



Volume 123

2024

p-ISSN: 0209-3324

e-ISSN: 2450-1549

DOI: <https://doi.org/10.20858/sjsutst.2024.123.12>



Journal homepage: <http://sjsutst.polsl.pl>

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**Article citation information:**

Prieto-Rodriguez, G., Garcia-Bedoya, O. Public transportation system fare, economic impacts on the purchasing power of its users, the case of Bogotá, Colombia. *Scientific Journal of Silesian University of Technology. Series Transport*. 2024, **123**, 245-257. ISSN: 0209-3324. DOI: <https://doi.org/10.20858/sjsutst.2024.123.12>.

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## **PUBLIC TRANSPORTATION SYSTEM FARE, ECONOMIC IMPACTS ON THE PURCHASING POWER OF ITS USERS, THE CASE OF BOGOTÁ, COLOMBIA**

**Summary.** The public transportation fare in a city is an important determinant of accessibility, equity, and quality of life for its citizens. This article makes a comparative quantitative analysis of the fare of the public transportation system in the city of Bogotá (Colombia), its evolution over time, and the impact on the poorest users. It compares with similar systems in Latin America and other cities in the world. The findings show that the fare has had high growth in US dollars (USD 0.38 in 2000 to 0.75 in 2024), but the purchasing capacity has increased with respect to the local minimum wage (10.84 tickets with a minimum daily wage, versus 14.69 in 2024). This rate is one of the highest in Latin America and has a high impact on lower-income citizens, since the purchase of 50 monthly tickets is equivalent to 15% of the local monthly minimum wage.

**Keywords:** public transport, bus transit, fare, Bogotá

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## 1. INTRODUCTION

### 1.1. Background

Public transportation is considered a sustainable means of transportation and the most viable alternative to replace a significant fraction of medium and long-distance trips made by private automobile [1] and motorcycle [2], whose accelerated growth aggravates the problems of congestion [3], pollution [4] and traffic accidents [5]. But at the same time, public transportation is also the main mobility alternative to access medium and long distances for low-income citizens, especially in cities in developing countries [6].

For these low-income citizens, the fare becomes more important because if the ticket to access public transportation is very expensive, they will not be able to pay it [7] or they will have to incur an expense with a high impact on their economic income to be able to afford the transportation service [8]. Since the public transport fare has such a high relative weight compared to household income, decisions involve making fewer trips, with the consequent reduction in accessibility, or making excessively extensive trips on foot or by bicycle [9]. In some cases, these high transportation expenses also lead citizens to choose to purchase a motorcycle as a means of daily mobility, which does not consider hidden costs such as increased risk of traffic accidents [10].

In the city of Bogotá (Colombia), for more than two decades, when a process of reorganization of the public transportation system towards a formalized and centralized scheme began, citizens have criticized the amount of the access fee, this being a recurring theme in the discourse of local politicians and various opinion generators (see, for example, [11]).

However, few academic studies have analysed the way in which the city's public transportation fares have impacted the city's poorest population throughout its history, both in comparative terms with other cities in the context and relative to the levels of income.

### 1.2. The Integrated Public Transportation System of Bogotá

In the last two decades, some Latin American cities have undertaken different efforts to modernize their public transportation systems, mainly in search of achieving formalization of the service, a reduction in the generation of externalities such as air pollution and traffic accidents, an improvement in the working conditions of the sector and the quality of service for users [12]. This is the case of the city of Bogotá, Colombia, which began a process of progressive transformation in 2000 to migrate from a semiformal system to a completely formalized one, whose structure contemplates the planning, management and control carried out by the public sector and the operation of vehicles and collection systems by private companies [13].

This process of change began with the implementation of the TransMilenio System, a high-capacity Bus Rapid Transit or BRT type system [14] that transformed the provision of the city's public transportation service. Starting in 2009, Bogotá expanded the scope of this transformation towards a model aimed at having total coverage of the city, through the implementation of the so-called Integrated Public Transportation System (SITP). The SITP includes the trunk component (i.e., TransMilenio) and the zonal component, consisting of buses with a lower capacity than those of the zonal component, which seek to have coverage in all sectors of the city. That is, a total system that by 2022 had 2,365 articulated and bi-articulated buses and 8,557 zone and feeder buses, to cover a city of approximately 8 million citizens,

whose total travel demand was calculated for 2023 at 14.6 million daily trips, of which 4.4 million (30.3%) were carried out by public transport [15].

The organizational structure of the SITP is based on a public-private operation scheme [16], while the entity that plans, manages and controls it is TRANSMILENIO SA, a 100% public district organization, of an industrial and commercial nature of the State (that is, it must manage its own operating resources), which contracts private companies that are responsible for the operation of trunk buses, zone buses, collection and fiduciary management of resources [17].

Regarding its tariff scheme, the TransMilenio System began its operation under a Colombian legal framework that prohibited the transfer of resources to subsidize the tariff. As was the case with the rest of the collective and massive public transportation of passengers in the country, the regulations made explicit that this type of service had to be “self-sustainable”, in such a way that the financial income generated by the tickets sold had to be equal to the operating costs of each system (Law 086 of 1989 and Law 310 of 1996). This scheme was maintained after the operation of the zonal component of the SITP began, despite the fact that a lack of resources began to be generated that has progressively increased. Subsequently, this “self-sustainability” restriction was modified by Law 1753 of 2015, but the sources of resources to generate permanent subsidies for the operation of the system are still unclear, as has happened with the rest of the public transportation systems in Colombia.

The result for user perception would be a comparatively expensive and poor-quality public transport system [18]. At least this is reflected in the citizen perception indicators, with values of disapproval of the service of 81% of those surveyed and where 60% consider that the system continues to worsen compared to the previous year [19]. In the same way, many users consider that the Bogotá public transportation rate is one of the most expensive in Latin America and that the cost of this ticket has risen wildly since its creation, to the detriment of the purchasing power of citizens and to the benefit of the system's businessmen [20]. This perception has progressively expanded to the entire SITP, including the zonal component, with the perception of high cost being the main topic of this article.

### 1.3. Fare structure of the Integrated Public Transport System

The SITP rate is made explicit through the contracts with the system operators, such as the bus operators (trunk and zone), the collection operators, the trust operator and the operating cost of the company itself. The manager of Transmilenio SA says that the tariff formula is based on defining a technical rate or real cost of providing the service to each user, which “*must permanently correspond to a balance rate, technically structured and that reflects the variation in costs and efficiency of the system*” [21].

Since its creation and until a few years ago, this technical rate responded to the principle of self-sustainability of the system, defined as that it “*must be autonomous in its flows so that it does not require any type of external subsidy to the operation over time to remunerate all its agents*” [21]. Under these definitions, the need for users to cover practically all the operating expenses with their tickets was made explicit in the TransMilenio contracts, with minimal exceptions generated by advertising and other revenues. That is, the System Costs ( $SC$ ) had to be equal to the total income ( $TI$ ):

$$SC = TI \quad (1)$$

Where operating costs correspond to the sum of the operators' costs, while total income corresponds to user payment income. In a schematic way, the calculation of costs can be

reduced based on the bus operators who charge based on the kilometers traveled, plus the charge that is made based on the number of passengers mobilized (although several types of operators have a collection that combines both factors), plus the sum of other costs, such as collection and trust. On the revenue side, it is calculated as the number of tickets sold ( $S$ ) multiplied by the user transport fare ( $TF$ ):

$$\sum_i C_i * K_{mi} + \sum_j CP_j * S_j + \sum_k Ok + CTM = S * TF \quad (2)$$

Where  $C_i$  is the cost per kilometer to be paid to operator  $i$ ,  $K_{mi}$  are the kilometers traveled by the buses of operator  $i$ ;  $CP_j$  is the cost of operator  $j$  for each person he mobilizes,  $S_j$  is the number of passengers transported by the operator  $j$ ;  $Ok$  are the costs to be paid to the operator of service  $k$  (e.g., fiduciary company) and  $CTM$  is the operating cost of the management company Transmilenio SA.

It should be noted that this is a very summarized equation to understand the basic principles of the tariff scheme, since with the passage of time the tariff formula has become more complex by incorporating other costs, such as the independent payment scheme for companies that put vehicle disposition and maintenance.

In contrast to the concept of *self-sustainability*, a guiding principle of *affordability* is also presented, which defines that “*the rates charged to the public (User Rate) must consider the average payment capacity of users and be competitive with analogous transportation systems*” [21]. The user Transport Fare ( $TF$ ) is then supported by these principles and defined by the city mayor, who must weigh the financial needs of the system with the political pressure of citizens so that the tariff does not increase [22]. That is why mayoral decision makers must weigh their actions regarding tariffs between permanently reducing operating costs and increasing the tariff.

Starting in 2012, different types of subsidies focused on demand began to be applied, which include discounts for older adults, people with fewer resources, citizens with physical disabilities and a discount for trips that were made during off-peak hours, which was later dismantled. For the year 2023, discounts for subsidies for senior citizens were 15.2% of the fare for up to 30 tickets per month, while for people with disabilities a monthly pass equivalent to 10 tickets, while there is no specific subsidy for the students. In the same way, and unlike most Latin American cities, in the SITP of Bogotá a specific subsidy is applied for low-income citizens, through a system for detecting potential beneficiaries of social programs, called SISBEN, whose discount corresponds also to 15.2%.

For the year 2017, it was estimated that 4.1% of the total trips in TransMilenio corresponded to subsidized trips for senior citizens and an additional 4.9% for low-income people with SISBEN benefits [22]. This would correspond to a total cost of USD 40 million per year approximately, which would correspond to 9.2% of the system's total income (own calculations).

The entry into operation of the zonal component of the SITP began to mark a gap between the costs and income of the public transportation system. This had not occurred during the previous 12 years of operation of the TransMilenio trunk component. By 2015, this deficit reached more than US\$230 million, a gap that remained relatively stable until 2019 but increased with the arrival of the pandemic, which led to a drastic decrease in the number of users with relatively similar costs, which raised the deficit above US\$600 million in 2020 and more than US\$680 million by 2024. These missing resources have had to be covered with money from district taxes, and permanent sources are still being sought to solve them.

## 2. LITERATURE REVIEW

### 2.1. Performance measurement and its importance

Studies such as those by Verbich & El-Geneidy [23], Mladenovic [24], Guzman & Hessel [25] and Saeid & Chowdhury [26] address the problem of the high impact of public transport fares on the precarious resources of the poorest. If the low payment capacity is also combined with the displacement that lower-income people usually suffer in large cities due to high land prices due to socio-spatial segregation phenomena, the result is that this segment of the population will have less accessibility to their basic needs, such as health, education, employment and recreation, among others [27].

This concept of accessibility can be assumed as “*the ease with which each person can overcome the distance that separates two places*”, but more broadly it can be understood as the ability to reduce the physical and economic distance towards centres of opportunity for people. “*Access, mainly economic, to transportation networks, in turn implies access to opportunity structures*” [28].

Mobility (and in this case, access to public transport) becomes a requirement or necessity to cover those difficulties that citizens have in reaching the place where they find the supply of goods and services they require, since “*Today, mobility is a key condition for access to the labour market, housing, education, culture and leisure, and family. The right to work, to have a home, to receive training, now implies the right to mobility (...) in a certain sense, this right to mobility is a precondition of the other rights*” [29].

This situation is particularly complex for the context of Latin America, taking into account that a high percentage of the population belongs to low socioeconomic strata [30] and, therefore, the conditions of inequality are aggravated by not being able to access offer of education, employment and health, among others. This is reflected in the preparation of several studies at the Latin American level that show how the confrontation between the ability to pay, and transportation costs generates accessibility problems, such as Bocajero & Oviedo [31] and Estupiñan et al. [32]. In fact, these phenomena related to the geographical location of people based on their income, the affordability or possibility of paying for transportation services by these citizens and the needs and characteristics of the trips made by them are generating the trend of creating their own fields of study, such as the *sociology of mobility*, *urban sociology* and the *sociology of transportation* [33].

## 3. MATERIALS AND METHOD

This article reviews the evolution of the fare of Bogotá's public transportation system in absolute and relative terms in the period 2000-2024. It analyzes different impact indicators on the income of the low-income population and makes a comparison with the fare levels of other public transportation systems in Latin America.

In the first part, the main characteristics of the Bogotá Public Transportation System, its operating structure and the impact it has on mobility in the city of Bogotá are presented. Subsequently, an analysis of the historical evolution of the fare is presented in comparative terms, both in constant pesos, in dollars and in the relationship between the cost of the ticket vs. the local monthly minimum wage. In a third part, a comparative analysis of the fare of the Bogotá system with respect to the public transportation fares of other Latin American cities is presented. Finally, some conclusions about the results are presented.

### 3.1. Data collection

Secondary data were collected from the websites of the local governments or of the operating entities of the public transport systems in each city. Exchange rates, minimum wage amounts and other data were taken from official sources at the date of preparation of this document (February 2024). Reports, journals, and books were also used as data sources for the research analysis.

## 4. RESULTS AND DISCUSSION

### 4.1. Fare evolution

At the beginning of operation of the TransMilenio System in 2000, its fare was defined at COP\$800 (USD\$0.38 of that year), an amount that historically remained above the cost of the traditional collective transportation fare by up to 20%, until the total disappearance of the latter. The rate has been increasing relatively constantly during the 18 years of operation of the system at an average rate of 5.7% annually, as seen in Figure 1.

It can be seen in the graph that there is only one “valley” in the rate trend towards the period between 2011 and 2015, which coincides with the period of Gustavo Petro's mayoralty in Bogotá, who undertook efforts to avoid increases in the rate and to apply subsidies differentiated by age, disability status and situation of vulnerability (included in the SISBEN System for identifying citizens in precarious conditions). In addition to a rate reduction in 'off-peak hours', which sought to distribute more efficiently demand throughout the day. However, due to the contractual structure of the rate and the lack of permanent resources to maintain demand subsidy levels, starting in 2016 a “correction” had to be generated that sought to balance the financial situation of the system, which was shown both in the increase in the full rate and in the reduction of subsidy levels for vulnerable groups and the elimination of the off-peak hour subsidy.

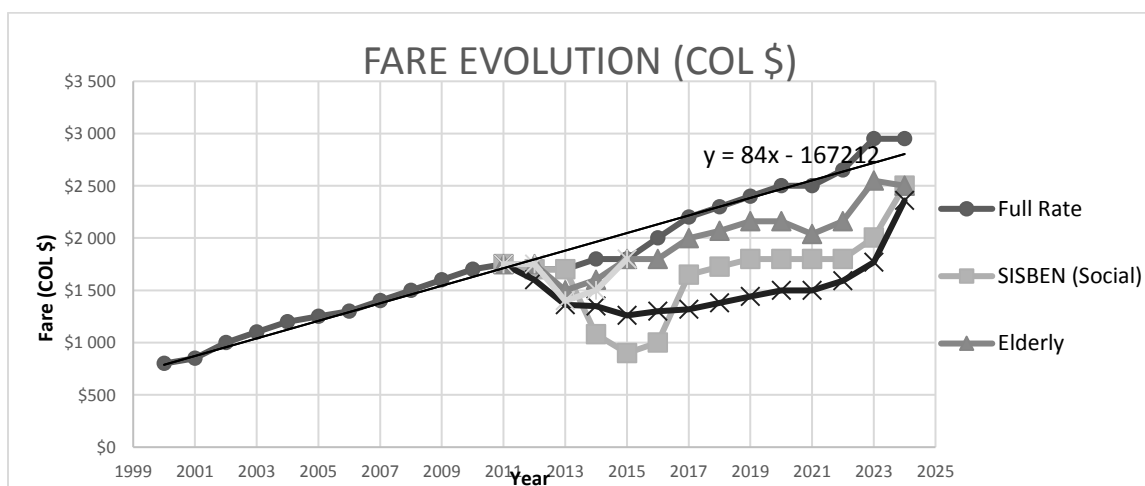


Fig. 1. Evolution of the Bogotá public transportation system fare in current pesos  
Own elaboration with data from TransMilenio SA

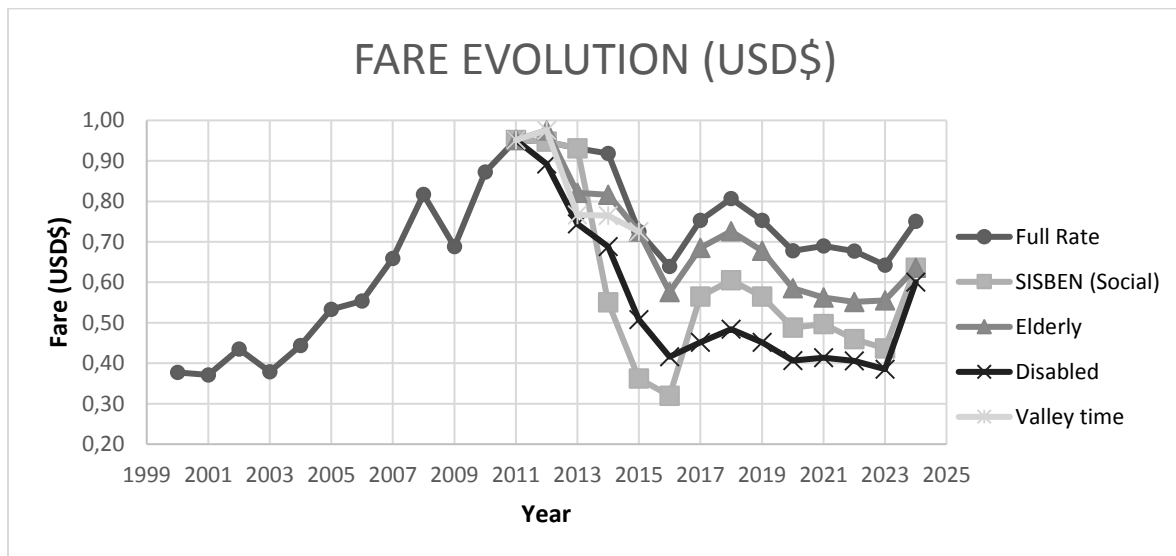


Fig. 2. Evolution of Bogotá public transportation system in American dollars  
Own elaboration with data from TransMilenio SA

In order to analyse these rates in terms of purchasing power, figures 2 and 3 show the evolution of the cost of the ticket measured according to the exchange rate of the Colombian peso with respect to the US dollar and in relation to the minimum daily wage.

The evolution of the rate in US dollars has remained mainly tied, as expected, to the peso-dollar exchange rate, although in general terms it has had significant growth during the 18 years of operation of the system. This is how in its first 4 years the full rate had a cost close to 40 cents on the dollar, while for 2018 and 2019 it has doubled its value towards 80 cents, with maximum values in the period 2010-2014 higher than 90 cents (due to exchange rates lower than COL\$1,900 per dollar between 2010 and 2013). Regarding the subsidized rates, it can be seen that they all had an accelerated reduction since 2012, even reaching 33 cents on the dollar in the case of the SISBEN rate. For 2019 they are between 46, 58 and 69 cents (Disabled, SISBEN and senior citizens, respectively).

To better visualize the way in which the ticket purchasing capacity has evolved over time, Figure 3 presents a relationship between the number of tickets that can be purchased with a Colombian daily minimum wage in each year. It can be seen that the purchasing power with respect to the full fare has remained very similar, going from 10.84 tickets in 2000 to 11.50 in 2019, with minimums close to 10 in the period 2002-2011 and with maximums between 2013 and 2016 close to 12 tickets.

Regarding the purchasing power of tickets by the subsidized groups, we see how the group of citizens with SISBEN had an accelerated increase between 2013 and 2016, reaching a maximum of close to 24 tickets per day and balancing out towards 2017 in 15 daily passages. As for the elderly, they have maintained their purchasing power between 12 and 13 tickets since 2013, while citizens with physical disabilities have had constant growth since 2011, going from being able to buy 11 tickets with a daily minimum wage to 19.

#### 4.2. TransMilenio fare in the context of Latin American public transportation

Ticket costs data were collected from the websites of the local governments or of the operating entities of the public transport systems in different Latin American cities. For this, the “full” fares were taken into account, being those corresponding to the cost of a single

ticket, as well as the discounted fares for the social groups of the elderly, disabled, students and those of lower-income citizens (called “social”).

For the purposes of the graph, other types of discounts are discarded, such as those for off-peak hours and ticket package purchases, and it is clarified that all systems have special peculiarities, such as that some have integrated rates and others do not, some discounts are applied for a certain number of tickets or with other types of restrictions and in some cities the cost of the ticket is different for different modes of transportation, among others. The compendium was carried out in February 2024 and the exchange rates of each currency to the US dollar in force on that date were used.

As shown in Figure 4, rates in Colombia are between 75 and 93 cents per ticket, which is why they would be the highest in the Latin American context after Brazilian cities and the Santiago metro, whose tickets are in values close to or greater than 1 dollar.

The full TransMilenio rate is equivalent to USD 75 cents, while that of older adults and lower-income citizens is 64 cents. Citizens with physical disabilities are assigned a monthly equivalent of money on their card, for which a cost equivalence per ticket was made if the user made 50 monthly trips, resulting in a cost of 60 cents per trip. This means that the full fare would be 76% more expensive than the Buenos Aires metro and approximately triple that of public transportation in Quito and Mexico City.

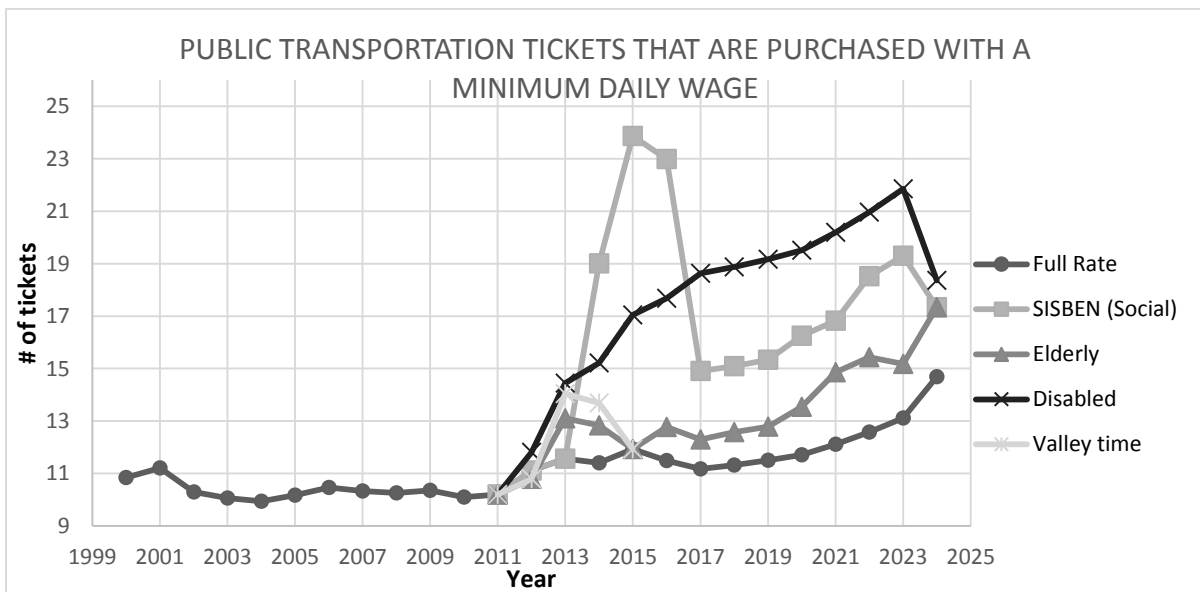


Fig. 3. How many tickets can be purchased with a minimum daily wage?  
Own elaboration with data from TransMilenio SA

To review these figures in relation to local purchasing power, a relationship was made between the equivalent cost of 50 monthly tickets (which can be considered a reasonable number of trips for daily reasons) and the local minimum wage, the results of which are summarized in the Figure 5. The result shows that in Colombian cities this ratio ranges between 13% and 15%, which is well above the standard recommended by the CAF of 6%. “If one considers that the desirable situation would be that the value of 50 fares does not exceed 6% of the minimum wage, it is possible to conclude that in most cities this relationship limits the mobility of people” [32].



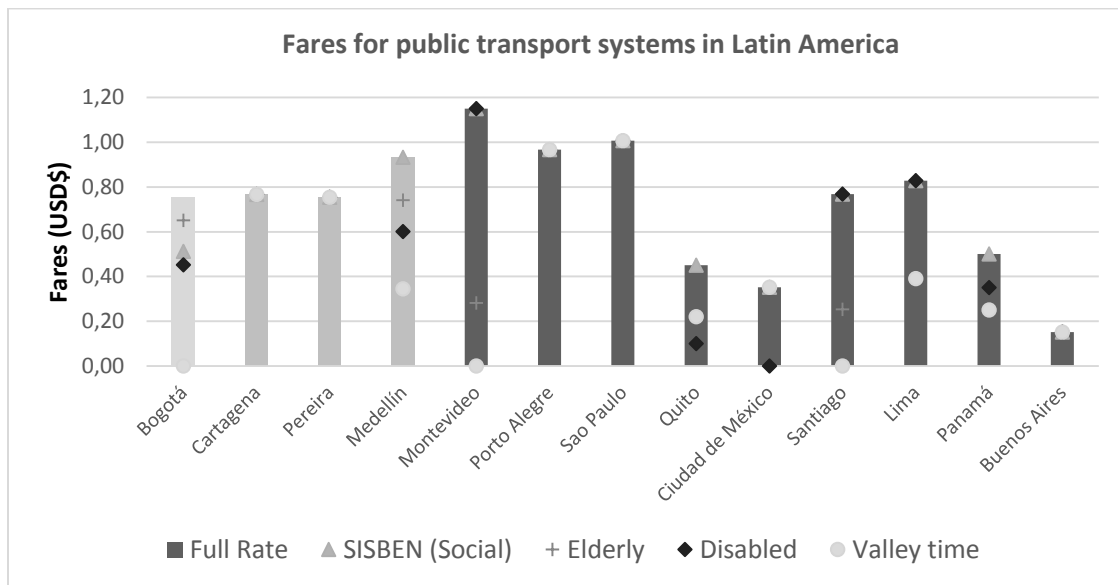


Fig. 4. Mass public transportation rates in Latin American cities. Own elaboration with data from official pages of the public transport systems retrieved in February 2024

A structural component of the rates charged to the user is the percentage of the technical rate or real costs per passenger that are covered by State subsidies. That is, the difference between the cost of transporting a passenger (technical rate) and the charge made for entering the system, which are usually covered with funds from the taxes of the city or the country, or by specific destination resource sources. Latin American cities have very different levels of public transportation subsidy, ranging from 71% of the operating cost in Buenos Aires, to cities such as Belo Horizonte and Porto Alegre that subsidize less than 6% of that fare.

In most Colombian cities, no operating subsidies have been defined, with the exception of those already stated in TransMilenio and a subsidy for students in the Pereira Megabús System. It is estimated that the average subsidy in the main cities of Latin America is close to 50% of the money collected for tickets, while our own calculations show that for Bogotá this amount would be close to 9.2%.

The high cost of public transportation would be generating three main effects. The first of them is a growing attraction for more and more users to be willing to switch from public transport to private cars and motorcycles. This is aggravated because, according to the CAF (ibid), the cost of traveling 7 kilometers by public transport in Bogotá is very close to that of traveling by private car (close to USD 0.70) and much higher than that of a motorcycle (approximately USD 0.35). The second factor is the diminution in the purchasing power of individuals using public transportation as a result of the expenditure required to travel, as it is estimated that the 'very poor' population allocates more than 17% of their income towards transportation. And the third, related to the previous one, is the impact on citizens who must stop making trips because they do not have sufficient resources to pay the fare. According to the Bogotá Mobility Survey, lower-income citizens make an average of 0.9 motorized trips per day, while those with higher incomes make an average of 2.01 trips of these characteristics.

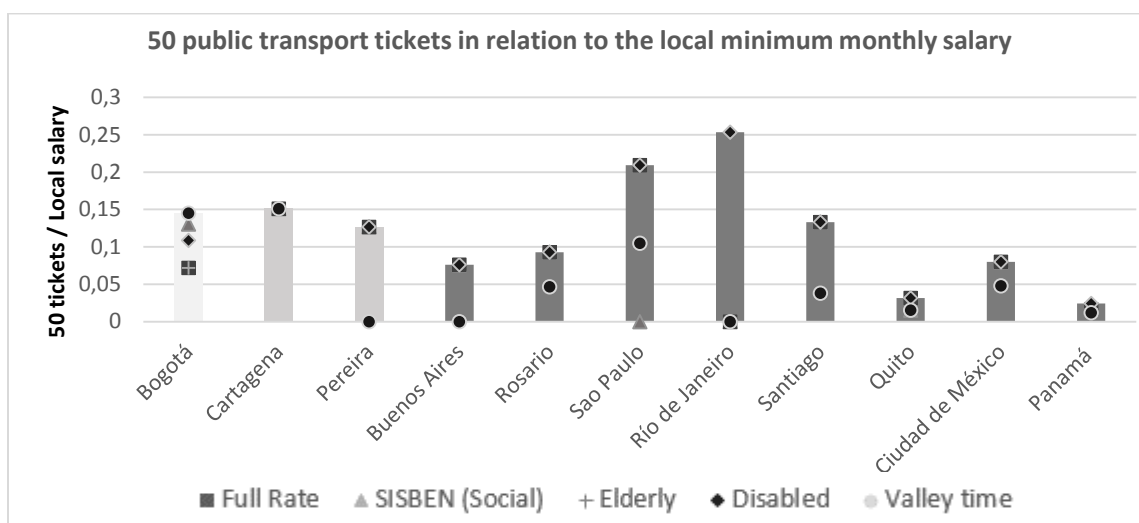


Fig. 5. Ratio of the cost of 50 public transport fares to the local monthly minimum wage. Own elaboration.

## 5. CONCLUSION

Public transportation in the city of Bogotá continues to have a high participation in the city's total trips, representing more than 30% of total trips and more than 50% of motorized trips in the city. This, despite the fact that the entrance fee to the public transportation system is among the highest in Latin America, along with the Brazilian cities, Santiago de Chile and Montevideo and very on par with other Colombian cities. On the other hand, it is important to highlight that there is an important difference in the comparison with these last cities. In most of them, higher levels of subsidy are provided for specific populations, such as the case of very cheap or even free rates for people of low income such as the elderly (as in the case of Sao Paulo and Rio de Janeiro) and students (free in Buenos Aires and Rio de Janeiro, and very cheap in cities such as Rosario, Sao Paulo, Santiago, Quito, Mexico City and Panama).

Both the possibility of offering these discounted fares and offering cheaper full fares is largely related to the amount of resources that each city and country contributes with respect to the cost of moving each passenger, that is, the fare subsidy. It is found that the city that offered the most subsidies was Buenos Aires (currently in a process of gradual dismantling), followed by cities such as Panama, Caracas, Rosario and Santiago, which subsidize more than 30% of the "technical rate". In the city of Bogotá, in practice, an amount of subsidy would be given that would be close to 9%, which would place it among the cities that generate the least contributions from the State to cover the operating costs of its public transportation.

Moving on to an analysis of its historical evolution, when the Bogotá SITP rate is analysed in US dollars, it is found that in the 24 years of operation it has grown almost double since the creation of the trunk component of the system (USD \$0.38 in 2000 to \$0.75 in 2024). However, this fare would have increased its affordability for people with lower incomes because while in the year 2000 a daily minimum wage would be enough to buy 11.50 tickets for the system, in 2024 that salary would be enough to buy 14.69 tickets, which it represents an increase of 35%, an increase that has become more pronounced since 2020

thanks to a moderate increase in the rate and a high increase in the Colombian legal minimum wage.

The results of this study could be complemented with an analysis of the impact that targeted subsidies have had on the beneficiary population and the possible impacts of deepening measures in this regard, whether by increasing the amounts of the subsidy or expanding it to other types of populations. This could complement works such as those of Guzmán et al. [34], who analyze the price elasticity of off-peak discounts that were applied in the system between 2012 and 2015, or that of Bocarejo & Oviedo [31] who analysed the impact of a redistributive rate with respect to accessibility in Bogotá. From this, a relationship of benefits and social costs of the implementation of this type of subsidy in the Colombian capital can be calculated, with a view to analyzing possible similar measures in the future.

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Received 02.03.2024; accepted in revised form 27.05.2024



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