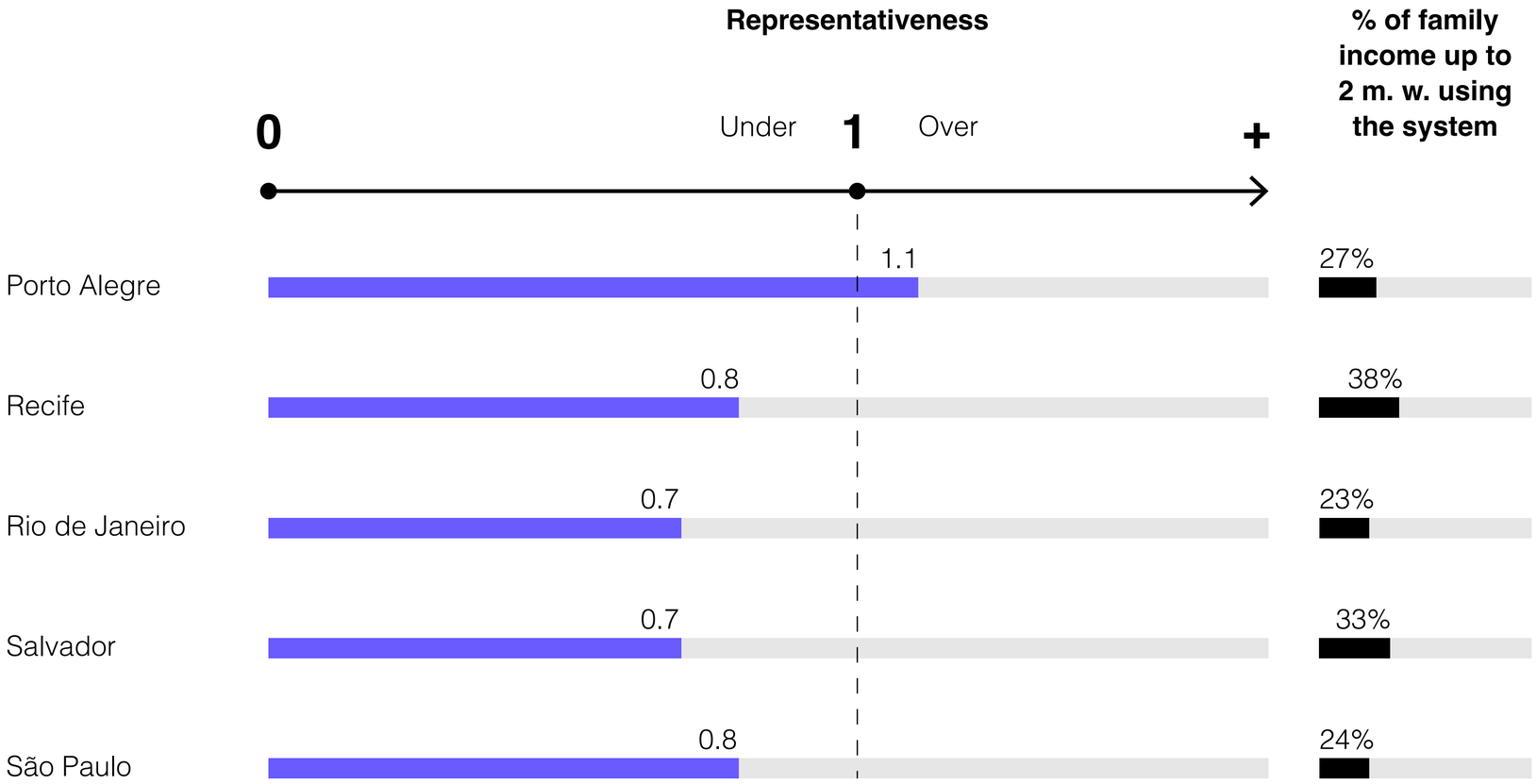
It is interesting to observe that, even in cities with a high proportion of whites, such as **Porto Alegre** and **São Paulo**, the systems manage to have **higher use**, proportionally, of blacks and browns.

The location of the systems and the low cost of using them in relation to other modes of transport may be related to this finding. It is worth noting that this research did not interview bike couriers who use the system for their professional activity.

*Race categories used by Brazilian Institute of Geography and Statistics (IBGE).

Income

In general, the proportion of low-income people (up to 2 Brazilian minimum wages) in cities is higher than the one in Bike Itaú. The exception is Porto Alegre, which has a LQ index of 1.1 on this indicator.

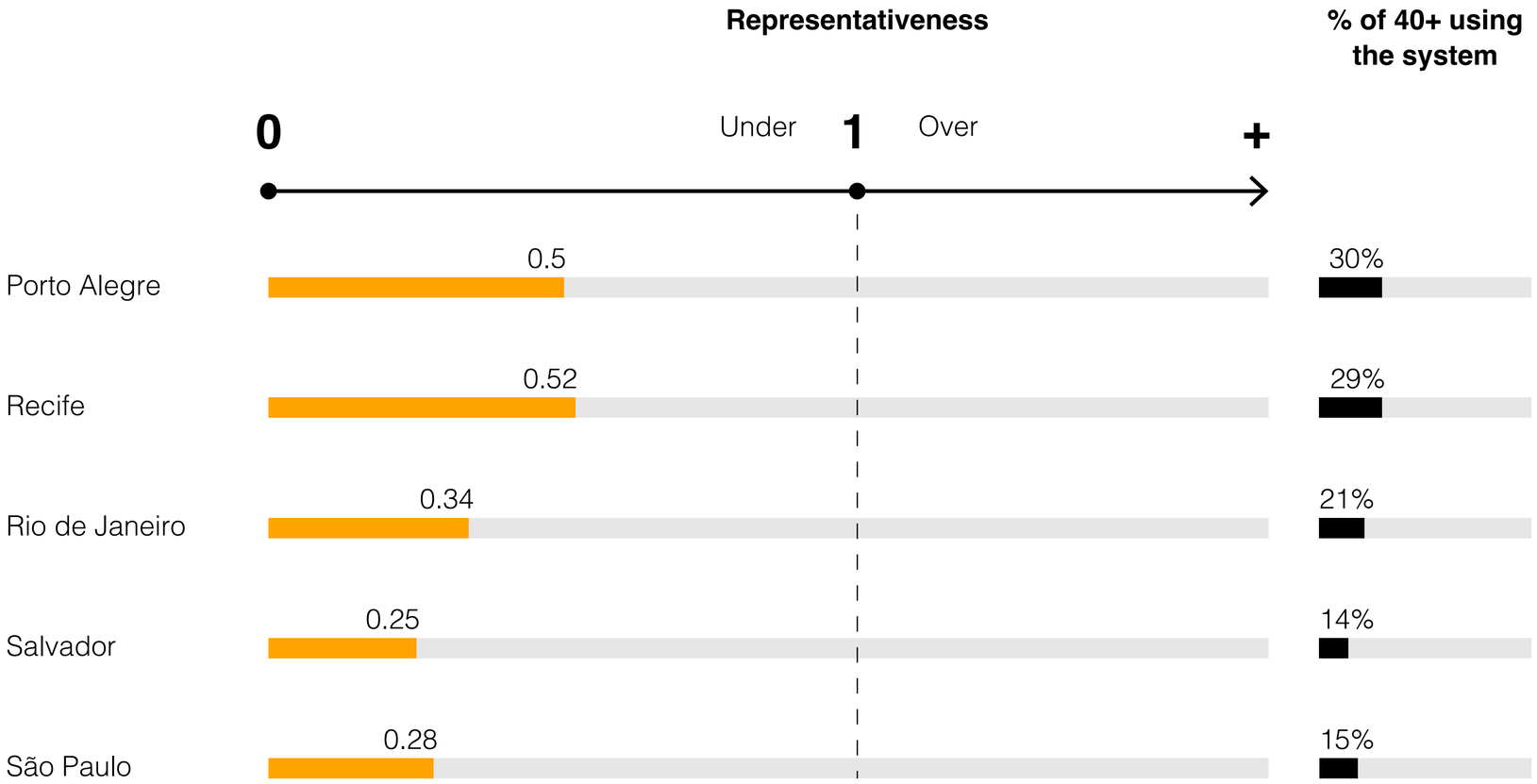


BSSs are generally concentrated in cities downtown, areas with prominent floating population.

This may explain the fact that three of the BSS city systems have an LQ index close to 1 in income, indicating that people who do not live in central districts also use the system in these sites.

Age

There is an underrepresentation of people aged 40 or more in relation to the city in all BSSs. The Recife system has the highest proportion, with a LQ index of 0.62.



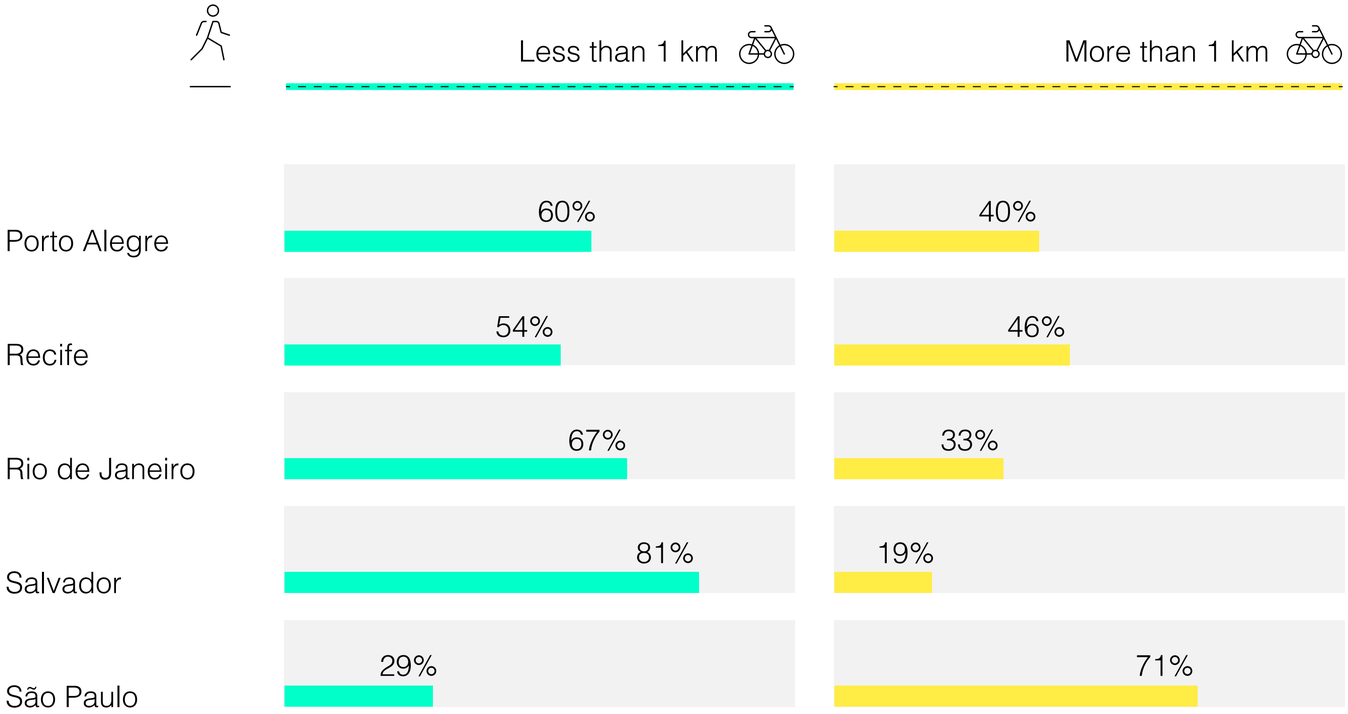
Age is still a major barrier to bicycle adoption, and this appears as well in bike-sharing systems.

As systems that facilitate access for new users, who will not need to own a bicycle to join cycling, they have potential for increasing the use of 40+ population, contributing to the expansion of urban cycling in this age group.

Housing

Distance between the house and the station characterizes BSS users in at least two ways. One is having a station up to 1km from home, which facilitates access to BSS, encouraging the use for the first part of the journey or in intra-neighborhood micro journeys. The other is perceived between those who live far from BSS stations, who access it to do the last part of their commuting or to move to more central areas in the city.

Distance from home to stations



A related variable is intermodal mobility, which depends on the city's infrastructure and how much the bike-sharing system is integrated into the local transport system.

Salvador has the BSS most used by those who live close to the stations. The city has less intermodal mobility and the system is well spread along the seashore, making integration with local transport difficult.

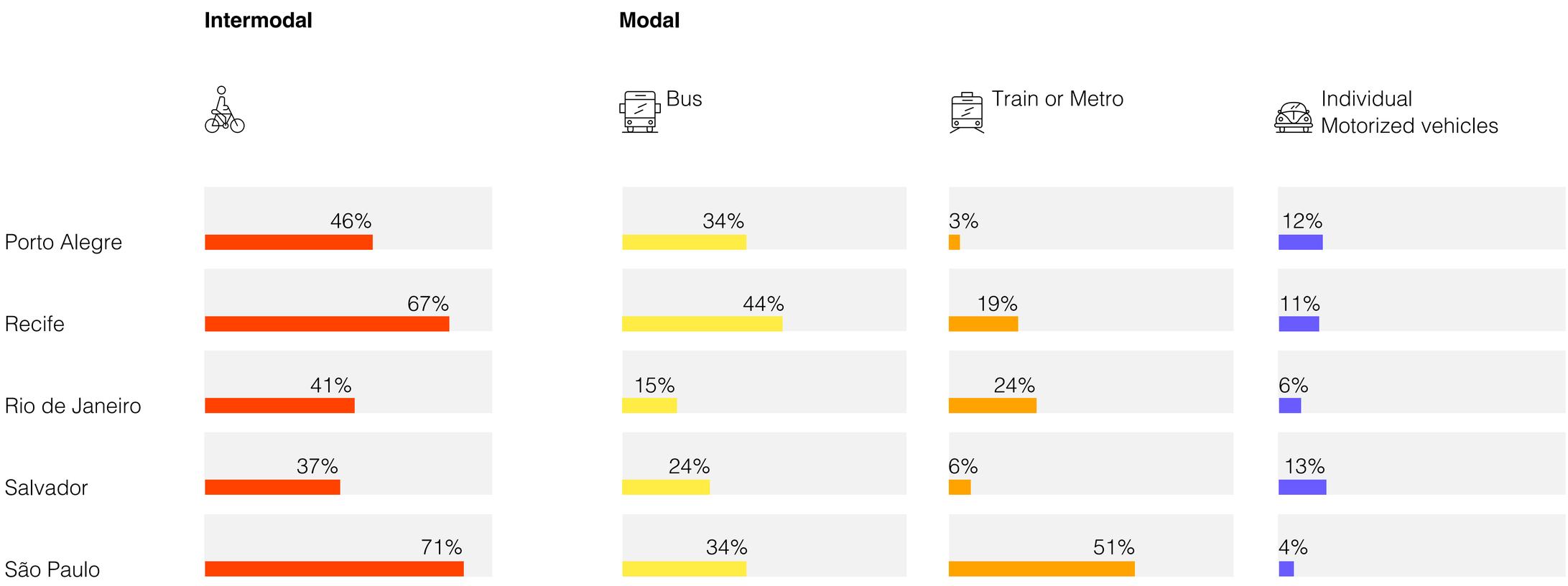
São Paulo has the most used BSS by those who live far from its stations. It is also the system with the most intermodal mobility, which may explain its use by so many people outside the system's perimeter. In addition, São Paulo's metropolitan transport system is more integrated than in other capitals, facilitating access for people in the Metropolitan Region.

How are shared bikes used?

Intermodal mobility and motivation for use

Intermodal mobility

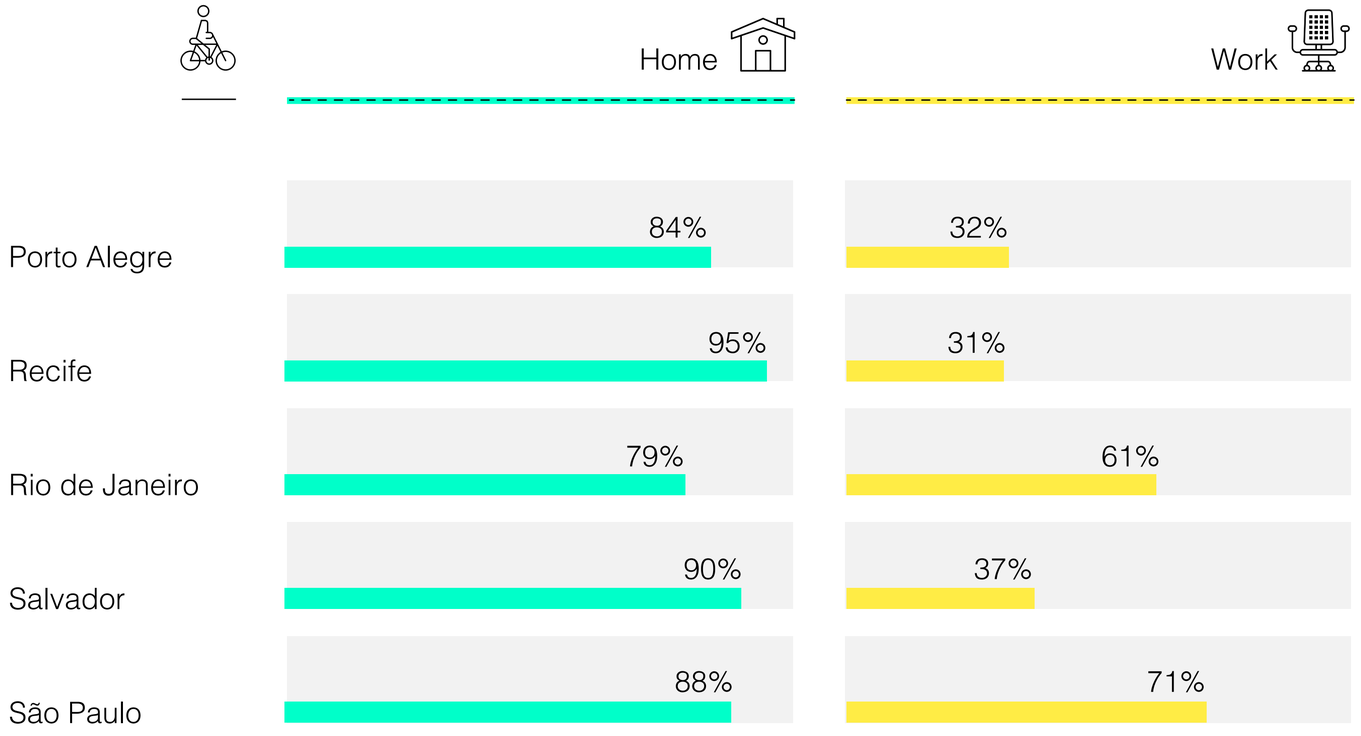
Bike-sharing has potential to expand the reach of public transportation by promoting intermodal mobility, making it possible for the first or last part of the journey to be made by bicycle. Having more intermodality may indicate that a system better integrated with the city's public transport, offering a network of options for users.



Use Motivation

As with intermodal mobility, motives for shared bicycles use helps understanding how much the BSS is integrated with the city, assisting day-to-day activities of its users. The most common reasons for taking a journey with bike-share are generally the same as those we see in surveys for other modes: commuting to/from home and work.

Journey motives work and home at origin or destination



Porto Alegre and Salvador have more than 30% of destinations related to leisure activities.

Recife has 45% of destinations connected to shopping and personal affairs.

The use for **education**, whether at origin or destination, did not exceed 7% in all systems. A possible explanation is the contextual pandemic period, in which universities and other educational institutions worked remotely.

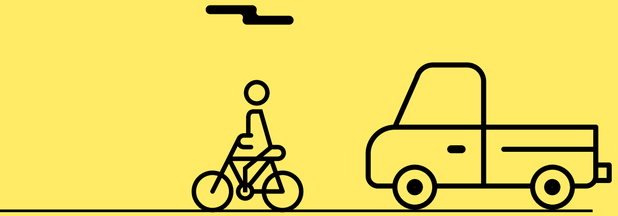
Social benefits of bike-sharing systems

Environment, health, and economy

Environment

The bicycle is a sustainable means of transport. It avoids greenhouse gas emission by not using a combustion engine. Users are saving emission of CO_2 and other gases by switching from a means of personal motorized transport to a bicycle.

Estimated CO_2 savings resulting from bike-sharing rides replaced by individual motorcycles rides
In tons of CO_2/year



780
Rio de Janeiro

446
Salvador

218
Recife

170
São Paulo

107
Porto Alegre

1.72 thousand

tons of CO_2 per year in emissions were avoided (approximately)

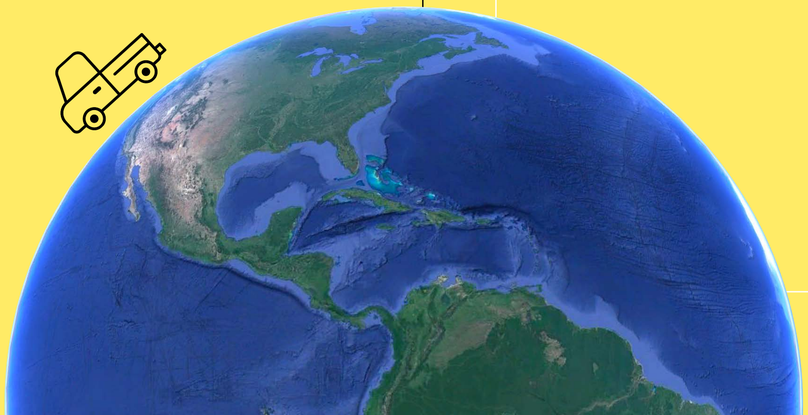
The CO_2 economy provided by bicycle rides corresponds to*:

4.5 million
kilometers traveled by car

or

112 laps
around the earth

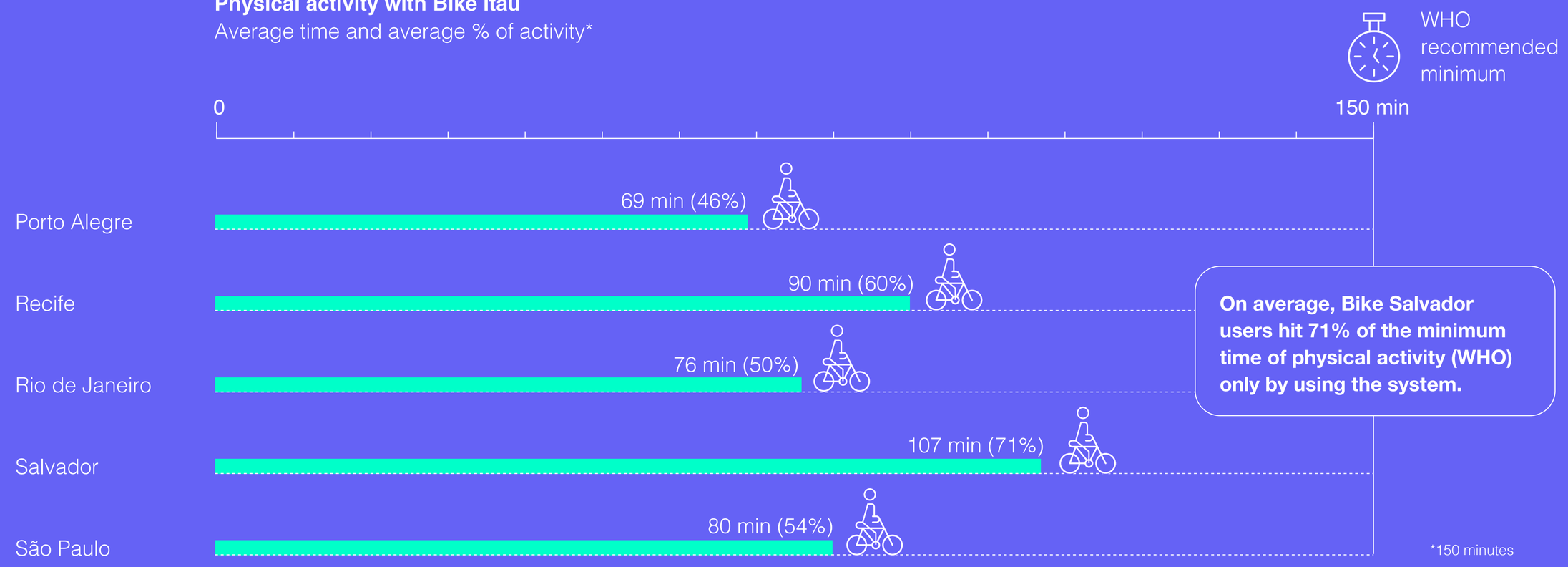
*Estimations used Eccaplan calculator



Health

One of the social benefits of cycling is associated with the improvement of health due to time of physical exercise. According to the WHO, an adult person should perform 150 to 300 minutes of moderate physical activity a week to benefit from reduced mortality chances from various diseases, such as heart disease, diabetes, cancer, and hypertension. Preventing these diseases through physical exercise also brings collective benefits by reducing the need for medical care and enabling the presence of more active and healthy people in society.

Physical activity with Bike Itaú
Average time and average % of activity*



Economy

The savings promoted by bike-sharing systems use guarantees individual benefits, but also collective ones, such as larger income availability for other expenses in local economy, and greater access to the city, made possible by cheaper way to reach a destination in a vehicle.

Savings of BSS users, considering only those who would pay for another means of transport

Annual $ Weekly

Porto Alegre
R$ 1,246
(+/- USD $250)
$ R$ 24

Recife
R$ 1,323
(+/- USD $265)
$ R$ 25

Rio de Janeiro
R$ 1.488
(+/- USD $300)
$ R$ 29

Salvador
R$ 1,409
(+/- USD $280)
$ R$ 27

São Paulo
R$ 1,371
(+/- USD $275)
$ R$ 26

Average savings

1.2
Brazilian minimum wages per year (approximately USD $290

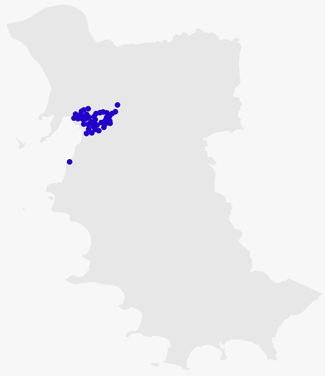
BRL 20
per week (approximately USD $4)

Cities results summary

Porto Alegre

41
stations

361 m
distance to next
station (on average)



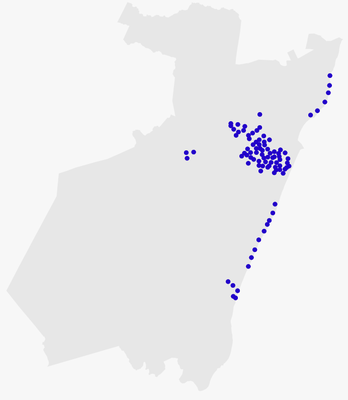
10 km

- Intensive use of women
- Intensive use of black, brown, and indigenous population
- Intensive use of low-income population
- Intensive use by people who live near the system
- Diffuse use motivation

Recife

90
stations

413 m
distance to next
station (on average)



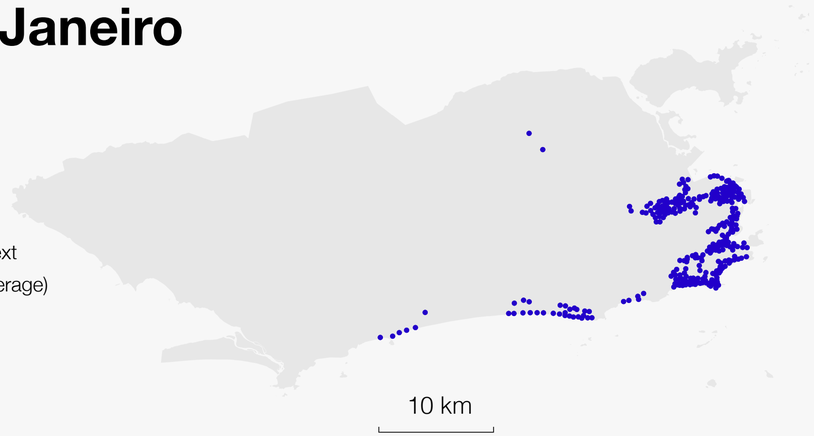
10 km

- Intensive use women
- Intensive use of black, brown, and indigenous population
- High intermodal mobility
- Diffuse use motivation

Rio de Janeiro

304
stations

318 m
distance to next
station (on average)



- Low usage by women
- Intensive use by black, brown and indigenous population
- Low usage by low-income population
- Greater share of users living near BSS stations
- Predominant use motives related to commuting (work/home)

Salvador

50
stations

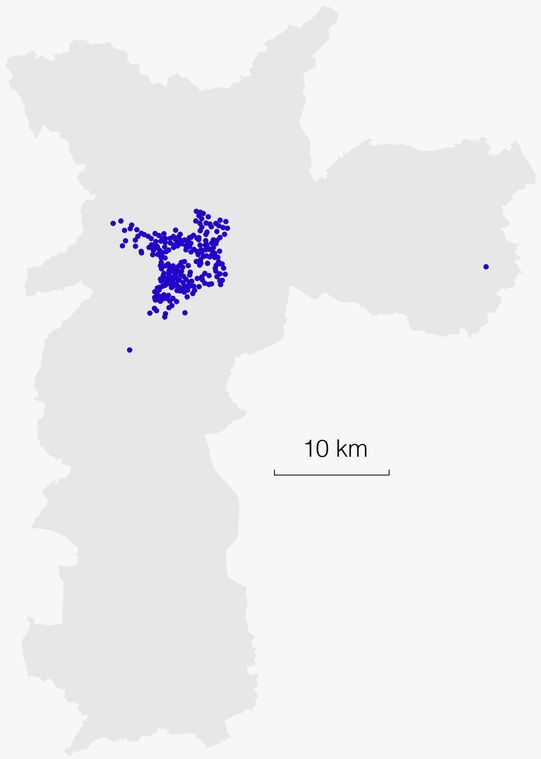
611 m
distance to next
station (on average)

- Average use of women
- Intensive use of black, brown and indigenous population
- Low usage of low-income population
- Low usage by people aged 40+
- Intensive use by people who live near the system
- Low intermodal mobility

São Paulo

260
stations

302 m
distance to next
station (on average)



- Intensive use of men
- Intensive use of black, brown, and indigenous population
- Low usage by people aged 40+
- Greater share of users living far from BSS stations
- Predominant use motives related to commuting (work/home)
- High intermodal mobility

Compared results

Topic	Pg.	Porto Alegre	Recife	Rio de Janeiro	Salvador	São Paulo
Gender	12	Intensive use of women	Intensive use of women	Low usage by women	Average use of women	Intensive use of men
Race	13	Intensive use of black, brown and indigenous population	Intensive use of black, brown and indigenous population	Intensive use of black, brown and indigenous population	Intensive use of black, brown and indigenous population	Intensive use of black, brown, and indigenous population
Income	14	Intensive use of low-income population		Low usage of low-income population	Low usage of low-income population	
Age	15				Low usage by people aged 40+	Low usage by people aged 40+
Housing	16	Intensive use by people who live near the system		Greater share of users living near BSS stations	Intensive use by people who live near the system	Greater share of users living far from BSS stations
Intermodal mobility	18		High intermodal mobility		Low intermodal mobility	High intermodal mobility
Use Motivation	19	Diffuse use motivation	Diffuse use motivation	Predominant use motives related to commuting (work/home)		Predominant use motives related to commuting (work/home)

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