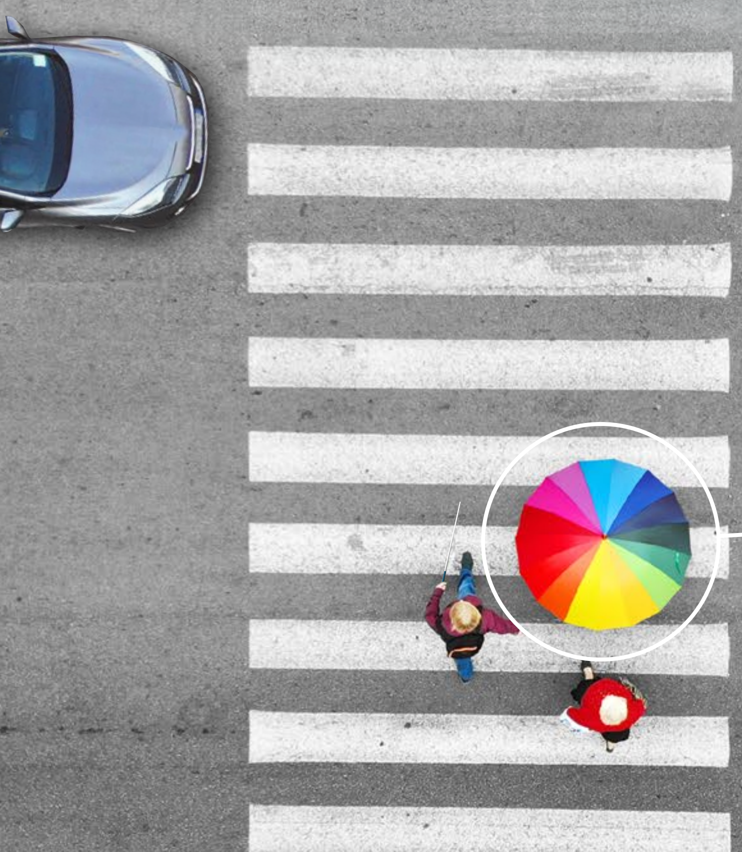
TRANSPORT FOR INCLUSIVE DEVELOPMENT

DEFINING A PATH FOR LATIN AMERICA AND THE CARIBBEAN



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Preface

Transportation is an enabler of opportunities that lead to economic and social growth, and it is essential in the daily lives of millions of people in Latin America and the Caribbean. Indeed, during the harshest months of the COVID-19 pandemic, when authorities put in place mass lockdowns to slow the spread of the virus, transportation was paramount for essential workers. That period, which seems like only yesterday, was a prime example of the intimate relationship between transport and many other areas such as the economy, productivity, the environment, innovation, technology, and social issues.

If we were to build a word cloud with the different issues that we all deal with in our daily tasks, transport would undoubtedly be in a prominent position, perhaps the predominant one. Although patterns and modes of transportation vary, all people travel, regardless of their age, gender, income level, physical ability, employment status, or place of residence. These trips enable people to go to work, access public services such as health and education, go shopping, or participate in social or leisure activities. Access to transportation facilitates and influences people's ability to meet even their most basic needs and access opportunities to improve their living conditions. It suffices to recall that conflicts surrounding public transport – a key mode of transport in the region, given its massive use – were one of the main triggers of the wave of protests that took place in Latin America and the Caribbean in 2019 and 2020.

In Latin America and the Caribbean, a region with high levels of inequality, talking about transportation and social inclusion is all the more important. *Transport for Inclusive Development: A Path for Latin America and the Caribbean* does exactly that: it places the two spheres of transport and social inclusion, whose symbiosis mirrors exactly the reality of the region, in the same equation. In fact, this book brings together not only the most relevant information available on these issues, with a clear focus on Latin America and the Caribbean, but also presents new evidence and proposals to close the social gap in transportation. As explained in these pages, providing better transportation can directly impact people's ability to escape poverty. This is particularly relevant in a region where poverty and inequality rates, which have remained at very high levels in recent decades, have increased due to the COVID-19 pandemic.

Based on the premise that transportation and social inequality are directly related, and if we bear in mind that Latin America and the Caribbean is the most unequal region in the world, it will come as no surprise to learn that the magnitude of the challenges is colossal. In other words, the analysis presented in this book is much more than a wake-up call. The descriptive and analytical work examines what should be improved and how, presenting outstanding findings on issues like the challenges that affect the most disadvantaged populations such as women and children, who are more likely to face disadvantages in transport systems, the quality of public transport, and the affordability and accessibility of rural transport, to mention a few examples.

Beyond a deeply detailed and accurate diagnosis, this book also sheds light on the path that the countries of the region can follow to address these challenges. What remains is the need to make decisive progress on this agenda: projects in the field of transport cannot be guided anymore exclusively by efficiency criteria while neglecting the needs of the most disadvantaged population groups. Transportation projects and programs in Latin America and the Caribbean must incorporate the particular needs of the most vulnerable in their design. In order to do this, as explained in these pages, better data are needed on these populations in order to inform more inclusive projects. In other words, studying mobility through an integrated, intermodal, intersectional, and interdependent perspective is essential to respond to the transport needs of women, persons with disabilities, LGBTQ+ persons, and children. This book will undoubtedly contribute to accelerating this paradigm shift, while underpinning the fulfilment of the Sustainable Development Goals in the region.

Transport for Inclusive Development: A Path for Latin America and the Caribbean provides us with a wealth of reasons to insist that the issues raised here must keep making their way forward – with increasing force – on the region's development agenda. At a time when countries continue to face the cluster of difficulties brought about by the COVID-19 pandemic – which the field of transport does not escape – this publication is called upon to play a fundamental role at all levels: governments, policymakers, academics, businesspersons, and workers. Thus, throughout these pages, which have been made possible thanks to the tireless work of a multidisciplinary group of experts, all of those actors will find facts and arguments to guide and enrich the conversation on these highly relevant topics for years to come.

With this book, the Inter-American Development Bank continues to promote steps towards a fully inclusive society in Latin America and the Caribbean, which falls under one of the medium-term strategic goals of our Vision 2025: *Promote social progress*. This publication is therefore closely related to strategic vectors of Vision 2025 such as promoting gender equality and inclusion, as well as small and medium-size enterprises, driving more digital economies and environments, and developing a more sustainable urban and rural environment in order to contribute to socioeconomic growth highly aligned with current commitments on climate change.

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The opinions expressed in this publication are those of the authors of the corresponding chapters and do not necessarily reflect the views of the IDB, its board of directors, or the countries they represent. Errors or omissions are entirely our responsibility.

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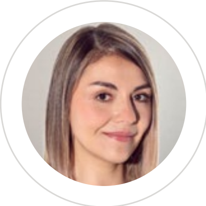

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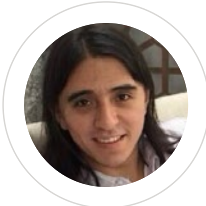

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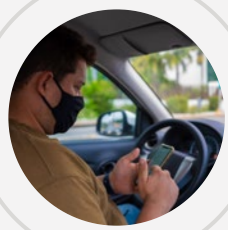
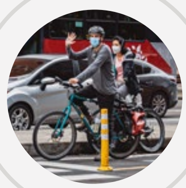
Executive Summary





Transport, Poverty, and Inequality: A Challenging Equation

Mobility and accessibility are essential elements for a dignified life and the full development of people and societies. Efficient, safe, and accessible transportation systems not only promote economic productivity and create jobs, but can increase access to employment, recreational, and other essential life-shaping opportunities that enable people to improve their living conditions and escape poverty. However, transport too often poses more, not less, barriers for people in Latin America and the Caribbean. These can include physical barriers faced by a person with a disability trying to board a public transit vehicle poorly equipped to meet their needs, or financial barriers faced by a single parent who takes children to school every day and who, due a lack of resources, must resort to using slower, or lower-quality means of transportation. Both examples are just a few of the many that can perpetuate poverty and exclusion. For poor and other disadvantaged groups that may already face differential access to employment and other economic opportunities, these transport barriers can deepen and compound existing inequities.

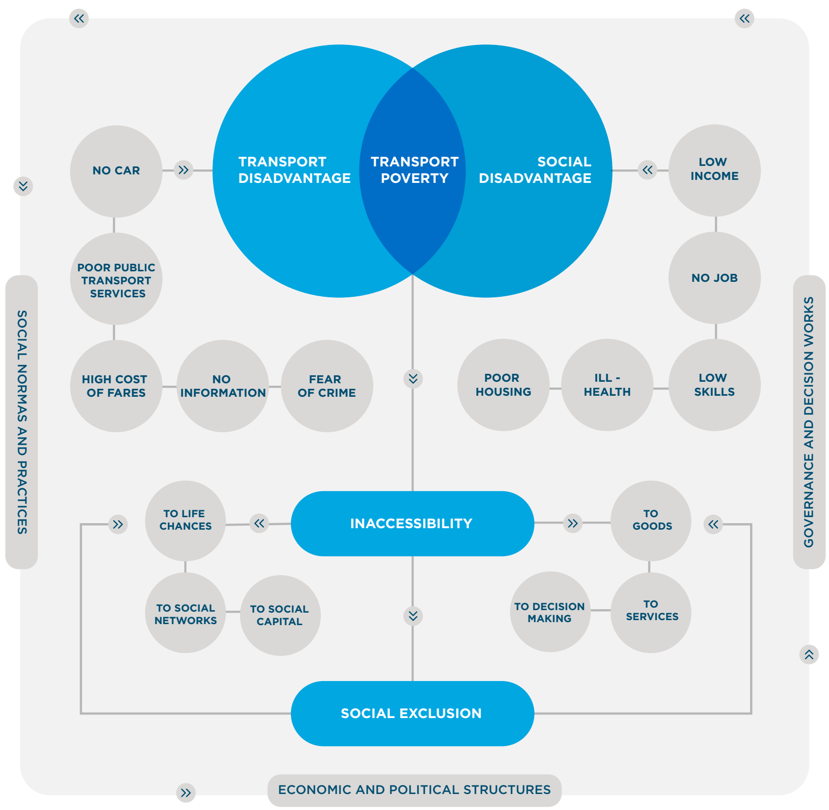
***Transport for Inclusive Development: Defining a Path for Latin America and the Caribbean* discusses the role that transport often plays in deepening social disadvantage and poverty, on the one hand, and its potential, on the other, to break the cycle of poverty and inequality** through investments and policies that better consider the needs of poor and socially excluded groups. This is particularly relevant in a region that suffers from staggeringly high rates of poverty and inequality, a reality that COVID-19 has significantly deteriorated. In 2020, approximately one-third of the region's population was living in poverty, a 10 percent increase from one year prior. Today, Latin America and the Caribbean remains as one of the most unequal regions in the world, with the share of national income held by the richest 10 percent of the population 22 times that of the share held by the bottom 10 percent.

High rates of poverty and inequality have historically placed a disproportionally heavy burden on specific population groups, such as women, children, indigenous peoples, LGBTQ+, Afro descendants, and persons with disabilities. For example, 4.4 million more Latin American and Caribbean women live in extreme poverty than men (United Nations 2018). UNICEF estimates that, worldwide, 1 billion children experience multi-dimensional poverty and children are more than twice as likely to live in poverty than adults (UNICEF 2021). Persons with disabilities are also overrepresented among the global population living in poverty and extreme poverty (WHO 2011).

Cities and Transport: the Consequences of a Rapid and Often Chaotic Growth

The interconnections between transport and poverty, inequality, and social exclusion (that are discussed in the conceptual framework on Chapter 1) are clearly visible in many cities across Latin America and the Caribbean.

FIGURE 1 A Complex Fabric: The Relationship between Transport Disadvantage, Social Disadvantage, and Social Exclusion



Source: Prepared by the authors based on Lucas (2012)..

The concentration of populations and economic activity in cities generate agglomeration economies that increase efficiency, productivity, and the potential for economic and social growth. However, rapid urbanization, motorization, and chaotic over-supply of informal public transport have placed enormous pressure on urban transport networks. A lack of urban planning and adequate investments in urban infrastructure, affordable housing, and sustainable transport, have led to high levels of traffic congestion, air pollution, and traffic fatalities. **This has resulted in poor-quality coverage of transportation infrastructure, longer travel times, a larger number of transfers when traveling to main activity hubs within urban centers, and high levels of informal transport supply.** Moreover, as the poor often live on the outskirts of cities where there is a general lack of infrastructure, they often rely on lower-quality and informal modes of public transport and on walking, which forces them to spend much more time traveling (trips by lower-income groups can take up to 90 minutes) and, when they do use public transport, to make multiple transfers leading to expenditures up to 30 percent or more of their incomes and sometimes they simply forgo trips altogether.

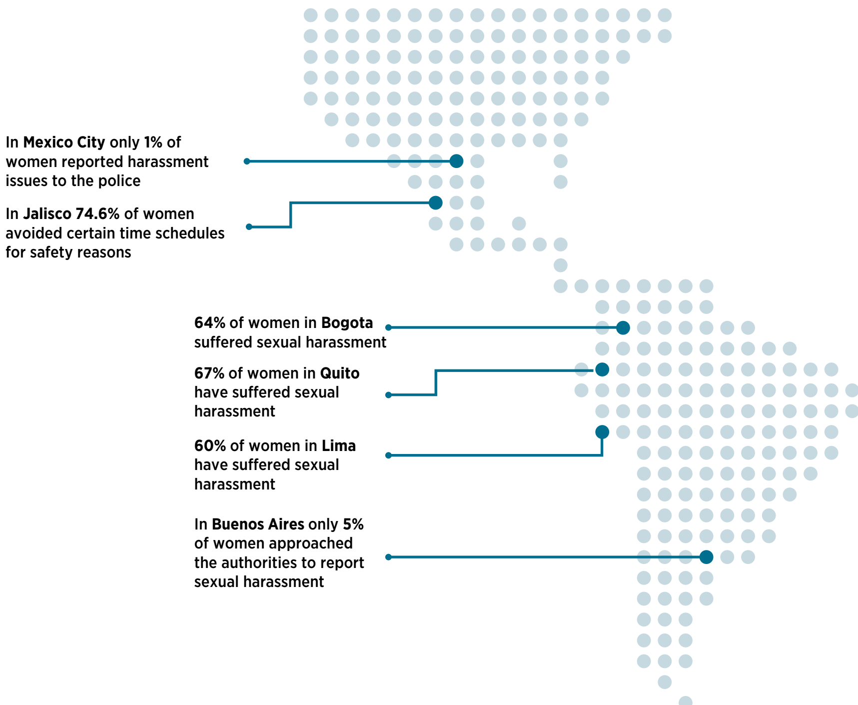
The Ignored Transport Needs of the Disadvantaged

The degree of access to opportunities can vary widely among different groups of people and is closely tied to where people live and the degree of transportation system accessibility, coverage, and affordability in their neighborhood. This is especially relevant for disadvantaged population that have been traditionally left behind during the planning of urban transport. While disadvantaged groups are more likely than others to depend on public transit and on walking for their daily mobility needs, they are also more likely to experience transport disadvantage and physical barriers in transport systems to meet their objectives of mobility. Additionally, fear of crime and sexual harassment can limit the times of day, contexts, and places that many disadvantaged persons choose to travel, particularly women.

Women often have more complex travel patterns and more diverse trip purposes, face greater financial and time restrictions, and have unique infrastructure needs. Given that women tend to take on a disproportionate share of household work compared to men, they often make more trips in a day than men (see Chapter 2) and engage in trip chaining, more non-work trips, and travel during off-peak hours. They are also more likely to travel to accompany others (such as children or the elderly) and to carry packages, strollers, or wheelchairs (Hasson and Polevoy 2011; Jeff and McElroy undated; Pickup 1984; Queirós and Marques da Costa 2012; Soto Villagrán 2019). Moreover, the amount of time they must devote to care-related trips accompanying other family members can result in time poverty that, in combination with long travel times associated with geographic segregation, can reduce the time available for them to access the economic and educational opportunities needed to rise out of poverty.

The prevalence of gender-based violence, which mostly affects women and the LGBTQ+ population, also causes fear-based exclusion from certain transport modes and times and may even lead to trip suppression and reduced labor market participation (Ferrant, Maria, and Nowacka 2014; World Bank Group and UFGE 2020). Data available for Latin American and Caribbean cities show that most women have experienced sexual harassment while commuting (see Figure 2) (Kash 2019; Montoya-Robledo 2019; Quiñones 2020; Rodas, Cardona, and Escobar 2020). For example, a survey in 15 cities worldwide revealed that more than 60 percent of women had suffered sexual harassment in public transport in Mexico City, Bogota, and Lima (Thomson Reuters Foundation 2014). However, sexual harassment is frequently underreported (Gardner, Cui, and Coiacetto 2017; Muholi 2004). Reasons for underreporting range from authorities underestimating or responding apathetically to the incident or accusing victims of provoking it, victims normalizing harassment, and bureaucratic and time-consuming processes (Dhillon and Bakaya 2014; FIA Foundation 2016; Montoya-Robledo 2019; Neupane and Chesney-Lind 2014; Quiñones 2020).

FIGURE 2 Women's Experiences of Harassment while Commuting in Latin America



Source: Prepared by the authors.

Children living in low-income areas often also experience large negative impacts due to lower access to appropriate transport infrastructure and services, adversely affecting their development and their ability to escape poverty as adults. A lack of safe spaces to play and move via active modes, and less access to recreational opportunities, healthcare, and other services in low-income neighborhoods, are associated with poor health outcomes and adverse effects on children's cognitive and social development and their future growth in society (Moreno-Monroy and Posada

2018; Chang and Romero 2018). This has also contributed to high rates of road injuries,[1] as well as to other health problems, such as high rates of obesity among children.[2] Long travel times to reach schools, associated with sprawling urban development, along with inadequate or unaffordable school transport systems, contribute to lower school enrollment and attendance and higher school dropout rates (Chang and Romero 2018). In addition, there are indirect consequences for the people caring for children resulting from the amount of time and economic resources needed to accompany children to and from school or other activities due to a lack of safe and affordable school transport systems.

Persons with disabilities and the elderly often face severe barriers in terms of physical accessibility to and affordability of adequate transportation services and infrastructure, which prevent them from freely navigating their environment and accessing opportunities. A lack of universally accessible and safe transport infrastructure and services not only creates barriers to access opportunities but also disproportionately impacts persons with disabilities, the elderly, pedestrians, women, and children and youth. Sometimes there are incidents of exclusion perpetrated by the community, drivers, or transportation service officials, as in the case of a bus not stopping for a person with physical disabilities or traveling with young children, strollers, and packages. These circumstances are forms of discrimination and exclusion that discourage people from using public transport and, in some cases, render them unable to travel independently (Hidalgo et al. 2019).

Low-income disadvantaged groups are also more likely to be more exposed to negative externalities of transport such as high levels of traffic injuries and noise and air pollution. Consequently, for poor and other marginalized and vulnerable groups that may already face differential access to employment and other economic opportunities, these additional transport-related barriers and externalities compound existing inequities by further constraining their ability to lift themselves and their families out of poverty, generating or exacerbating existing conditions of social isolation and exclusion.

The Effects of COVID-19 on Transport Systems and Users

The COVID-19 pandemic has disproportionately affected transport-disadvantaged groups, such as those without access to a private vehicle or adequate public transport coverage, or who do not enjoy the privilege of being able to telework (see Chapter 9). Before the pandemic, public transit systems in the region were already strained by rapid population growth and underinvestment

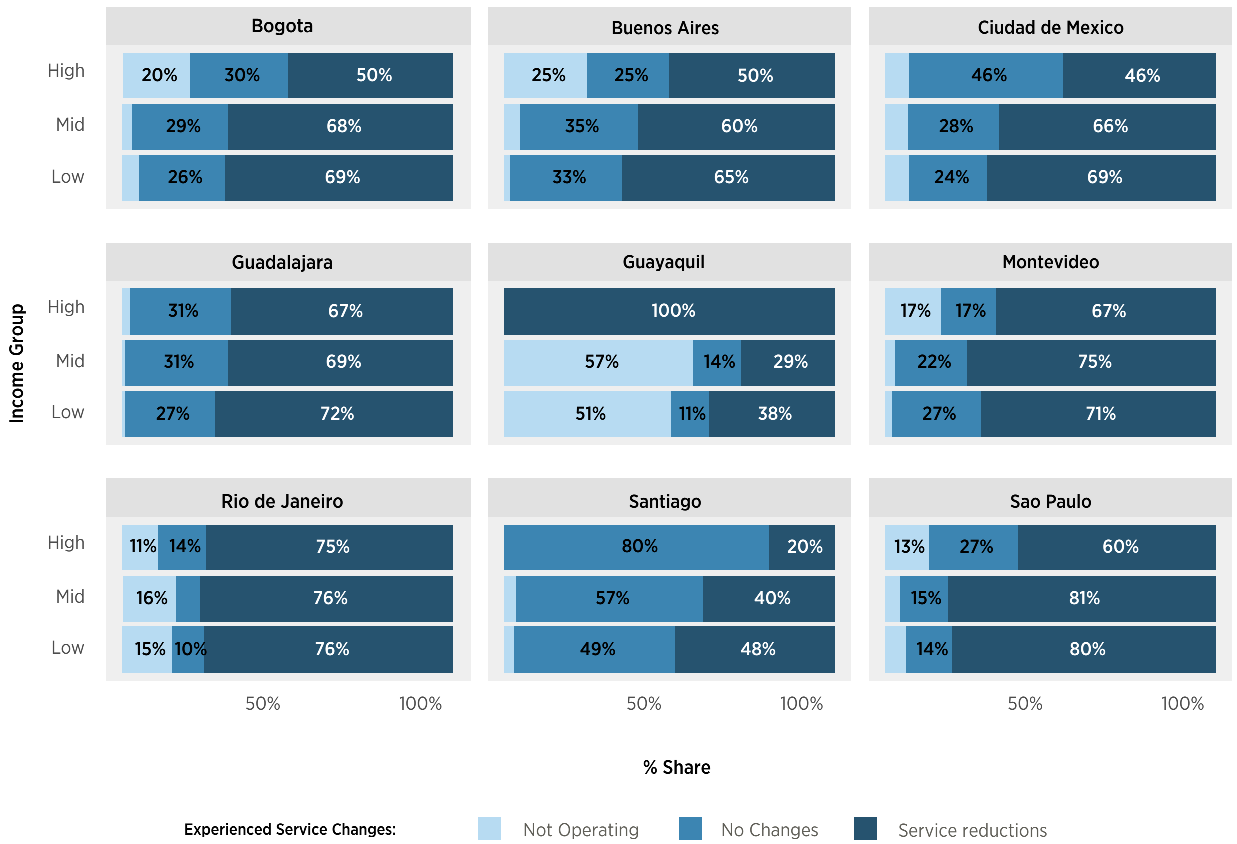
1. See the Institute for Health Metrics and Evaluation website at https://www.healthdata.org/ (accessed in August 2020).

2. For example, one in five children is either overweight or obese in the region, with lack of physical activity being one of the factors influencing (Caballero et al. 2017).

(Yañez-Pagans et al. 2019). Overcrowding in peak hours, high levels of informality, poor service quality, and safety concerns (Cervero and Golub 2007) were among the chronic problems associated with several public transit systems in the region.

The precipitous declines in transit ridership during the pandemic, combined with increased demands on operators in terms of sanitation protocols, has exacted a significant financial strain on the region's vital public transportation systems, leading to cutbacks in services and deterioration in service quality (see Figure 3). This has impacted not only workers but has also exacerbated exclusion and equity conditions for all those who continue to depend on transport systems for their daily activities. As a result, **many public transit users in the region have reported experiencing a deterioration in service levels and longer travel times**. Among public transit users between 2019 and 2020, Moovit (2020) reports an increase in average commute times of people with very long commutes (over two hours one way). On the other hand, the unprecedented increase in bicycle trips in many regions of the world has been widely regarded as a positive shift resulting from the pandemic. Buehler and Pucher (2021) found an overall 8 percent average increase in cycling over 11 European Union countries, but with a much larger increase on weekends (+23 percent) than on weekdays (+3 percent).

FIGURE 3 **Most Transit Users Saw a Decline in Transit Service Quality: Reported Changes in Experiences with Public Transit Service by Income Group (percent)**



Source: Prepared by the authors based on the 2020 Moovit-IDB Survey.

A Problem for Many: Transport-Related Social Exclusion

The previous paragraphs show that, when transport disadvantage and immobility intersect with diminished transport accessibility, the result is transport-related social exclusion. This broadly refers to the conditions under which, due to insufficient or nonexistent resources and means to travel, people are excluded because they cannot access the necessary activities and networks related to work, education, or cultural, political, and social (leisure and family) activities (Oviedo 2021; UK Social Exclusion Unit 2003; Ureta 2008; Lucas 2012; Bocarejo and Oviedo 2012; Benevenuto and Caufield 2019). For its part, efficient, safe, and accessible transportation systems not only promote economic productivity and create jobs but are important enablers to access essential life-shaping opportunities for people to improve their living conditions, participate fully in society, and escape poverty.

The Cost Burden

The cost of transport can also be a source of economic stress and vulnerability for those spending a disproportionate share of their income accessing mobility and the opportunities it makes available (Mattioli, Nicolas, and Gertz 2018). As illustrated in Chapter 5, not everyone in Latin America and the Caribbean can afford public transit, and many people have to make trade-offs between the cost of accessing public transport and other goods, services, or opportunities for themselves and/or other members of their family. Differences in affordability are interrelated with land use and functional urban configurations, transport supply structure, and pricing policies. The degree of transport affordability depends on the alternatives (e.g., the feasibility or practicality of walking or cycling as an alternative to using public transport) and other costs of living, including housing and the cost of the city's basic food basket, among other essential items in the household economy (Fay et al. 2017).

When compared to the region's average purchasing power, transport expenditures as a percentage of income in Latin America and the Caribbean, at 17 percent, were among the highest of all world regions in 2010 (9 percent in sub-Saharan Africa, 11 percent in Eastern Europe and Central Asia, and 5 percent in South Asia).[3] This suggests that **urban mobility in Latin America and the Caribbean is on average more expensive**. Those with lower incomes tend to bear the highest economic burdens of accessibility. For example, in Port-Au-Prince, Haiti, domestic workers earning the minimum wage can spend between 10 and 24 percent of their income (depending on the number of transfers required) using the semi-formal public transport service known as tap-taps.

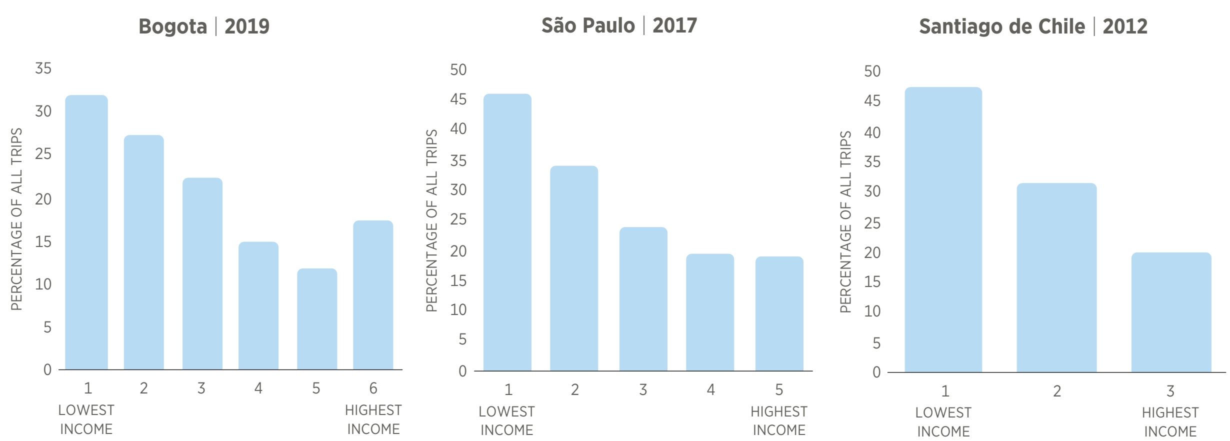
Many cities have historically implemented policies requiring that public transit systems be financially self-sustainable based on fare revenue, which requires fare rates that place a significant financial burden on poor and low-income transit riders. Moreover, public transport affordability is a heightened challenge for island states in the Caribbean given that infrastructure and provision costs are high due to geographic and logistical challenges. **Policies and investments targeting the availability of public transit for poor populations are also challenging in countries and sectors with low access rates** – in other words, in contexts where the demand is too small to bear or alleviate investment costs. Furthermore, by increasing transfer costs, a lack of public transit connectivity and integration can impose high financial burdens on poor households (Scholl et al. 2018; Suárez, Murata, and Delgado Campos 2016).

3. These figures might hide forgone trips and suffer from data issues, such as the extent to which transport expenditure is accurately measured across world regions, and the lack of available data for low-income groups. See https://datatopics.worldbank.org/consumption/sector/Transport.

The key Role of Active Transport

Active modes of transport such as pedestrian and cycling-play a central role in the mobility of low-income populations (see Chapter 6). **Walking can represent a significant share of transport modes for low-income groups in some cities in the region,** often significantly higher than for high-income groups. For example, in Bogota, São Paulo, and Santiago de Chile, from 30 to 45 percent of all trips taken by low-income persons are on foot (see Figure 4). In contrast, this share is about 20 percent for higher-income groups. Walking trips are also longer for low-income groups, who need more time on average to reach destinations, with significant adverse impacts.

FIGURE 4 Share of Walking Trips in Transport, by Income Level, in Bogota, São Paulo, and Santiago de Chile (percent)



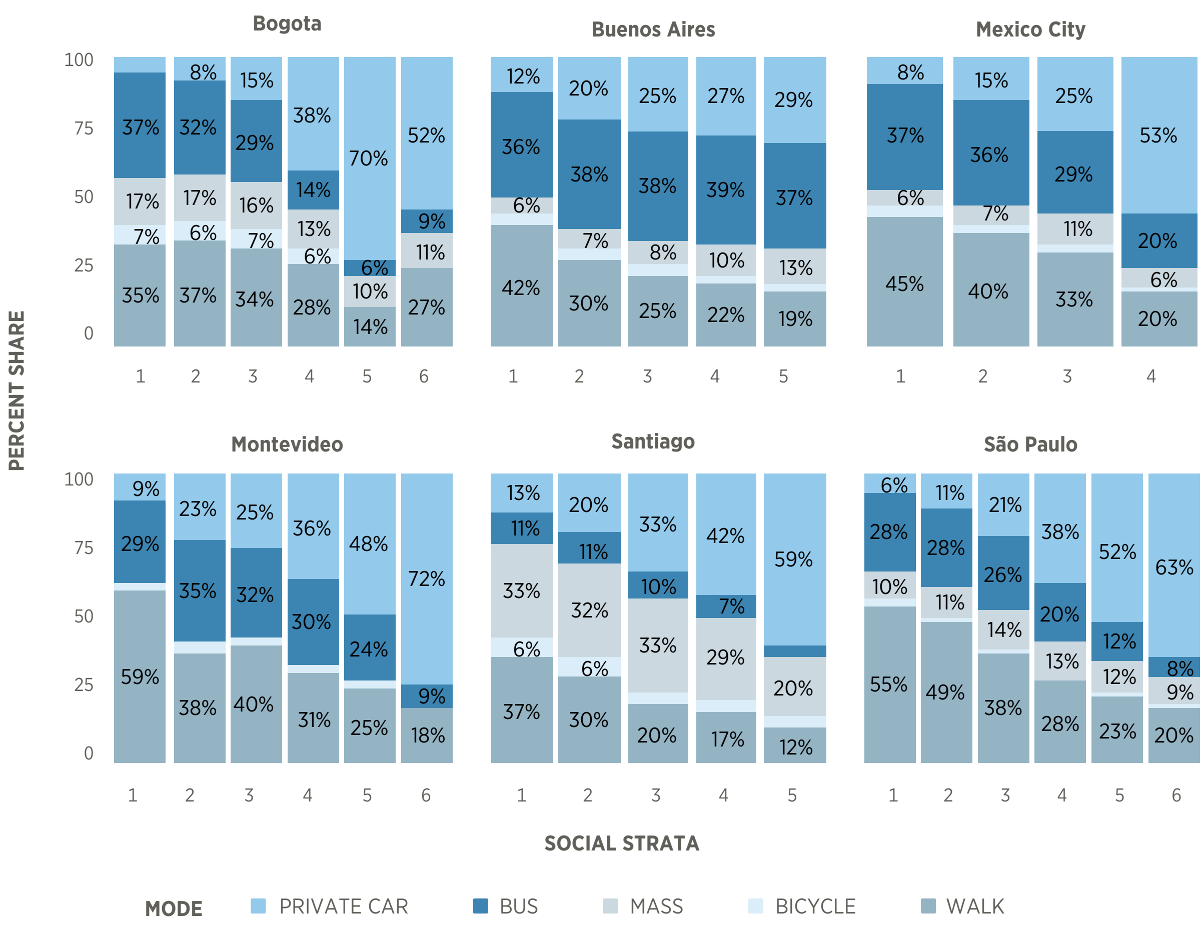
Source: Prepared by the authors based on Steer-CNC (2019), STM – Metro SP (2019), and SECTRA (2015).

For the poorest, however, reliance on active modes of transport (particularly walking) has little to do with sustainability and health benefits; instead, it is more likely driven by affordability reasons or directly to lack of access to other modes of transport (see Figure 5). **The poorest walk primarily because they have no other choice, and usually have to do so under unsafe conditions,** since income disparities in the region are also reflected in infrastructure quality. In Montevideo, for example, a study found that around 27 percent of low-income persons say they walk because they have no other transportation option, compared to just 5 percent of persons in high-income groups (Mauttone and Hernández 2017). This is especially common among women, who often walk and make trips for care-related tasks,[4] as well as in other specific circumstances. In Haiti, for example,

4. Low-income mothers walk mostly by necessity, often in unsafe pedestrian environments.

women working on mango plantations walk one-hour distances to reach their work in the morning, and they return by motorcycle in the afternoon (Gandini, Monje-Silva, and Guerrero 2021). Beyond affordability, physical distance from access points to motorized transport can also exacerbate the plight of captive walkers. Many neighborhoods in the peripheries of cities are informal settlements or slums that are poorly served by public transport services, forcing residents to walk, often long distances, for most of their trips to access goods, jobs, and services (see Chapter 4).

FIGURE 5 Comparison of Modal Shares for Six Latin American Cities (percent)



Source: Prepared by the authors based on local household travel surveys (Bogota 2015, Buenos Aires 2010, Mexico 2017, Montevideo 2016, São Paulo 2017, and Santiago 2012)
Note: Social strata groups as reported by each respective city. Social strata 1 makes reference to the lower category (less income) and 6 (or 5, depending on the country) to the higher category (those with the most income). Mexico City, Santiago, and Buenos Aires report strata levels 4,5, and 5, respectively.

Residents of less affluent communities and neighborhoods are more likely to face poor-quality or nonexistent pedestrian and cycling infrastructure (e.g., bike lanes, crosswalks, and sidewalks), which is essential for safe active transportation. Walking conditions in low-income neighborhoods are usually suboptimal at best, can be severely hazardous, and are often characterized by unpaved, weather-vulnerable, poorly lit, isolated, and insecure routes, or by heavily trafficked streets lacking adequate pedestrian infrastructure such as sidewalks, medians, and protected crosswalks. As a result, low-income walkers are disproportionately exposed to several environmental hazards, including air and noise pollution, and traffic-related risks. These harsh conditions make mobility even more difficult for specific subgroups such as persons with disabilities and women (see Chapter 2).

Most countries, except those in the Caribbean, have national or subnational policies promoting walking and cycling. However, **only 30 percent of countries have design standards to promote the safety of active transport users.** The improvement of active mobility conditions also requires the design and implementation of integrated policies that ensure the safety of pedestrians and cyclists. For example, Salvador de Bahía in Brazil was able to reduce road traffic deaths by more than 50 percent – from 266 fatal crashes in 2010 to 121 in 2017 – by bringing together institutions with the common goal of improving road safety (PAHO 2019).

The Challenging Reality of Transport in Rural Areas

In rural areas, the lack of adequate transport infrastructure and services poses significant barriers to access agricultural markets, education, and other key opportunities for rural residents. Over half of the poor in in Latin America and the Caribbean live in rural areas (ECLAC 2019a). Yet, the region faces multiple barriers to ensuring inclusive rural transport. Spatial dispersion of populations and towns has led to lower passenger demand and traffic volumes and has reduced economic incentives to invest in transport infrastructure and services. Additionally, low road density and poor road conditions increase operating costs for transport service operators and reduce transport efficiency in terms of operation time and costs, worsening agricultural productivity. The lack of available and reliable transport services limits accessibility for rural populations, especially those that lack access to a private vehicle and/or primarily depend on non-motorized transport modes. These problems are amplified by several institutional challenges in rural areas, including weak financial and technical capacity, as well as a lack of adequate data and indicators to measure rural accessibility of different transport modes and patterns of rural mobility (see Chapter 10).

Opportunities and Challenges for Socially Inclusive Transport

Better Transport Infrastructure to Respond to the Needs of the Vulnerable

In more recent years, **Latin American and Caribbean cities have begun planning and building transport infrastructure and services that respond to the needs of vulnerable and disadvantaged users** through improvements to public transit systems and infrastructure for active modes. For example, the city of São Paulo intentionally built the Lilas line of the metro system directly connecting low- and high-income residential neighborhoods to improve mobility for paid and unpaid care workers, usually women. Cities worldwide have implemented different policies to reduce gender-based violence in public transport systems. Some programs include promoting bystander interventions against gender-based violence through awareness campaigns, empowering victims to report incidents, training public transit operators and users on access to justice protocols, prosecuting gender-based violence cases, and providing medical and psychological first aid responses. Other strategies are focused on panic buttons, proper lighting of public space and transit, creation of solidarity networks among shops close to transit, women-only (sex-segregated) transportation, and collection of better data on gender-based violence (DiDomenico et al. 2000). However, fewer strategies have focused on diminishing girls' and women's fear of certain public spaces and of using public transit. There are also few strategies in place to transform the culture to stop sexual harassment, although a program in Quito working toward that goal is an exception. Moreover, more rigorous evidence on the impacts or results generated by these policies is needed to inform programs.

In terms of public transport, planning systems that can reach all users in Latin American and Caribbean cities is challenged by sprawling urbanization patterns, rising motorization, and high levels of informality in transportation, housing, and employment. Despite these challenges, **new investments in the region, with the key examples of Bus Rapid Transit (BRT) and aerial cable car systems, have demonstrated promising results in terms of the redistribution of access to public transit in order to mitigate social inclusion**. For example, in Lima, Peru, the investment in the city's first bus rapid transit system and metro line 1, resulted in substantially reduced travel times and increased security. As a result, rates of employment increased among residents living near the systems (Martinez et al, 2018). This particularly benefited women, whose labor market participation rates rose dramatically.

Nevertheless, in some cases, **traditional public transit projects focused primarily on increasing efficiency have neglected the needs of the poor or other disadvantaged groups** and widened inequalities in accessing opportunities via public transport. Constraints to financing transit related to political cycles, institutional capacity, and lack of coordination, as well as the need to maintain low operating costs, can also limit the degree to which disadvantaged groups enjoy the benefits of projects and result in unintended adverse impacts, such as longer walk times, unaffordable fares, or the divisive effects of large infrastructure that cuts through neighborhoods and/or cuts off access for the poor.

The Impact of Mass Transit Investments on Land Values

Another challenge relates to land value increases associated with mass transit investments that increase accessibility to economic activity centers. Such increases may have an upward effect on housing costs close to public transit result in the untended effect of pricing out low income and vulnerable groups who depend on transit for their daily mobility needs. However, the degree of such displacement or gentrification effects in the region's cities is currently unknown, highlighting the need for studies exploring the socioeconomic and socio-spatial distribution changes occurring as a result of the investments in mass transit corridors.

An Effective Trend: "Tactical Urbanism"

In terms of infrastructure for active modes, recently, f**lexible, low-cost, and often short-term changes to the built environment – what has been frequently coined "tactical urbanism" – has proven to be an effective way to move towards the achievement of long-term goals related to street safety, walking, and public spaces**. For example, the Panamá Camina ("Panamá Walks") intervention in 2018 included the pedestrianization of part of the busy intersection of Plaza de Mayo square in Panama City and the promotion of art and culture. The successful intervention generated 73 percent more walking space and 78 percent more visits during weekends, and according to one survey, 72 percent of visitors viewed the intervention positively and 45 percent said they felt safer.

However, these positive walkability initiatives tend to be focused in central areas with a high concentration of commercial and business activities. There is a critical need to develop and promote peripheral interventions so that low-income groups can also benefit directly from them. An example is the tactical urbanism intervention to create a safe walking route in the poor neighborhood of Alto Perú at the foot of the Morro Solar hill in Chorrillos, Lima that reduced transport costs for parents and increased community cohesion in the area of the project (see Chapter 2).

Passport to Innovation: the Importance of Technology

Technology and innovation in the transport sector have brought both opportunities and challenges when it comes to social inclusion. For example, a transition to cashless fare collection systems – such as smart-card-based systems or other types of systems that accept fares from multipurpose payment instruments that their customers may already hold (e.g., debit or credit cards or mobile payments) – is under way in many cities throughout the region (see Chapter 7). When well-designed and implemented, cashless fare collection systems can positively impact the accessibility, affordability, and safety of public transportation for low-income and socially excluded groups. For example, cashless fare collection systems can significantly shorten dwell time, that is, the time spent at stops and stations to facilitate boarding and alighting of passengers, including the time needed for opening and closing doors. This can translate into notable operational cost savings for transport service providers and time savings for passengers, which is critically important for the poor and socially excluded. Cashless systems can also improve affordability because, when cash is the only payment method accepted for transportation and there is no fare integration among or across different modes of transport, commuters are forced to pay the full fare for each leg of the trip.

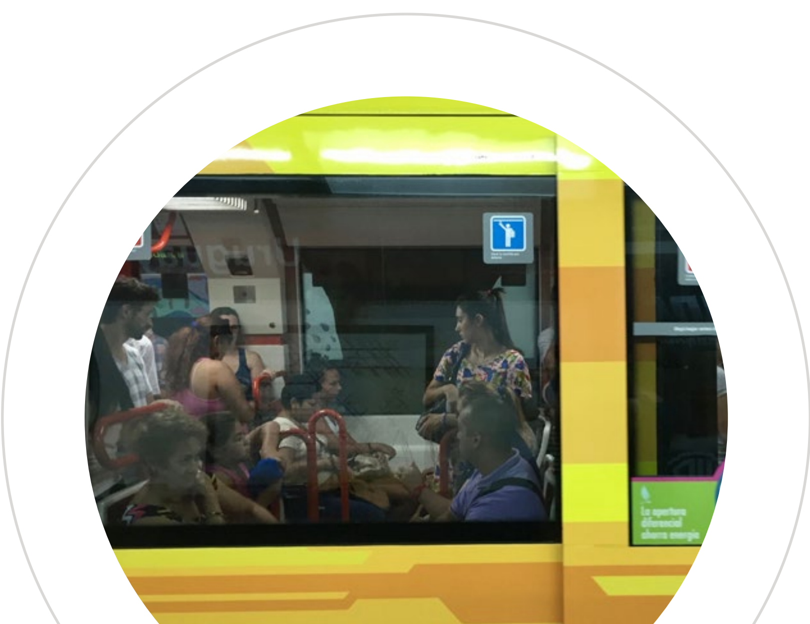
However, **while digital fare collection can significantly increase efficiency and productivity in the public transit sector relative to cash-based collection, its implementation also carries risks** in terms of potential exclusion of the poor and/or underbanked groups. For example, poor informal sector workers, with small, irregular, and often cash-based incomes, are unable to afford to store much value in a single-purpose digital fare media and tend to top-up more frequently and in smaller amounts. This requires them to spend more on transport to get to and from top-up locations. Those who are financially and digitally excluded may be charged additional fees, or face increased security and financial risks, since they rely on others for assistance. Low-income transit users who continue to purchase single-trip tickets or participate in pay-as-you-go schemes using cash may even pay higher fares, as they miss out on fare capping, fare integration, and lower per-ride rates available to digital fare media users who are able to purchase fares in bulk and in advance. If the cashless fare collection system relies on acceptance of contactless cards, transport access will be constrained for those who do not have such payment instruments.

Emerging transport alternatives based on information and communications technology have catalyzed broad transformations in urban mobility (see Chapter 8). Between 2010 and 2019, the app-based transport industry – understood as digitally enabled transport services that connect spare capacity or idle goods with demand for mobility – received a total disclosed investment of over US$49 billion. Pre-COVID-19 forecasts projected growth of 25 percent by 2025 for such services, including bike-sharing, e-scooters, ridesharing, car-sharing, and ride-hailing, with the largest investments targeting firms with origins in the United States, China, and Europe.

Depending on the context, **shared mobility innovations have the potential to either alleviate or reinforce social exclusion in urban areas across Latin America and the Caribbean**. Although there are few studies on app-based transport and transport-related social exclusion in Latin America and the Caribbean, emerging research has identified several positive benefits in terms of social inclusion. Features such as panic buttons on ride-hailing and microtransit services have improved perceptions of safety, especially for women and for people traveling at night. Furthermore, services such as shared micromobility can be instrumental in providing first- and last-mile solutions to access public transit and can also potentially improve accessibility for people who have difficulties walking or cycling. For those who can afford these services, they can also be an attractive alternative for the car-less and can delay car ownership among some individuals.

App-based companies can also serve as a source of economic activity for people wanting to gain extra income through flexible or part-time work. Ride-hailing services have provided opportunities for disadvantaged groups to access employment, as in the case of disabled drivers who are prevented by local regulations from working in the traditional taxi industry.

Conversely, **barriers to access app-based transport for vulnerable populations include a lack of affordability, coverage, and supporting infrastructure**. For instance, a lack of adequate bike lanes and wide sidewalks can make shared micromobility such as e-scooters and shared-bikes unusable, at least safely, in some parts of a city. Furthermore, ride-hailing services are heavily influenced by perceptions of crime, which can lead to the exclusion of some neighborhoods from their supply. Given the range of regulations and approaches to app-based transport services in different contexts, users can also be negatively affected by volatile fares, leading to prohibitive costs for some users. In addition, there is evidence of discrimination against different actors involved in the provision of this type of service, as well discrimination against some users due to context-specific perceptions. Another larger issue that can have both direct and indirect effects on inequality is the potential contribution of new services to congestion, vehicle miles traveled, and safety and pollution.



Looking Ahead: Achieving Equitable Access to Safe, Reliable, and Affordable Transportation Services

Comprehensive, integrated, and accessibility-based mobility planning is critical to achieve equitable access to safe, reliable, and affordable transportation services that will in turn foster social inclusion and reduce poverty and inequality in Latin America and the Caribbean. The provision of better transport can have a direct bearing on the ability of individuals to escape poverty. Leveraging the potential for transport investments and polices to reduce poverty and inequality and foster socially inclusive development demands a clear understanding of the challenges faced by disadvantaged populations in the region. It also requires drawing on lessons learned from programs to improve transport with inclusion goals in mind. Such efforts should strive to target investments in transport infrastructure and services to address existing gaps in and barriers to mobility and accessibility to opportunities, and to mitigate adverse impacts of negative transport externalities such as noise and air pollution and traffic injuries and deaths that disproportionately affect poor and marginalized groups in the region. Importantly, policies, programs, and interventions should increase the inclusion of populations suffering from transport inequalities and inequities in the decision-making process (Lucas et al. 2019).

Community Participation

When it comes to designing socially inclusive transport systems, **understanding the diverse needs of population groups is paramount to designing such systems in urban and rural areas alike**. Mobility planning that fosters social inclusion requires data disaggregated by diverse population groups, including women, children, and persons with disabilities, among others (Allen 2018). Examples of these data include transport mode choice, travel times, distances, and purposes of trips, disaggregated by socioeconomic data such as sex (and gender identity), age, disability, ethnicity, household composition, and income, among others. Data should reveal how users respond to the existent mobility services and their specific needs and should include detailed information on a range of trip purposes (in addition to work trips), including chained trips related to the mobility of care (ECLAC 2019b).

To this end, **taking steps to foster the full participation of beneficiary communities** – facilitated through participatory budgeting, interactive dialogue, and local representation in project appraisal and evaluation processes – **is critical to ensure that the process of designing and managing projects is inclusive and responsive to local needs and realities**. Furthermore, monitoring tools – such as satisfaction surveys designed to enable comparative analysis of perceptions of a range of groups, including vulnerable and low-income populations, during the preparation and operation phases of public transit systems – are needed to help provide and adjust infrastructure and services that respond to the needs prioritized by communities.

To improve gender inclusion and equality, transport planners should also design and build infrastructure to make it easy for trips related to mobility of care and reproductive work. Recommendations include installing diaper-changing stations in both male and female public transit station bathrooms, digital kiosks to pay for utilities and run bureaucratic errands, accessible signaling and maps of care-related resources, and resting places and playgrounds close to stations. In addition, more work is needed to reduce crime on public transit, as all persons, regardless of gender identity, sexual orientation, or ability, should feel safe using public transport.

Safe Streets for Children

Helping children survive and thrive is one of the most important global health and development goals. **All children and youth have the right to access quality education and adequate healthcare through efficient, affordable, and safe transport systems**. However, targeted action is urgently needed to protect them from the disproportionate burdens they now face in terms of transport externalities such as road traffic crashes and pollution.

A key measure to foster children's mobility is through the improvement of transport infrastructure with their needs in mind. According to the report "Designing Streets for Kids" by the Association of City Transportation Officials (NACTO) in 2020, the design or redesign of urban streets through the lens of children can improve road safety and mobility for everyone by promoting street improvements in relation to reliable mobility choices, space, visibility, play and learning, places to pause and stay, social interaction, security, and a safe environment. These improvements should be made in order to upgrade the actual design (meet basic needs), set minimum standards to improve safety accessibility and mobility, control speed (child traffic fatalities are preventable by designing for safer speeds), and extend the street experience into adjacent spaces. Streets that are safe are also enjoyable, nurturing, and inspirational for children and caregivers alike. In fact, helping children in their formative years safely interact with their environment improves their cognitive development and educational achievement and builds a strong foundation to make them independent and responsible adults.

Universal Design

In line with the prior discussion, **the application of universal design principles is fundamental to improving accessibility to transport and public spaces for persons with disabilities as well as other user groups**, including the elderly, children, and parents traveling with strollers and packages. The concept of universal design and accessibility rests on the assertion that public space and transport infrastructure should be designed in a way that is accessible to everyone, regardless of the users' abilities. Universal design and accessibility are centered around seven principles:

1. Equitable use for people with diverse abilities
2. Flexibility in use that accommodates a wide range of individual preferences and abilities
3. Simple, easy to understand, and intuitive regardless of the user's experience, knowledge, language skills, or current concentration level
4. Perceptible information regardless of ambient conditions or the user's sensory abilities
5. Tolerance for error that minimizes hazards and the adverse consequences of accidental or unintended actions
6. Low physical effort with a minimum of fatigue
7. Size and space for approach and use regardless of a user's body size, posture, or mobility.

These standards are supported by the Convention of Rights of Persons with Disability, the international treaty that came into force in 2008 and has been ratified by 182 countries. Their implementation is fundamental to ameliorate inequalities associated with the barriers faced by persons with disabilities, and it benefits all users, not only individuals with disabilities.

Improving Public Transit Coverage, Quality, and Affordability in Underserved Areas

Coverage and Quality

As discussed in Chapter 3, public transportation has been recognized in global transport and urban development policy and practice as a cost-effective and sustainable mechanism to enable daily mobility and accessibility for thousands of urban commuters. **The region urgently needs to continue improving the coverage and quality of public transit systems, targeting poor and underserved areas, and implementing policies to mitigate the negative impact of the pandemic**. Investments in public and non-motorized transport infrastructure and services should target existing gaps in and barriers to mobility and accessibility to opportunities that so often disproportionately affect poor and marginalized groups. The experiences of various Latin American and Caribbean cities with different forms of formal and informal public transit illustrate a need for a more disaggregated approach to planning and decision-making in the public transport sector. Moreover, these experiences point to a need for an accessibility-based approach to planning for public transit systems that increases coverage, quality, and integration, targeting areas where disadvantaged populations lack access based on a nuanced and deeper understanding of the socioeconomic composition of the population and its needs, preferences, and abilities. Accessibility metrics such as the Cumulative Opportunities Index that require relatively low amounts of data and are easily comparable across jurisdictions can help with this objective (see Chapter 1). It is also recommended to set benchmarks and targets for service standards (see Chapter 4) and minimal levels of access to public transit in order to inform decisions geared towards reducing inequalities across income groups.

Improving public transit coverage and quality also requires recognition of the functional configuration of cities beyond municipal jurisdictions. Approaches to metropolitan planning can contribute not only to more equitable allocation of resources, distribution of routes, and frequency of public transit services, but can also allow for agreements and coordination of operations in areas with high demand that are not adequately serviced by networks restricted by municipal boundaries. Metropolitan coordination is necessary to guarantee that jurisdictional issues will not compromise the continuity and coverage of transportation services. Participation and representation should also be extended to the informal and small-scale operators currently meeting the needs of under-served communities. Despite their lower quality and externalities compared to high-capacity and modern public transit systems, these services are flexible and adaptable to local needs. They are also embedded in communities and have networks that can facilitate the processes of formalization and modernization of public transport supply to low-income neighborhoods.

Operational and fare integration with other current systems and with alternative modes of transport are also critical to foster socially inclusive systems. These initiatives can be complemented by efforts to improve service quality – for example, developing strategies for personnel training directed to customer service and implementing quality indices that allow for benchmarking customer satisfaction, identifying the performance of several independent quality attributes, and establishing a global measure of quality that can be disaggregated by income level, socioeconomic characteristics, and neighborhood and planning zones. Finally, cities should work to increase the allocation of road space for public transit (e.g., dedicated bus lanes) and active modes, and the integration of systems across public transit and other modes, including walking, cycling, and micromobility (e-scooters and e-bikes) to improve first- and last-mile access to public transit in low-income areas (see Table 4.4 in Chapter 4; see also Chapters 6 and 8).

Affordability

To improve public transit affordability among disadvantaged populations, **cities should implement targeted supply-side and demand-side subsidies** (i.e., transfers of resources from the public sector to users and operators), **differentiated fare schemes, fare integration, and targeted improvements in public transport supply in areas previously disconnected from public transit**. This could alleviate the burden of transport affordability for both the general population and different disadvantaged groups. System integration and the implementation of integrated tariffs in already consolidated public transit systems can also increase demand and affordability among low-income groups (Yañez-Pagans et al. 2019). Projects directed toward physical integration of public transport services have been implemented in a significant number of cities in the region in the last two decades. However, while fare integration without implementing widespread institutional, operational, and infrastructural reforms is possible, positive results in terms of affordability have typically followed physical integration of services that work to bridge the large spatial gaps created by decades of socio-spatial segregation in cities in the region. Affordability benefits in these cases are related to reducing the excessive costs associated with the transfers between independent, localized, and often informal services to mass transit or other forms of higher-capacity or longer-distance public transit services (Cervero 2014; Rodriguez et al. 2017).

Other measures such as the provision of affordable housing near areas with a concentration of opportunities, that, in turn, reduce average distances needed to travel to access jobs, services, and other key activities, along with and initiatives to improve the gathering, systemization, and availability of disaggregated data to enable improved target of subsidies for public transit and housing to vulnerable groups, can also serve to improve affordability. Differentiated fare mechanisms that reduce the economic cost of accessing public transport for socially and transport-disadvantaged populations range from discounted fares for the elderly and disabled to spatially and temporally differentiated fares. However, most subsidies in Latin America and the Caribbean have deficiencies when it to comes to targeting those most in need. Precisely identifying these vulnerable users requires detailed information and therefore instruments for data collection and management that can inform the mechanism to select beneficiaries. Pricing measures coupled with other structural interventions such as improving coverage and quality can go a long way towards reducing time and monetary costs for the poor. **Policy remedies should also recognize that time-related travel needs can also contribute to affordability challenges for different population groups**, such as people whose livelihoods may depend on traveling at night or in the early morning, and who often do not have access to public transport. Finally, it is important to define long-term affordability targets and synergize current public transport agendas with affordability objectives.

Given the significant affordability barriers faced by low-income and disadvantaged groups and the importance of walking for their daily mobility, **improving infrastructure and conditions for active**

transport for all is also key to encouraging more sustainable, socially inclusive, and equitable transport solutions in the region. Cities and rural areas alike can improve access for under-served groups by focusing on and integrating four main areas of action: (i) developing non-motorized infrastructure and services, (ii) increasing citizen participation, (iii) improving planning and regulation, and (iv) integrating non-motorized transport services into a more connected network. Improving access to better-quality and more integrated active transport services that are supported by appropriate and high-quality infrastructure represents an opportunity to improve accessibility for low-income groups.

Achieving the goal of improved infrastructure for active transport modes will require increased citizen participation, greater emphasis on planning, and strong support from public policymakers in the region. The potential of active transport modes lies in recognition of their crucial role in achieving sustainable systems and the synergies with other transport modes, especially public transport, to improve access for under-served groups.

Taking a Multisectoral Approach through Transit Oriented Development

Recognizing that transport is not an end in and of itself, but rather an enabler to reach opportunities, cities should take a multisectoral approach to improving it. For example, this could entail coupling development projects that improve healthcare, education, or job training for vulnerable groups with investments and subsidies for transport services targeted toward beneficiaries of those programs. Also, within a wider policy framework, these projects can strengthen coordination between the transportation, land-use planning, housing, and other sectors for which reducing poverty, inequality and social exclusion are also among the priorities.

Transit-oriented development approaches that enable equal access to opportunities for low-income and disadvantaged populations are critical to fostering more socially and environmentally sustainable mobility landscapes. This calls for integrated land-use and transport planning that promotes a compact urban form and a diverse mix of land use, including day care, offices, and shopping near public transport stations, to make mobility more efficient. It also calls for developing high-quality pedestrian environments that support active modes (such as walking and cycling) around and connected to public transit corridors and stations, which serves to improve accessibility and increase public transit ridership. Additionally, affordable housing initiatives clustered around and linked to mass transit infrastructure are urgently needed to improve the social inclusion of transit investments, and projects should also include meaningful social equality and accessibility indicators to evaluate the effects of transit-oriented investments on the poor. While land-value-capture mechanisms should be explored as a way to financially support transit investments and affordable housing near transit systems in cities, more knowledge and policies are needed to avoid the potential unintended effects of gentrification from land-value increases associated with transit investments.

Recovery from COVID-19

Moreover, **the implementation of policies to mitigate the negative impact of the pandemic on urban mobility is salient to reducing poverty, inequality, and social exclusion and to aiding the region's overall recovery from the COVID-19 pandemic**. Increasing financing to bolster transit systems that are struggling as a result of the pandemic to retain user bases, as well as building resilient funding mechanisms for long-term sustainability, are urgently needed to support the region's transit systems. Continuing to expand gains in infrastructure for active modes of transport and extending these efforts to lower-income areas that lack safe pedestrian infrastructure could go a long way towards providing socially inclusive, sustainable, and safe mobility and access.

Poverty Reduction Through Socially Inclusive Rural Transport Investments

Investments in rural transport infrastructure and services are critical to facilitate access by rural populations to the economic opportunities and basic social services that ultimately contribute to alleviating rural poverty and improving rural livelihoods. By reducing the operational costs of and time required to transport agricultural goods to marketplaces, improved transport links can extend the range of profitable activities. This in turn improves the agricultural supply chain and access to export markets and can also reduce production costs by lowering the transport price of inputs, which increases profitability for rural farmers. In addition, case studies have shown that road investments have had benefits that extend beyond increases in agricultural income, including access to non-farm job opportunities and improved school attendance and healthcare visits through the generation of local transport services (Gannon and Liu 1997; Sánchez 2016).

Along with enhancing rural connectivity and accessibility through higher density and quality improvement of rural transport infrastructure, policy actions should aim to promote active community participation in project areas and generate synergetic interventions related with rural development. Additionally, **reliable, safe, and affordable rural transport services should be fostered through facilitating various transport modes for different mobility needs**. Strengthening financial and technical capacity of local institutes and regular project monitoring and evaluation can go a long way in closing the knowledge gap in observing socio-economic impact of rural transport on local communities.

Digital Technologies

Digital technologies should be harnessed to diagnose and improve transit service demand responsiveness, security, and quality, and to enable data collection to improve social inclusion in the transport sector. This digital potential remains largely untapped in Latin America and the Caribbean. For example, from a perspective of equality and inclusion, proactively regulating cashless fare collection systems and app-based transport services to shape their evolution becomes more pressing as these technology applications expand in the region.

To be truly inclusive, **strategies to automate fare collection and encourage adoption of digital fare media must engage all users of the transportation system**. In Latin America and the Caribbean, such strategies should be specifically designed to be accessible and provide benefits to the poor, un(der)banked, and digitally excluded. While there are many challenges associated with ensuring that cashless fare collection systems are inclusive and accessible to these populations, the recurrent nature of transport payments, coupled with their pervasive reach across socioeconomic groups, gender, age, and other characteristics, highlights the potentially compelling case to incentivize and advance financial and digital inclusion in the region, while facilitating access to more efficient mobility services for all. To this end, measures that could make shared mobility a powerful aid to urban mobility equity include (i) allowing for alternative payment mechanisms for lower-income communities, (ii) ensuring coverage throughout cities, and (iii) designing integrated cashless payment systems.

App-based transport platforms have the potential to improve demand responsiveness. as data (e.g., geo-location, direction and speed of travel, and capacity) can be used to find an available scooter or bus with available seats. **Establishing alliances and agreements with ride-hailing and micro-transportation companies can facilitate more efficient, affordable, and inclusive first- and last-mile mobility services, making economic and other human capital development opportunities more accessible within a reasonable time and cost**. A thorough understanding of the policy incentives and disincentives that can lead to more inclusive, equitable, and sustainable behaviors associated with app-based on-demand transport that can inform policy and regulation should be given high priority in transport planning research and practice in Latin America and the Caribbean.

Furthermore, **it is urgent to promote discussions on inclusive fare collection systems and app-based mobility services to inform decision-making and open spaces for more conversations on governance and regulation in order to maximize their positive inclusion effects**. For example, the public sector should set clear policy stances and regulations that make supply distribution more inclusive both spatially and economically. The challenge of sexual harassment and gender violence on public transit highlights the importance of exploring how technology similar to that used by transport network companies can be applied and adapted to the public transit context in order to improve safety for vulnerable populations.

Finally, **leveraging these transit modes to harness new data and improve efficiency and equity beyond that guaranteed by traditional systems is a key potential area for future research**. For example, use of real-time data from Transportation Information Systems can be used to support decision-making, improve the quality and reliability of services, and inform users about delays, detours, road works, or closures, giving users a tool to plan ahead and increasing system reliability, particularly in low-income areas.

Promoting equitable, accessible, and affordable mobility for all will require synchronized and well-targeted public policy efforts and stronger institutions. Given the host of socioeconomic challenges facing Latin America and the Caribbean, this is no small challenge. However, by embracing more data-driven, technology-enabled, and accessibility-focused measures, and by strengthening and integrating planning institutions responsible for transport and land use planning and investing in transport infrastructure and services that are intentionally designed, implemented, and monitored to be inclusive, policymakers can make great strides towards ensuring that mobility effectively serves as an enabler of social and economic progress rather than a barrier to it.


TransMilenio
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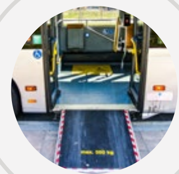
The Challenges of Delivering Socially Inclusive Transport in Latin America and the Caribbean



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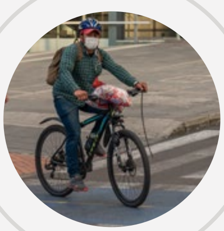

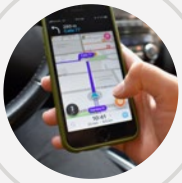

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Mobility is a cornerstone of daily life. While travel patterns and modes of transport may vary, individuals from all walks of life – regardless of age, gender, income level, physical ability, employment status, or urban or rural residence – take trips to get to work, access public services like healthcare and education, purchase goods and services, or take part in social and leisure activities. This defining characteristic of transport as a derived demand driven by the desire to access other goods and services also makes it a universal need. Access to transport facilitates, and therefore influences, one's ability to meet even the most basic needs and access opportunities to improve living conditions.

The degree of access to opportunities that transport provides can vary widely among different groups of people and is inextricably linked with where they live and their individual characteristics and capabilities, such as income, age, and ability, as well as the land-use patterns and the degree of transportation system accessibility, coverage, and affordability in their neighborhood. For those who live close to job centers, a short trip – on foot, by public transport or by private car or motorbike – can provide access to a wide range of lucrative employment opportunities. Conversely, people living on the outskirts of the city are likely to face significantly longer travel times and incur higher financial costs to access those same opportunities, which may instead require a 90-minute trip, especially if traveling by public transport. When affordable transportation to reach key destinations and economic centers is unavailable, those living farther away may be limited to jobs closer to home, often with lower wages, fewer employment benefits, or lower-quality working conditions.

When transport disadvantage – or lack of access to transportation – intersects with poverty, inequality, and social disadvantage, the result is transport-related social exclusion (Suzuki 2022; Colleoni, 2016; Burchardt, Le Grand, and Piachaud 2002; UK Social Exclusion Unit 2003; Lucas 2011, 2012, 2019). For the poor and other marginalized and vulnerable groups that may already face differential access to employment and other economic opportunities, additional transport-related barriers compound existing inequities, and further constrain their earning potential and thus their ability to lift themselves and their families out of poverty, generating or exacerbating existing conditions of social isolation and exclusion. The same can be said for access to other public and private services and human capital development opportunities that may interact with transport poverty through housing location and affordability to not only help determine the quality of life in the present, but directly influence the ability to improve it for the future. With stubbornly high – and rising – rates

1. The authors of this chapter are grateful for the contributions and feedback from Juan Pablo Bocarejo and Daniel Oviedo on this chapter.

of poverty and inequality, affordable, inclusive, and accessible transport is essential to fostering a more equitable future for Latin America and the Caribbean.

However, rapid urbanization and motorization in the region have led to several challenges, including high levels of congestion, air and noise pollution, and traffic fatalities, that tend to disproportionately affect already-disadvantaged populations. Investments in high-quality public transit systems have not kept pace with urban growth (Yañez-Pagans et al. 2019; Lucas 2019; Rivas, Suarez-Aleman, and Serebrisky 2019). Moreover, rapid urbanization has led the poor to seek housing in far-flung peripheral areas of cities with poor connectivity to formal transport networks, and where infrastructure is of low quality or nonexistent (Oviedo and Titheridge 2016; Oviedo and Davila 2016). In combination with sprawling development patterns, this has challenged the ability of governments to deliver efficient and effective public transit, reducing access to employment centers, particularly for those who live far away from them, and contributing to higher levels of unemployment and underemployment, particularly for already-disadvantaged individuals who may have access only to slower, less-efficient transport modes (Gannon and Liu 1997; Crankshaw 2014). In the case of rural areas, the spatial dispersion of the rural population, which results in low passenger demand and traffic volumes, translates into reduced economic incentives to invest in transport infrastructure and adequate availability of transport services. Furthermore, poor road conditions increase operating costs for transport operators and limit accessibility for rural dwellers, especially those who lack access to their own vehicle or mostly depend on non-motorized transport.

This book discusses the role that transport often plays in deepening social disadvantage and poverty and its potential to break the cycle of poverty and inequality through investments and policies that take into account the needs of poor and socially excluded groups. Following the conceptual framework for accessibility and social exclusion discussed below, the book explores the multifaceted dimensions of transport-related social exclusion, offers potential solutions to these challenges, and presents several case studies where they have been successfully overcome. It also examines the ways in which these concepts apply in urban and rural settings, how they differentially impact transport and socially disadvantaged populations, coverage, and quality of infrastructure for both active modes (walking and cycling) and public transportation in lower-income or disadvantaged areas, and how the increasing adoption of technology introduces prospects and perils for transport equity in Latin America and the Caribbean.

This chapter draws on examples that illustrate some of the main challenges faced by transport users in the region in order to present an in-depth analysis of the interconnections between poverty, inequality, and social exclusion and how these structural challenges intersect with transport poverty in the region. By defining key concepts and presenting a conceptual framework for understanding the direct and indirect impact of transport on access and inclusion, this chapter also paves the way for the rest of the book, which discusses the roles of transport coverage, quality, and affordability. This chapter and those that follow offer insights into where and how transport systems could be further developed and improved to better facilitate access to employment and human capital development opportunities, and thereby reduce poverty and inequality and drive social inclusion in the region.

Chapter 2 argues that when it comes to designing inclusive transport systems, one size does not fit all and understanding the needs of vulnerable and transport-disadvantaged populations is paramount to designing inclusive transport systems in cities. It explores the lack of equitable and inclusive access to safe, reliable, and affordable transportation systems and public spaces and how this excludes disadvantaged populations from accessing the opportunities and services that tend to be concentrated in cities. The chapter begins by diagnosing the main mobility challenges faced by disadvantaged populations in Latin American and Caribbean cities, with a special focus on women, children, and persons with disabilities and reduced mobility. In the chapter, disadvantaged populations refer to groups that cannot fully participate in the social, political, economic, and cultural systems of their societies due to structural inequalities. The chapter highlights the differences in travel patterns among transport users while describing transport affordability and urban accessibility issues. It points to the need for more research on the transport barriers faced by other disadvantaged or historically marginalized groups that live in urban areas, such as afro-descendants and indigenous peoples.

Today, 8 out of 10 people in Latin America and the Caribbean – the most urbanized developing region in the world – live in cities, and the urban population is expected to reach nearly 90 percent by 2050 (United Nations 2018). Although cities offer opportunities to drive innovation due to the density of knowledge and economic activities, the uneven distribution of employment opportunities and services, the imbalances in access to housing and job opportunities for the entire population, and the difficulties of providing access to urban services for all urban dwellers may also increase socio-spatial inequalities. **Chapter 3** describes emerging issues related to the trade-off between affordable housing location and transport availability. It explores the effectiveness of large-scale affordable housing developments in the region from a mobility and accessibility perspective. The recent promotion of transit-oriented development projects in Latin America and their impact on urban transformation, including unintended consequences in terms of equity, are also examined. The chapter closes with a set of recommendations for better integration of land-use planning and urban transport to achieve equity outcomes in the region.

With the role of urban development patterns discussed in Chapter 3 in mind, **Chapter 4** assesses how coverage and quality of public transport services affect the degree of accessibility for low-income populations, illustrating access to affordable and high-quality public transport systems as a fundamental concern in understanding transport-related inequalities and rectifying transport's role in generating social exclusion. The chapter adopts a critical view on the inequalities between social groups stemming from the distribution of public transport in cities in the region, and the ways in which the distribution of public transit may adversely affect the poor and socially disadvantaged.

Continuing the focus on transport inequality, **Chapter 5** shows that not everyone in Latin American and Caribbean can afford public transit, and many people have to make trade-offs between the cost of accessing public transport and other goods, services, or opportunities for themselves and/or other members of their household. Disparities in affordability, both in terms of aggregate travel expenditure for public transit users and those with lower incomes in cities, illustrate how differences in affordability are attributable to land-use and functional urban configurations, transport supply structure, pricing policies, integration, and informality, among other factors. Women, informal settlers, and people in need of care are some of the most vulnerable to being priced out of public transit and therefore most likely to be prevented from fully participating in the opportunities that cities in the region can offer.

Chapter 6 examines the crucial role of active transport modes in the mobility of low-income groups. The objective is to understand the active transport landscape in the region and identify policies that could improve mobility and accessibility for the most disadvantaged and promote social inclusion. The chapter begins by presenting the challenges of active travel and the scale of the problem for low-income persons who are dependent on these modes, including disparities in availability and quality of infrastructure, as well as safety risks. The chapter then identifies the potential benefits of integrating active transport modes with public transit and closes with an analysis of policy actions to improve active transport and enhance mobility for low-income populations.

Next, delving into the growing trend toward the application of technology in the transport sector, Chapters 7 and 8 present the potentially serious implications of this development – in terms of both risks and opportunities – for the poor and other marginalized groups.

Chapter 7 focuses on cashless fare collection, which can range from smart cards issued by transport service providers to open-loop systems that can accept card- or mobile-phone-enabled payment methods that customers already have in their wallets. The analysis considers the ramifications of cashless fare collection for the un(der)banked and digitally excluded. It draws attention to significant structural challenges – economic and transport sector informality, low levels of financial inclusion, and cost and skill barriers that constrain digital adoption – that place poor informal sector workers at risk or make it more difficult for them to accrue the benefits of cashless fare collection. On the other hand, the chapter identifies several potential advantages of purposefully designed, inclusive fare collective systems – such as improved efficiency and user experience, more affordable transport through fare integration, more efficient targeting and delivery of subsidies, and improved pandemic response – all of which could significantly benefit poor and socially excluded communities. Chapter 7 closes with recommendations, broadly classified into three categories – legal and regulatory, technical, and operational, and public policy – that could help cities develop inclusive, pro-poor cashless systems.

Chapter 8 discusses the role that app-based transport services may play in either exacerbating or ameliorating transport-related social exclusion and transport (dis)advantage. The chapter focuses on the implications for (in)accessibility and social (in)equality, how the services are distributed and used, and their impact on different social groups. It identifies how emerging transport alternatives based on information and communication technology (ICT) have catalyzed broad transformations in urban mobility at the local neighborhood and city levels. Between 2010 and 2019, the app-based transport industry – understood as digitally enabled transport services that connect spare capacity or idle goods with demand for mobility – received a total disclosed investment of 50.3 billion euros. Pre-COVID-19 forecasts projected growth of 25 percent by 2025 for such services, including bike-sharing, e-scooters, ridesharing, car-sharing, and ride-hailing, with the largest investments targeting firms with origins in the United States, China, and Europe. Despite this, the potential of these services to either alleviate or exacerbate existing social inequalities, as well as their role in the mobility and accessibility of low-income and socially disadvantaged urban populations, has been otherwise largely unexplored.

Chapter 9 explores the impacts of the COVID-19 pandemic on transport-related disadvantage and exclusion, and the ways in which it has disproportionately impacted Latin America and the Caribbean as a region. In particular, the chapter illuminates the disparate effects on lower-income, car-less, and transit-dependent populations, many of whom did not have the option of teleworking, and the reduction in quality and availability of transit services for those who had no other choice but to keep commuting, It highlights the impact of the dramatic decline in ridership in response to lockdown orders and the subsequent contraction of economies on the financial health of transit operators that rely primarily on fare revenues to cover operational expenses. The chapter concludes by recommending policy measures and investments that could help catalyze the post-pandemic recovery of the region's transport systems.

Over half of the poor in in Latin America and the Caribbean live in rural areas (ECLAC 2019). **Chapter 10** sheds light on how the lack of adequate transport infrastructure and services in rural areas poses significant barriers for rural communities to access agricultural markets, education, and other key opportunities for development. In this regard, the chapter reviews the socioeconomic impact of transport on rural dwellers and provides a diagnosis of the mobility challenges faced by rural communities. The chapter then advances the analysis of how rural transport infrastructure and services can be leveraged to generate pro-poor impacts in the region through effective policy actions at the nexus of transport and sustainable and inclusive rural development.

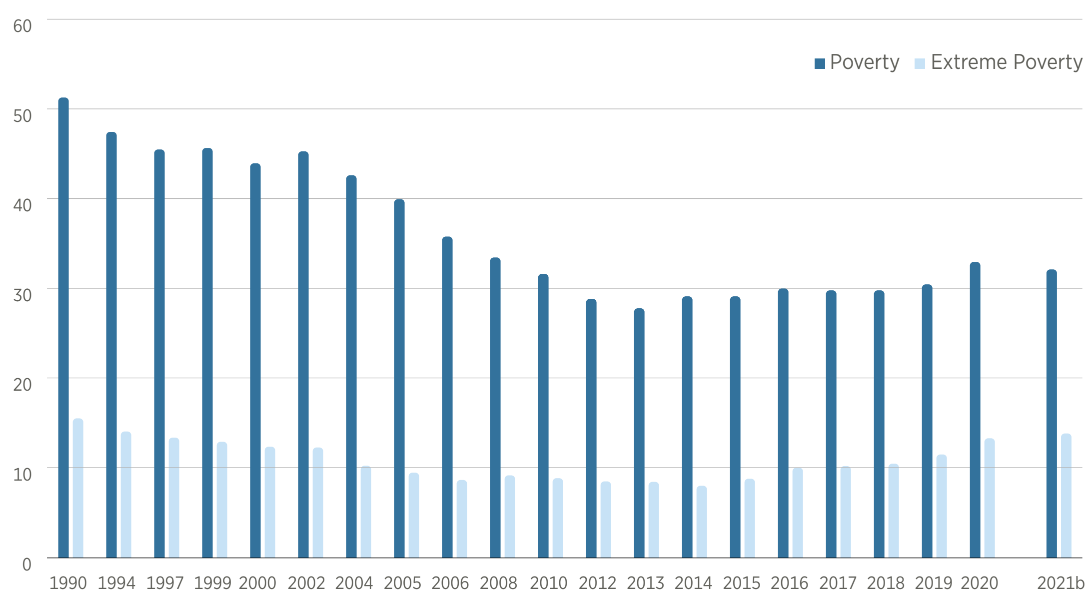
The book closes by bringing together the topics discussed in the preceding chapters to identify intersectionality between and across the many different socioeconomic characteristics that drive conditions of poverty, inequality, and social exclusion. A critical theme underlying **Chapter 11** is that the countless connections with other structural problems that drive social disadvantage and exclusion imply that transport problems should be addressed from a broader social and economic perspective and not just as discrete public investment projects. Importantly, this last chapter presents a synthesis of cross-cutting policy guidelines and recommendations that can serve as a roadmap for policymakers, transport system operators, and planners to better understand and meet the complex, multi-faceted, and diverse needs of transport-disadvantaged populations throughout Latin America and the Caribbean. The guidance is intended to help these key agents of change move the region forward towards a more equitable, inclusive, and prosperous future. In light of the COVID-19 pandemic and its effects on vulnerable populations and the transport systems on which they rely, the chapter recommends policy measures and investments that could catalyze the post-pandemic recovery of the region's transport systems to provide more equitable and inclusive mobility and foster accessibility to opportunities for all. In addition, recognizing that transport is an important complementary input critical to the distribution of benefits of other projects – such as those seeking to improve education, health, or other basic services – the chapter discusses the role that multisectoral approaches can play in catalyzing the role for transport to reduce poverty and inequality in the region.

1.1 Poverty and Inequality in Latin America and the Caribbean

Latin America and the Caribbean suffer from staggeringly high rates of poverty and inequality, both of which have been on the rise in recent years and have been exacerbated by the COVID-19 crisis. This combination of structural challenges yields vast – and often physical – divides between the "haves" and the "have-nots" that limit people's opportunities to improve their living conditions, thus creating a vicious, mutually reinforcing cycle of poverty and inequality.

In 2020, approximately one-third of the region's population was living in poverty, a 10 percent increase from one year prior. In the same year, more than 1 in 10 (13.1 percent) persons was living in extreme poverty – a nearly 15 percent increase compared to 2019, as illustrated in Figure 1.1 (ECLAC 2021). This has resulted in an additional 17 million people living in poverty and 11 million more in extreme poverty and in the highest levels of poverty and extreme poverty seen since 2008 and 1997, respectively (ECLAC 2021). Poverty had declined during 2002–2014, primarily due to increases in labor income, highlighting the importance of access to employment in reducing poverty.

FIGURE 1.1 Latin America: Poverty and Extreme Poverty Rates (percent)



Source: Prepared by the authors based on Household Survey Data Bank (BADEHOG) data published by the Economic Commission for Latin America and the Caribbean.

The COVID-19 pandemic contributed significantly to the rise in poverty and extreme poverty, compounding existing upward trends that began in 2014. A survey conducted in 2020 in 17 countries in Latin America and the Caribbean showed that the economic impact of the COVID-19 pandemic was significant and unequal: overall, 45 percent of respondents reported that a household member lost a job, but this figure was 71 percent among households with the lowest income levels before the pandemic (Bottan, Hoffmann, and Vera-Cossío. 2020). Labor income among the poorest was also significantly constrained by mobility restrictions, which reduced the number of hours worked and limited options to work remotely. The disproportionately negative impact of COVID-19-related restrictions on personal mobility and on the ability of low-income populations to remain employed highlights the accessibility dimension of transport and the role that it plays – in this case – in exacerbating poverty and deepening inequality.

Today, Latin America and the Caribbean remains among the most unequal regions in the world. The share of national income captured by the richest 10 percent of the population is 22 times that of the share captured by the bottom 10 percent (Figure 1.2). On average, the richest 1 percent takes more than one-fifth of the income generated by the entire region – twice the average in the industrialized world (Busso and Messina 2020). Box 1.1 discusses definitions of poverty, inequality, and the approach taken by the Economic Commission for Latin America and the Caribbean (ECLAC) in measuring inequality in Latin America and the Caribbean.

BOX 1.1

Defining Poverty, Inequality, and Social Exclusion

Absolute versus multi-dimensional poverty. Broadly speaking, poverty is recognized as the lack of sufficient resources to meet basic needs such as food, clothing, and shelter. Absolute poverty is an income-based measure of poverty, even as the general standard of living improves, though nominal amounts may reflect increases in prices over time (Yang 2017). The Economic Commission for Latin America and the Caribbean (ECLAC) considers people to be poor when their per capita household income falls below the national poverty line, which refers to the country-specific income level required to meet the basic needs of all household members. ECLAC defines extreme poverty as lacking the means to buy even a basic food basket (ECLAC 2022).

Multi-dimensional poverty. Multidimensional measures of poverty aim to measure not only economic poverty but also other elements of deprivation. The most widely accepted measure – the Global Multidimensional Poverty Index (G-MPI) – is composed of 10 household indicators categorized into three dimensions: health, education, and living standard (Gasparini, Santos, and

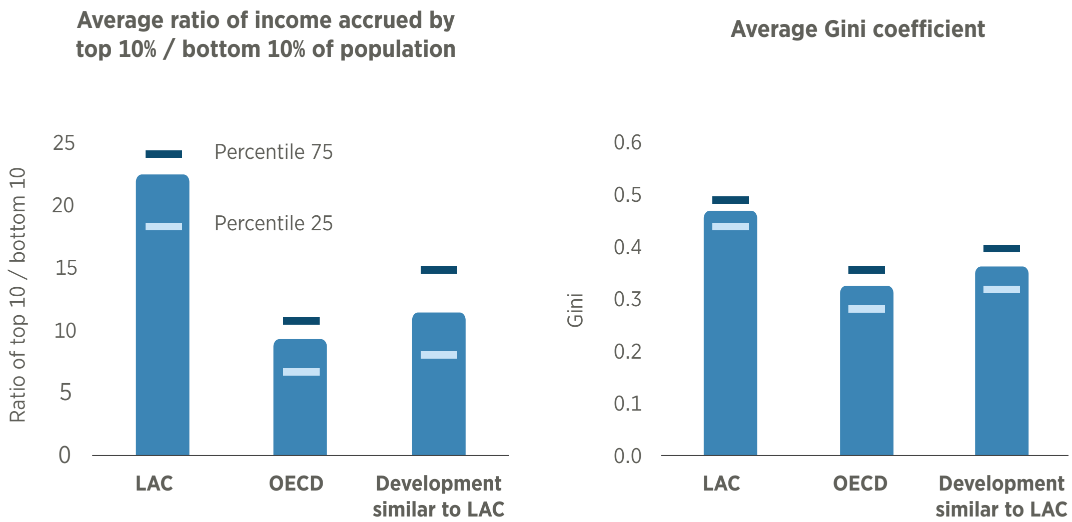
Tornarolli 2021). A region-specific Multidimensional Poverty Index in Latin America (MPI-LA) maintains comparability with the G-MPI, while utilizing thresholds of deprivation – five dimensions with a total of 13 indicators – that are more reflective of living standards in the region (Santos and Villatoro 2018; Gasparini, Santos, and Tornarolli 2021). Signaling the global commitment to improving quality of life and not just increasing incomes, Target 1.2 of the United Nations Sustainable Development Goals aims to "reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions" by 2030.

Inequality. Like poverty, there is no single agreed-upon definition of or way to measure inequality. Many authors distinguish between economic inequality – where income is used as a proxy for well-being – and living conditions. Another complementary distinction is made between inequality of opportunities, such as access to employment, healthcare, and education, on the basis of attributes outside of people's control – race, ethnicity, sex, family background – as opposed to inequality of outcomes, as measured by material dimensions of well-being, including income, educational attainment, and health status (United Nations 2015).

Measuring inequality in Latin America and the Caribbean. According to ECLAC's Social Inequality Matrix for Latin America and the Caribbean, there are four structural axes of inequality that, due to their current and historical relevance, contribute to the production and reproduction of unequal social relations: (i) socioeconomic stratum; (ii) inherent characteristics, such as sex, race, and ethnicity; (iii) rural or urban residence; and (iv) age (ECLAC 2016). Consequently, inequality can be analyzed from different perspectives, such as the distribution of income among the population and the possibility of accessing lifeline services such as drinking water, transport, and energy in urban and rural areas; differences in access to education according to ethnicity; or the size of the wage gap between men and women (ECLAC 2016).

Social exclusion. While there is no universally accepted definition, the concept of social exclusion generally refers to a state in which an individual or group is unable to participate fully in social, economic, or political activities, resulting not only in a diminished quality of life but also in reduced life chances. Both the factors contributing to social exclusion and the constraints that manifest as a result of it are many and varied and depend on the social context and individual circumstances (OECD and ITF 2017).

FIGURE 1.2 Income Inequality in Latin America and the Caribbean



Source: Busso and Messina (2020), based on data from the World Bank's World Development Indicators and on the Socio-Economic Database for Latin America and the Caribbean (SEDLAC) of the Centro de Estudios Distributivos, Laborales y Sociales (CEDLAS), Universidad Nacional de La Plata, Argentina.
Note: LAC: Latin America and the Caribbean; OECD: Organization for Economic Co-operation and Development.

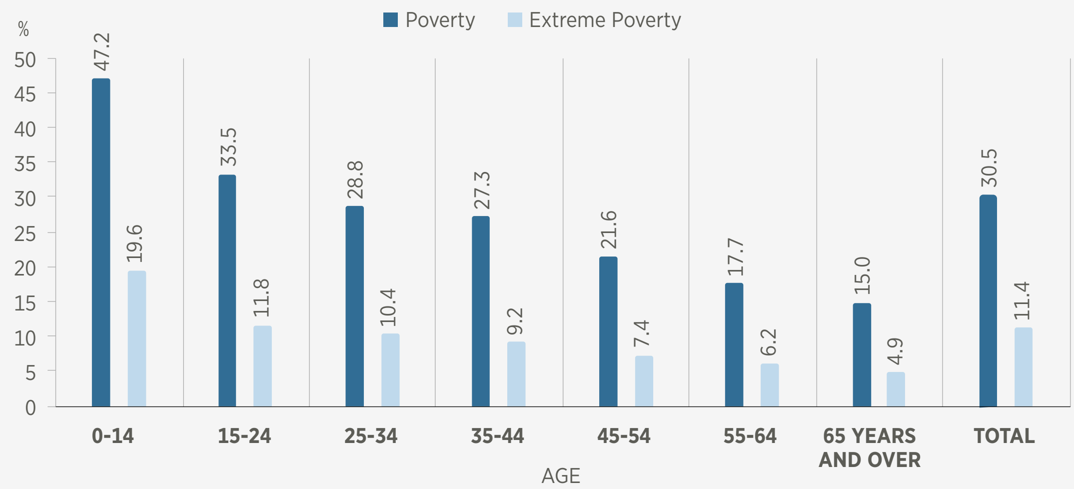
These regional and national averages for poverty and inequality mask the true depth of the impact at the individual level, and what that means for society. Although Latin America and the Caribbean is highly urbanized, over half of the poor in the region are found in rural areas, where and 19.9 percent of the overall population lives. Rural poverty is multifaceted and characterized by the lack of the access to basic services. The rate of multidimensional poverty in rural areas in the region is 19.9 percent, compared with 3.1 percent in urban areas (UNDP 2020). These results imply that even within the same country, an individual living in rural areas is more likely to be poor in monetary terms, but also experiences deprivations of a number of necessary services and deficits in resources at higher rates than those living in urban areas. Moreover, specific subgroups of populations such as small-holder farmers in rural areas, women, children, and adolescents, persons with disabilities, indigenous people, and Afro-descendants have higher incidences of poverty due to their physical barriers, sociocultural exclusion, geographical isolation, and resource deficits. Poverty is significantly higher in rural areas (see Chapters 2 and 10; see also Box 1.2).

BOX 1.2

The Many Faces of Poverty

Characteristics such as race, ethnicity, sex, and other individual dimensions such as age, physical ability and even place of residence, are correlated with poverty and inequality in Latin America and the Caribbean. In both urban and rural areas, children (ages 0 to 14) are the poorest age group in the region: in 2019, 47 percent were living in poverty and 19.6 percent in extreme poverty. Children who grow up in poverty frequently live in inadequate housing conditions, have poorer nutrition, and have fewer opportunities for social interaction and to develop human capital and workforce skills. This in turn leads to poorer health and educational outcomes and lower future earnings and perpetuates the poverty cycle in the region.[1]

FIGURE 1.2.1 Latin America and the Caribbean: Incidence of Poverty and Extreme Poverty by Age, 2019 (percentage average)



Source: ECLAC (2020).

The causes of poverty and disability are various and interrelated, resulting in a vicious cycle, a lack of access to education and employment, lower wages, and a higher cost of living (ECLAC 2012; see also Chapter 2). Data from Mexico, Chile, Costa Rica, and Bolivia (Hicapie, Duryea, and Hicapie 2019) show that poverty rates for households with members with disabilities are 5–15 percentage points higher than for other households due to higher expenses caused by the additional cost of the disability, which affects household finances.

Women are also more at risk of being poor. Approximately 118 million Latin American women are estimated to live in poverty (ECLAC 2021). These general poverty numbers conceal numerous other inequalities hindering women's development in both urban and rural areas. For example, even though urban women have more opportunities than those in rural areas, women in cities still face significant gender inequalities (Chant 2013). These inequalities are signaled by unequal access to decent work, fewer chances to attain human capital development, lower income and limited physical assets, less intra-urban mobility, more personal safety incidents, and less representation and political participation in municipal governmental structures (Chant 2013).

In addition, Indigenous peoples and Afro-descendants in the region have a higher incidence of poverty and social exclusion, face geographic isolation due to ethno-racial discrimination – a remnant of European colonization – and are overrepresented in the low-income strata, particularly among people living in extreme poverty (ECLAC 2019).2 Also, notably in rural areas, among nearly 83 million rural residents in nine countries – Uruguay, Chile, Brazil, Guatemala, Ecuador, Peru, Panama, Mexico, and Paraguay – 33 million people (40 percent) live below the monetary poverty line, and among them, 11.4 million people (33 percent) belong to either indigenous or Afro-descendent groups (FAO 2018). In urban areas, Afro-descendent or indigenous migrants often face discrimination or xenophobia on the basis of their ethnicity and race that significantly affect their social inclusion (ECLAC 2019).

While each of these groups individually is more likely to experience conditions of poverty and inequality, these characteristics can intersect and amplify the effects such that a person with two or more characteristics – for example, an Afro-descendent female living in a rural area– is impacted by all of them and suffers more severe deprivation as a result.

1. It is more difficult to break out of the cycle as it often begins when a child is born into a family with limited or no resources to foster opportunities.
2. It is well documented, including by Peruvian sociologist Aníbal Quijano (2005), that the idea of race has been "the most effective and long-lasting tool of universal social domination and has become the most basic underlying criterion for the distribution of the world's population among the various ranks, places and roles making up the power structure of the new society that grew out of European expansion and domination of the American and Caribbean territories" (ECLAC 2018, 15).

Not having enough financial resources is a fundamental deficiency, and one which constrains the choices available to people. But deprivation goes well beyond dollars and cents. In 2019, the Multidimensional Poverty Index in Latin America (MPI-LA) – which measures not only economic poverty but also social aspects including lack of access to education, health, electricity, water, and social protection systems – stood at 7.2 percent (OPHI and UNDP 2020). This figure masks large disparities between countries, with Cuba on the low end of the spectrum with an MPI of 0.7 percent, and Haiti – which has the highest MPI score in the region – with 41.3 percent of the population living in multidimensional poverty (OPHI and UNDP 2020).

More recently, a consensus has emerged about the importance of ensuring equal access to opportunities for all (United Nations 2020). Access to opportunities must be viewed from an equity perspective that addresses and prioritizes needs based on the disadvantages and vulnerabilities specific to each social group. Inequality, especially in terms of access to opportunities, provides a more robust measure of how individuals can freely exercise their rights and roles within the community. Reducing poverty is inextricably linked to generating employment and human capital development opportunities for the poor, and transport is a key enabler to access these opportunities.

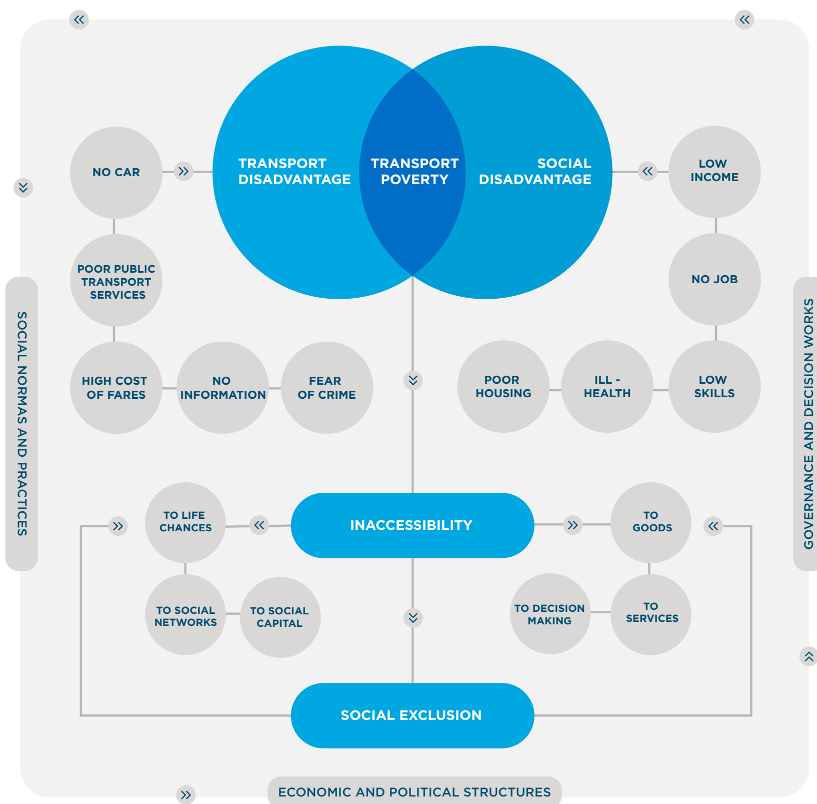
1.2 Transport and Its Intersectionality with Poverty and Inequality

Income gaps are just one of several forms of inequality that adversely impact social cohesion in the region. For the poor and other socially disadvantaged populations, less access to reliable and safe transport services presents a significant challenge in accessing opportunities. When transportation provision is limited, and exclusion and inequality are rampant, people in vulnerable situations adopt varied travel strategies to access the city (Oviedo and Titheridge 2016. In-depth empirical case studies in the region have further analyzed how some people are less mobile or rely on informal modes because they lack the financial resources to afford public transport, meaning further isolation from the opportunities of the city (Gandelman, Serebriskey, and Alemán 2019)). An evaluation of Bus Rapid Transit projects in Lima, Peru and Cali, Colombia conducted by the IDB (Scholl et al. 2016) assessed criteria such as coverage, quality, affordability, and temporal and spatial travel patterns of the poor population. It concluded that affordability for the most disadvantaged was a barrier to using the system regularly, leading to fewer trips. This intersection of social disadvantage with transport disadvantage – also known as transport poverty – hinders accessibility to opportunities for low-income and disadvantaged people, generating and exacerbating existing conditions of social exclusion (Lucas 2012). Transport poverty has been framed in the literature by several concepts, including transport unaffordability, mobility poverty, accessibility poverty, and disproportionate exposure to negative externalities from transport. Mobility poverty occurs when there is a lack of transport options that meet individual needs and capacities. Transport unaffordability refers to the ability of individuals or households to pay for necessary transport or the degree of financial burden that transport expenditures exact on households. Accessibility poverty is defined as difficulty in reaching, within a reasonable time or cost, locations, and activities essential to meeting basic needs or accessing key opportunities such as employment, healthcare, education, or recreation. Lucas et al. (2016) argue that transport poverty occurs when at least one of five conditions exist (Lucas et al, 2016):

- There is a lack of transport options that meet individuals' physical conditions or capabilities.
- Available transport options do not reach relevant or key destinations, such as employment, education, shopping, or healthcare, that are critical to meeting an individual's basic needs and maintaining a decent quality of life (mobility poverty).
- The amount spent on transport leaves little residual income for other basic needs (unaffordability).
- The amount of time spent in transport to conduct daily activities leaves the individual or household with little time for other activities, leading to time poverty or social isolation (accessibility poverty).
- Most existing available transport options are dangerous or unhealthy, or individuals are disproportionately exposed to negative transport externalities (Lucas et al. 2016).

Figure 1.3 illustrates the way that these circumstances interact with and reinforce each other to result in transport poverty.

FIGURE 1.3 A Complex Fabric: The Relationship between Transport Disadvantage, Social Disadvantage, and Social Exclusion



Source: Prepared by the authors based on Lucas (2012)..

1.2.1 Transport's Direct and Indirect Effects on Poverty and Inequality

The provision of better transport can have both direct and indirect positive impacts on the ability of individuals to escape poverty. Indirectly, transport investments that facilitate more efficient movement of goods and people can foster economic growth, which in turn increases the number of income-generating opportunities for all. For example, urban transport investments can have important productivity and efficiency benefits that increase the efficiency of doing business, and thus increase the number and diversity of firms within an urban space, creating multiplier effects across the economy.

In urban areas, more intensive use of space and interactions is a necessary precursor to achieve agglomeration economies. As access to an efficient transport system also increases the competitiveness of firms and may entice new firms into the marketplace, transport infrastructure can be a key determinant of firm location choice. Therefore, as transport investments expand within urban areas, the range of location choices for firms and households can expand. In addition, by increasing productivity, accessible transport potentially has income effects by lowering the prices of goods and services dependent on those networks. Rising income, in turn, can increase the number and range of employment, social, and other opportunities that people can afford to access, generally increasing economic welfare and the demand for transport.

In rural areas, transport plays a fundamental role in promoting economic growth and poverty reduction through linkages with agricultural productivity and access to economic opportunities and basic social services. By reducing the operational costs of and time required to transport agricultural goods to marketplaces, improved transport links can extend the range of profitable activities, which in turn improves the agricultural supply chain and access to export markets. This can also reduce production costs by lowering the transport price of inputs, which increases profitability for rural farmers. In addition, case studies have shown that road investments have had benefits that extend beyond increases in agricultural income, including access to non-farm job opportunities and improved school attendance and healthcare visits through the generation of local transport services (Gannon and Liu 1997; Sánchez 2016).

Direct impacts of transport on poverty and inequality are those fostered by measures that increase accessibility for lower-income and disadvantaged groups to essential opportunities – including schools, nutrition, healthcare, and jobs – that allow these groups to navigate relevant destinations and opportunities from where they live, while taking their needs into account in the design of such systems. At the level of the individual, increased access through efficient and affordable transport services that connect to schooling, healthcare, and social and cultural opportunities has a direct bearing on human capital development – an essential ingredient for escaping poverty – among poor people (Starkey and Hine 2014; Lunke 2022).

Where the poor live, the quality and degree of coverage of transport modes they can access, the degree to which transport systems available to them facilitate their access to relevant opportunities, the connectivity of these services, individual circumstances such as ability to pay for transport services, and the extent to which the poor can safely travel within their environments are all intrinsically linked to their ability to escape poverty (see Chapter 3). Therefore, the potential for transport to reduce social exclusion and poverty is closely related to the extent to which it enables access to relevant and meaningful opportunities for vulnerable and impoverished populations. However, large-scale transport infrastructure construction and increased traffic to remote locations can generate unintended adverse environmental and socioeconomic impacts on disadvantaged communities, particularly in the case of rural transport projects. In particular, indigenous communities and Afro-descendant groups, who more often live in isolated areas, can be significantly negatively affected by transport infrastructure projects unless those risk factors are carefully explored and mitigated.

1.2.2 Accessibility and Its Linkages with Poverty and Social Exclusion

Accessibility reflects the role of transport as an enabler of opportunities relevant to people's well-being and therefore can range from employment to social interactions and human capital development (e.g., through access to education). In the context of transport, accessibility is defined as the ability of an individual to reach potential activities (Hansen 1959) and can be used as an indicator to evaluate the extent to which a transport system facilitates reaching available opportunities or – to the contrary – generates or deepens social exclusion (Luz et al, 2022; Oviedo 2021; Lucas 2012; Bocarejo and Oviedo 2012; Ben-Akiva and Lerman 1959).

Several scholars have explored the connections between mobility, social inequalities, and poverty (Wachs and Kumagai 1973; Hanson 1980; Kain 1968; Kwan 1999; Neutens, Versichee, and Schwanen 2010). Individual, transportation, the urban environment, and travel characteristics determine not only the main needs of the most vulnerable, but also the barriers that may restrict their ability to access various kinds of opportunities (Oviedo et al. 2018; Oviedo and Guzman, 2020). Transport systems and their characteristics in relation to the urban environment, social conditions, and individuals' needs and abilities have profound effects on people's well-being and ability to access opportunities (Pereira, Schwanen, and Banister 2017).

The United Nations Sustainable Development Goals (SDGs) identify "access" as a critical target of human development going forward (United Nations 2015). Goal 11 (Sustainable Cities and Communities) aims to "provide access to safe, affordable, accessible, and sustainable transport systems for all…with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons" by 2030 (United Nations 2015, 21). This explicitly highlights the role that accessibility afforded by inclusive transport systems can play in bridging disparities across social groups and socioeconomic conditions. Targets of the United Nations' New Urban Agenda also highlight the promotion of equitable access, with emphasis on low-income and peripheral urban populations, to sustainable transport that enables participation in both social and economic activities (UN-Habitat 2017).

Accessibility analysis also plays a central role in socially centered approaches to transport planning, as it focuses on the impact of transport investments on the range and number of opportunities reachable and provides a holistic view of social inclusion challenges. The resurging prominence of accessibility as the central goal of urban and metropolitan development signals a paradigm shift that is referred to as the mobility-to-accessibility paradigm shift (Levine 2020). It recognizes the role played by urban structure, location of activities, and land use, relating it to the effort that different social groups must make to reach their work and other activities in the context of available transportation systems. It considers a series of attributes of people in terms of their abilities, but also their ability to pay (Pereira, Schwanen, and Banister 2017). A myriad of factors influences the degree of accessibility, which in turn is also influenced by individual characteristics and abilities, and how these interact with transport systems and land use (Luz et al. 2022). These can be grouped into four major components (Figure 1.4) (Van Wee, Hagoort, and Annema 2001; Oviedo et al. 2018):

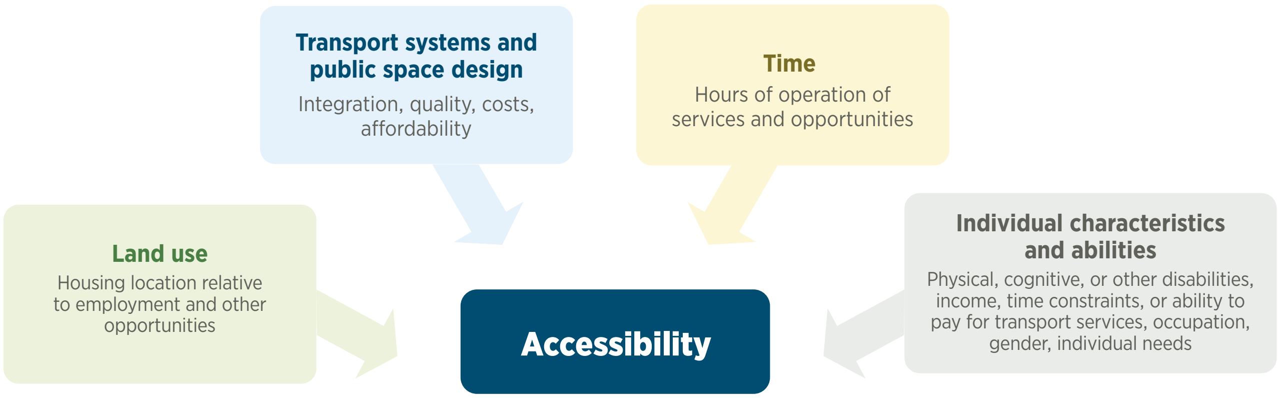
1. **Land-use component:** This component considers the spatial distribution of activities, mix and density of land use, and the resulting distances between origins and destinations. This component is also influenced by urban design and infrastructure characteristics that can, in turn, influence the degree of walkability between destinations.

2. **Transport component:** This component is defined by the prices, distance, and time between an origin and destination using a specific means of transport. Because transportation is a generated demand, it creates disutility, which in addition to requiring time, has a cost and effort associated with it. This in turn is determined by the quality of the transportation system, its efficiency, travel times, and transfers, among other factors.

3. **Time component:** Transportation opportunities and services have time restrictions that allow or prevent people from participating in different activities. This is in turn affected by individuals' time windows to participate in activities.

4. **Individual component:** People's individual characteristics (age, income, gender, education level, family structure, etc.) influence the opportunities and the means of transportation they can access. This in turn is dependent upon people's abilities to travel or move, including their ability to pay, their physical and intellectual ability (e.g., to use and understand certain modes of transport), and their time availability. For example, people with low incomes often are less able to afford a private vehicle, which leads them to depend on public transportation and non-motorized means of transport. Additionally, how people perceive the transportation system, safety, and their individual experience in public spaces affects levels of accessibility and mobility.

FIGURE 1.4 Components of Accessibility



Source: Prepared by the authors based on Geurs and Wee (2004).[2]

A wide array of metrics has been developed to measure accessibility to opportunities, but the most common are the cumulative (or contour-based) accessibilities and potential accessibility indices. Cumulative opportunity measures focus on the spatial distribution of opportunities or the number of opportunities such as jobs or education reachable from different neighborhoods or zones within a specific time frame by mode (e.g., the number of jobs reachable within 60 minutes on public transit). Comparisons by mode (e.g., the ratio of public transit to car by income zones) have been used diagnose spatial inequalities in cities (ITF 2017). While these measures can be easily implemented and have lower data requirements, they do not consider individual capabilities (such as the degree to which systems are accessible for persons with disabilities or individuals' ability to pay for transport). Gravity-based accessibility (or potential) measures use non-linear decay functions that inversely weight accessibly to opportunities by their overall travel costs expressed in terms of time and monetary costs to reach them from each travel zone or area (Palacios and El-geneidy, 2022). However, they are less often used by planners due to their relative complexity and data intensity. Despite debate in the literature over which accessibility indices are more appropriate, recent research has found a high correlation between cumulative and gravity-based indices (Palacios and El-geneidy, 2022).

The estimation of accessibility to different types of opportunities and facilities – employment, health, education, recreation – can also provide important insights into where and how transport systems could be developed and improved to increase social inclusion and equity. This relies first

2. The discussion and development of this conceptual framework on Accessiblity and Social Inclusion also greatly benefited from discussions and input from Juan Pablo Bocarejo and Daniel Oviedo.

on the inclusion of accessibility in the evaluation of transport decisions. Second, it necessitates the estimation of benefits beyond traditional cost-benefit analysis (Bocarejo and Oviedo 2012). Various studies have used the concept of accessibility to assess inequality related to transportation projects and locations. Luz et al, (2022) studied the causal relationship between cumulative accessibility to jobs within 90 minutes via public transit in São Paulo, Brazil, and participation of individuals in activities (including mandatory work and study) and discretionary (leisure and shopping) and found a statistically significant increase in participation in all activities, with the largest impact for work activities (1.06 percent increase in mandatory activities for every 1 percentage point increase in the number of accessible jobs). Bocarejo and Oviedo (2012) used gravity-based measures and calculated accessibility impedance in terms of time and percentage of income spent on transportation by inhabitants of different areas of Bogota. They established three types of accessibility to employment: (1) real accessibility, which considers the daily effort made by the inhabitants of the different areas to access their activities in terms of both time and percent of income spent to access work; (2) desirable accessibility, using data from a stated-preference survey, which reflects the number of jobs that would be accessible with the amount of time and monetary resources that the inhabitants of each area would be willing to invest; and (3) standard accessibility, which would be obtained from a "reasonable" effort based on international experiences.

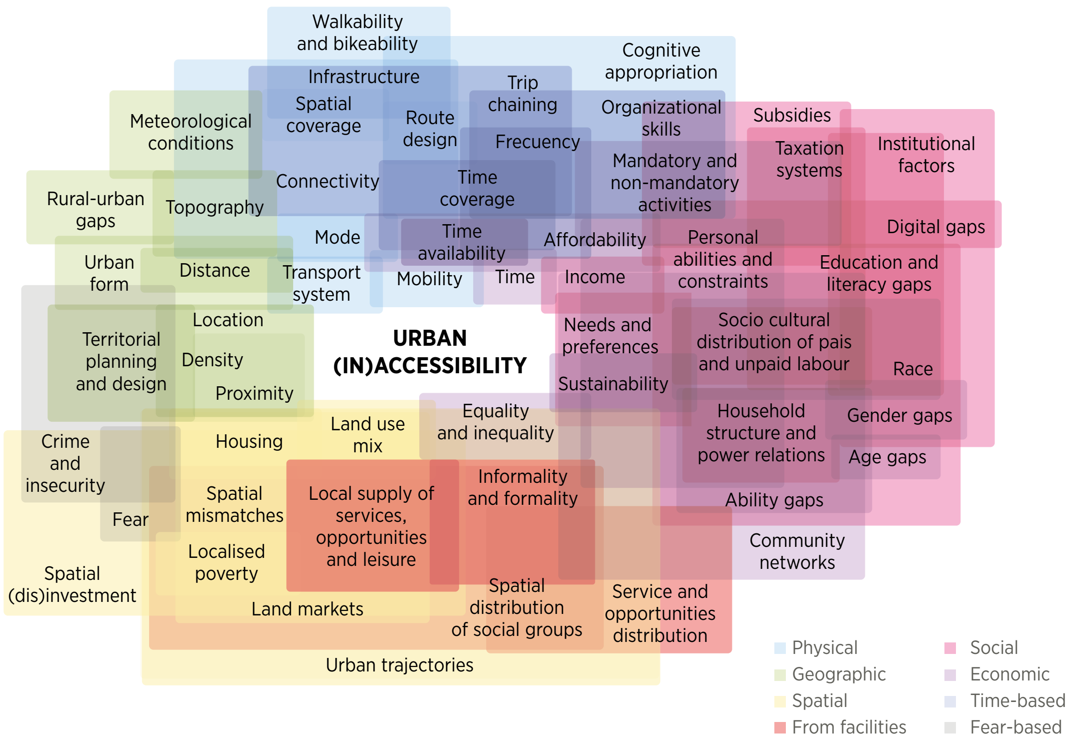
In the case of Latin America and the Caribbean, the constraints on access to opportunities vary widely between the different income levels, generating unequal access in cities. The concept of accessibility has been employed widely not only in terms of scientific research and publications, but also from the point of view of policy and planning. The approach to mobility in cities has evolved from prioritizing the analysis of transportation systems and their infrastructure to focusing on the mobility of the individual and its impacts, to finally concentrating on the individual's access to the different opportunities offered by the city; from prioritizing the analysis of transportation systems and their infrastructure to focusing on the mobility of the individual and its impacts, to finally concentrating on the individual's access to the different opportunities offered by the city. From the point of view of transportation planning, for example, governments have increasingly moved from transportation plans to mobility plans, and more recently some countries are promoting the development of accessibility plans (Preston and Rajé 2007).

Access to activities is conditioned by the time and cost of transportation in relation to the individual's ability to pay, or affordability (Gandelman, Serebriskey, and Alemán 2019). Thus, by measuring potential access for different social groups, it is possible to measure the spatial inequalities between them. By being closer to the centers of employment and having faster means of transportation and more resources to use them, higher-income populations tend to have access to more opportunities. In contrast, the poorest often have access to lower-quality and slower modes and make greater sacrifices in terms of the cost of accessing their activities or may be unable to access them, leading them to be excluded from the opportunities offered by the city.

Referring back to the conceptual framework discussed above, when transport disadvantage and immobility intersect with diminished transport accessibility, the result is transport-related social exclusion (Figure 1.5). This broadly refers to the conditions under which, due to insufficient or non-existent resources and means to travel, there is exclusion because people cannot access desired activities and networks related to work, education, or cultural, political, and social (leisure and family) activities (Oviedo 2021; UK Social Exclusion Unit 2003; Ureta 2008; Lucas 2012; Bocarejo and Oviedo 2012; Benevenuto and Caufield 2019). Church, Frost, and Sullivan (2000) developed a framework that delineates the inter-related types of exclusion that can affect an individual's ability to access the activities necessary to participate in society (see also Lucas 2012). These include:

- **Physical exclusion:** Physical barriers related to the transport system's nature and the built environment to access it, which limit the accessibility of the population with physical/psychological difficulties, excluding them from using the transport system.
- **Geographical exclusion:** Due to spatial isolation of the origins, usually located in the peripheries, with inadequate transport provision resulting in significantly more time and cost to travel.
- **Exclusion from facilities:** Distance, time, and income constraints to access facilities such as shops, schools, healthcare, or leisure services. This also refers to exclusion due to the flight of facilities from non-attractive areas.
- **Economic exclusion:** High monetary costs of travel or inaccessibility to the employment market, therefore impacting incomes.
- **Time-based exclusion:** Also referred to as time poverty (Harvey and Mukhopadhyay 2007; Turner and Grieco 2000), this relates to other demands on time such as combined work and household and childcare duties, which reduce the available time for travel.
- **Fear-based exclusion:** Individual fear in public spaces differs according to social characteristics, especially gender, influencing how public spaces and transport facilities are used.
- **Space exclusion:** Space management prevents and discourages certain groups' access to public spaces and public transport (e.g., private management, surveillance systems, power relations).
- **Digital exclusion:** Beyond the dimensions outlined above, other characteristics – both individual and of the transport system – may conflate to result in exclusion from access for some social groups. For example, ICT-based systems can be more challenging to access, and several factors – including age, income and education levels, gender, ethnicity, and residential location – influence the impact that these digital technologies may have on transport access. Furthermore, as planning and service design become more and more data-driven and algorithm-dependent, persons who are excluded from data are largely invisible to those designing systems and services (Durland et al. 2022).

FIGURE 1.5 (In)Accessibility and Links between Dimensions of Transport-related Social Exclusion



Source: Prepared by Daniel Oviedo for this report.

As shown in Figure 1.5, from a social exclusion perspective, inequalities and inequities related to transport can disproportionally affect people already experiencing social disadvantage. Inequalities in transport can further exacerbate social exclusion by impeding the full participation of individuals lacking full access to efficient and affordable transport services from opportunities affordable by society (Lucas 2012). The figure illustrates the wide range factors affecting urban (in)accessibility and includes not only individual characteristics and travel behaviors, but also conditions of the urban environment, policy priorities, and socioeconomic context, among other factors.

1.3 Measuring the Distributional Impacts of Transport

Understanding the distributional impacts of transport is key to planning more equitable and inclusive transport systems. The framework illustrated in Figure 1.6, shows how the benefits and burdens generated by transport impact the poor and other vulnerable groups and transport equity. This framework is useful both for assessing the equity of existing transport systems as well as evaluating measures to improve equity. It consists of three key components. First, it presents the benefits and burdens being distributed, which refers to the positive and negative impacts on and outcomes for beneficiary populations of transport systems and projects, and the ways in which poor and disadvantaged populations may be disproportionately impacted – benefiting less from the opportunities provided or suffering more adverse consequences. Second, the framework outlines the populations and social groups across which the benefits and burdens are distributed and underscores the ways in which certain groups may benefit less or be more adversely affected by transport. Finally, the third component looks at how we think about and measure the equity of these distributional effects, both in terms of existing systems and specific transport interventions.

FIGURE 1.6 Measuring the Distribution of the Benefits and Burdens of Transport among Social Groups and Transport Accessibility Components

1

Benefits and Burdens

- Mobility/accessibility
- Health impacts related to active transport
- Traffic safety
- Traffic related pollution
- Community cohesion or severance

2

Components and Groups Across Which They Are Distributed

- Residential location
- Transport mode
- Income
- Age
- Gender
- (Dis)ability
- Ethnicity

3

The Yardstick or Distributive Principles

- Standards for assessing the existing situation
- Standards for assessing interventions

Source: Prepared by the authors based on Lucas et al. (2019).

In general, while the benefits of transport have been well-covered in the literature, identifying and addressing the burdens of the transport sector is relatively incipient. For example, improved pedestrian and bikeway infrastructure in lower-income neighborhoods can have important benefits for poor and vulnerable groups that tend to rely more heavily on these transit modes by improving the safety, comfort, and ease of accessing key opportunities within the city. Affordable public transport systems that reach poorer neighborhoods, efficiently and safely carry passengers to relevant destinations, and are safe and physically accessible to persons of all abilities, ages, and genders can improve mobility and accessibility to key opportunities for these groups. In addition, improved access to infrastructure for biking and walking (active modes) and public transport (which is often combined with active travel can improve health outcomes (Lucas et al. 2019; Mackett and Thoreau 2015).

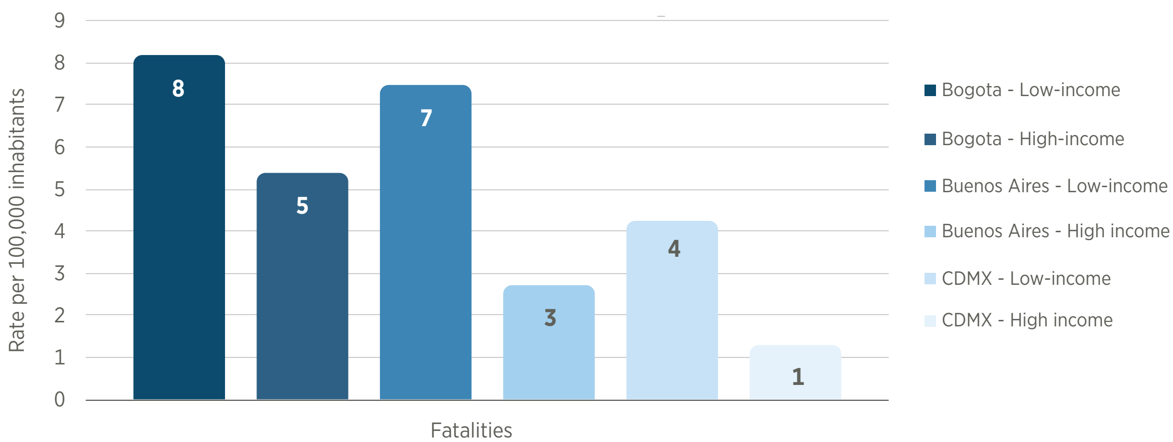
However, conventional approaches to transport planning in developing countries often prioritize efficiency benefits, based on their linkages with economic development through productivity gains, which has resulted in skewing planning towards private motorized transportation (Oviedo and Nieto-Combariza 2021) at the expense of public and active modes. Thus, overemphasis on efficiency goals can lead to neglecting the needs of low-income or disadvantaged groups and result in unintended adverse impacts on the poor. These include rights of way for transport infrastructure that cut through and divide neighborhoods and/or cut off access for the poor, promotion of formal transport systems that may be unaffordable for poor, and the exclusion of informal transit operators due to regulatory barriers to market entry (Cervero 2000). In addition, low-income groups often benefit less than wealthier groups from transport improvements. For example, regarding unaffordable transport, a recent study in Bogota revealed that over two decades (1999 to 2019), after increasing formalization and large investment in mass transit, the overall cost of commuting increased by close to 44 percent when considering time and financial costs – often due to lengthier commutes caused by increased traffic (Bocarejo and Urrego 2020). The study also found that poor households spend approximately 17 percent of their income on transportation, double the average expenditure on transportation in the city (Bocarejo and Urrego 2020). A study of Mardin, Turkey found that, in addition to transport infrastructure deficits and service failures, there are several other barriers to accessibility, such as counterproductive social norms and cultural values that constrain the mobility of certain social groups (in this case, women) (Akeyelken 2013). Such issues must be fully explored and understood in order to alleviate transport-related social exclusion more effectively through transport investments.

Overemphasis on motorized transport may also skew investments towards wealthier areas. A study in Santiago, Chile by Iglesias et al. (2019) found that the top quintile of the income distribution benefited from 2.5 times more investment in both transport infrastructure and new construction space for commercial activities and services from 2010 to 2016. This highest quintile made 1.2 times more trips than the lowest quintile and enjoyed travel times that were on average 1.6 times faster.

In addition to capturing fewer benefits, low-income/disadvantaged groups are also more likely to be exposed to negative externalities of transport such as traffic injuries and noise and air pollution.

For example, the relationship between income level and the risk of being killed or badly injured in a traffic crash is linked to the lack of safe and adequate infrastructure for pedestrians, cyclists, and children's playgrounds in lower-income neighborhoods (O'Toole and Christie 2018), as well as to sociodemographic and attitudinal characteristics, cultural level, and other factors (Mannocci et al. 2019) (see also Chapters 2 and 6). For example, in Buenos Aires, the fatality rate for high-income areas is less than half of that for low-income areas, in Mexico City the fatality index in low-income areas is four times higher, and in Bogota, the difference is a 40 percent higher rate in low-income areas (Figure 1.7).

FIGURE 1.7 Fatality Rate per 100,000 Population in Road Crashes for Low-income and High-income Areas

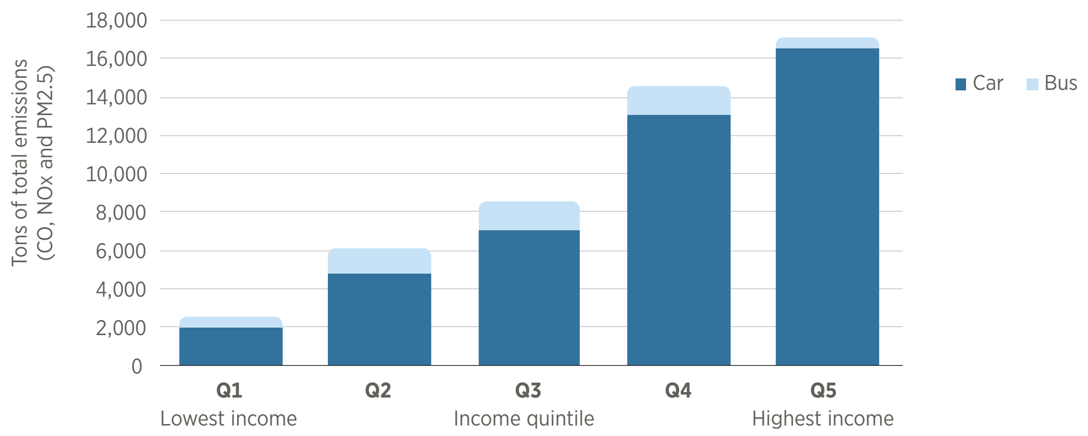


Source: Prepared by Juan Pablo Bocarejo and Erik Vergel for this report. Data collection from road crashes reports in each city are for 2018 for Bogota and Buenos Aires and for 2019 for CDMX (the Mexico City Metropolitan Area).

Walking also plays a key role in the mobility of low-income persons due to affordability issues and the lack of access to motorized transport, accounting for up to 40 percent of their trips in some cities. Yet, the conditions walkers endure – absence of adequate safety infrastructure such as sidewalks and pedestrian crossings – make for hazardous journeys. In Jamaica, for example, pedestrians accounted for 1 in 5 road fatalities in 2021, making them the second most vulnerable road user group, after motorcyclists, who accounted for 1 in 3 road deaths (Jamaica Information Service 2022).

Disadvantaged populations are often more exposed to transport related environmental pollutants poor air quality. For example, the richest quintile in Santiago de Chile generated 6.7 times as much pollution as the poorest and was responsible for 35.5 percent of emissions because of their intense use of private cars, whereas the poorest quintile was responsible for only 6 percent, as shown in Figure 1.8 (Iglesias et al. 2019). Based on an analysis of air quality for different areas of Bogota, lower-income inhabitants endure higher levels of air pollution in their residential areas due to the proximity to industrial zones and freight corridors (Bocarejo and Urrego 2020). In the poorest neighborhoods, not all roads are paved. This is an additional source of PM_{10} concentration. This phenomenon is common in other Latin American cities, where the location of lower-income households exposes them to greater health risks. In the case of environmental pollutants, these are generated either by industrial activity or mobility using fossil fuels, where particulate matter generates significant negative health consequences (Pope and Dockery 2006).

FIGURE 1.8 Share of Pollutants Emitted by Quintile and Transport Mode in Santiago de Chile



Source: Iglesias et al. (2019).

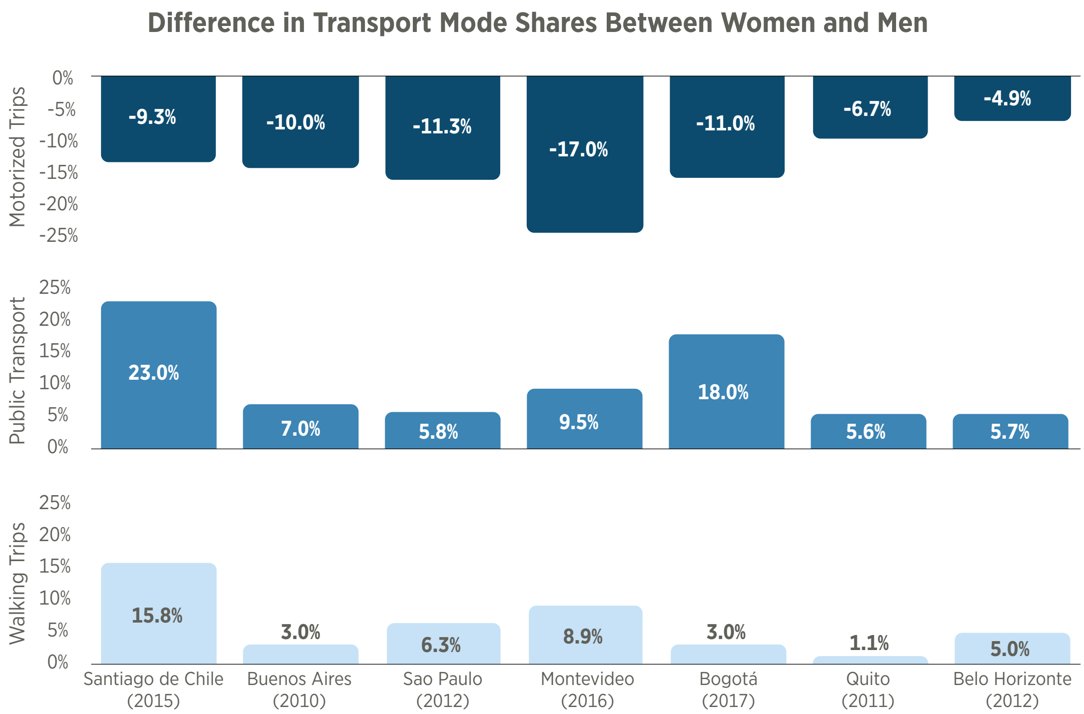
Moreover, communities experiencing social disadvantage can also suffer disproportionately from the fragmentation and isolation that can result from the development of large and busy roads in proximity to low-income communities – a phenomenon known as community severance (Preston and Rajé 2007; Delbosc and Currie 2011; UK Social Exclusion Unit 2003). When community severance occurs, what has been defined as community breakdown takes place. Anciaes et al. (2016) identify the barrier-like effects, both at a physical and psychological level, that large infrastructure projects, urban traffic, or vehicular speeds can generate in the community or at a personal level by preventing continuous pedestrian mobility. This situation negatively impacts the urban and social fabric, thus exacerbating the vulnerabilities of some already disadvantaged groups such as the elderly, children, and persons with disabilities.

The urban poor living in informal settlements are also more likely to suffer more from a general lack of basic infrastructure, including sidewalks, paved streets, lighting, and efficient public transport services, as well as from high levels of insecurity. They are also more likely to be exposed to traffic safety risks and transport-related air pollution and its associated negative effects on health outcomes, placing an additional burden on their livelihoods and opportunities for economic progress (Heinrichs and Bernet 2014; see also Chapter 3). In 2018 , a regional average of 20 percent of the urban population lived in informal settlements in Latin America and the Caribbean, with some of the highest figures in Haiti (66 percent), Jamaica (57 percent), and Bolivia (49 percent), and the lowest in Costa Rica (3.6 percent) and Belize (5 percent). With public transport in informal settlements characterized by high rates of informality, and relying on aging and polluting vehicles, residents are more likely to be exposed to pollutants from transport. According to the WHO, exposure to PM (such as $PM_{2.5}$ and PM_{10}) is considered the fourth highest risk factor for humans and the greatest environmental risk (WHO 2016). The latest available data show that, globally, 3 million of the deaths in 2012 were attributable to air pollution. Of these, approximately 87 percent occurred in low- and middle-income countries, representing 82 percent of the world's population.

Moreover, high levels of insecurity in informal settlements can constrain the time of day or context in which people feel safe traveling and can increase transport costs. For example, a study in three informal settlements in Buenos Aires found that a majority of residents (62 percent) felt unsafe when walking in neighborhoods, forcing them to rely heavily on public transit even for trips that otherwise could have easily and more quickly been made on foot, increasing their expenditures on transport, and generating economic and time burdens (Gutierrez et al. 2022).

Transport-disadvantaged groups such as women, children, the elderly, persons with disabilities, indigenous groups, and Afro-descendants have limited access to opportunities in cities and areas in the region due to numerous factors that stem from their economic vulnerability and social disadvantages. This results in different mobility patterns and accessibility needs specific to these groups. For example, in an analysis of seven Latin American and Caribbean cities, it was found that women make more trips on foot and by public transport than men (Rivas, Suárez-Alemán, and Serebrisky, 2019)). One case that stands out is that of Santiago de Chile, where the differences between genders are greatest. In all seven cities, women make fewer motorized trips than men, with the difference particularly pronounced in Montevideo, as shown in Figure 1.9, highlighting women's comparatively lower access to private vehicles. Yet, as will be discussed in Chapter 2 women frequently experience high levels of sexual harassment on public transit systems that are often not designed to take their travel needs into account.

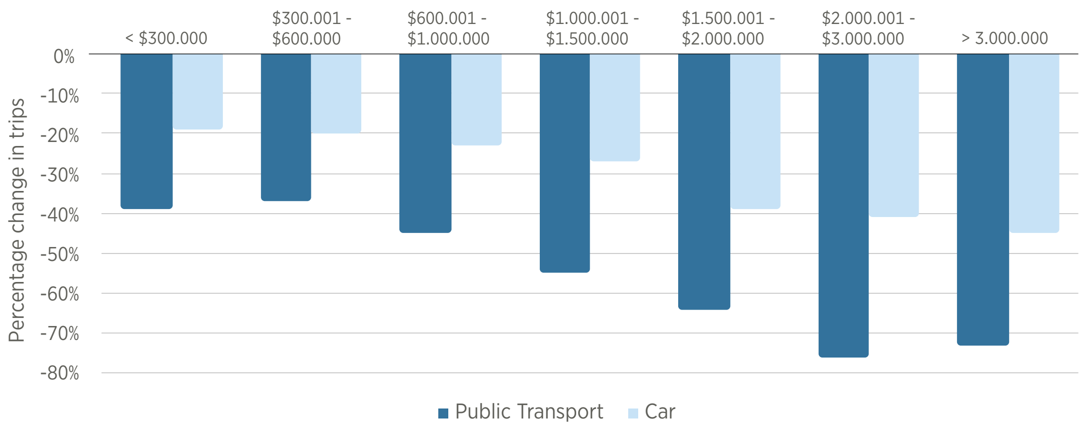
FIGURE 1.9 **Mobility Patterns Are Not Gender-Neutral in selected LAC cities (percent)**



Source: Rivas, Suárez-Alemán, and Serebrisky (2019).
Note: Differences in percentages (female - male).

The impact of the pandemic also exacerbated existing inequalities in mobility by income group. Figure 1.10 shows that in Santiago de Chile, the use of public transport and private vehicles significantly declined in every income group after the start of the pandemic. It is also notable that higher-income groups abandoned trips by public transport more than lower-income groups. This could be mainly associated with the fact that lower-income populations depend more on public transport for their daily activities and lower vehicle ownership. Thus, they do not have any other alternative for their mobility mode despite the pandemic, while the higher-income population could have the options of telecommuting or being able to pay for safer modes of travel (Tirachini 2020).

FIGURE 1.10 COVID-19 and Inequality: Reduction in Trips by Public Transport and Car Users in Santiago de Chile by Income Level



Source: Tirachini (2020).
Note: Percentage decrease in trips is a comparison of the pre-COVID-19 crisis week (March 9-15, 2020) with the first week when measures were implemented to contain the virus at the country level (March 16-22, 2020).

Finally, when thinking about a more equitable way is to distribute transport resources, as argued by Lucas et al, (2019) in their book *Measuring Transport Equity*, it is important to carefully consider what yardsticks are employed to measure transport. The authors note that "what is considered to be the general norm for the majority within a society is not necessarily fair for everyone living within it" (Lucas et al. 2019, 5). For example, in the context of growing motorization, particularly among income groups that can afford private vehicles, policies that provide a car to everyone in the interests of equity would not be a desired outcome given that (i) not everyone wants to or is able to drive, and (ii) this would increase the negative externalities such as traffic congestion, and the emissions of local and global pollutants. These constraints and impacts adversely affect everyone, and especially the poor and other groups such as the elderly and young people who do not drive – not to mention the resulting loss of green spaces and pedestrian and public infrastructure to make room for cars.

Several approaches or yardsticks have been proposed by scholars to measure equity. For example, Pereira, Schwanen, and Banister (2017) suggest that analysis of the distributional effects of transport policies should center around a minimum standard of accessibility to key destinations and the extent to which policies respect individuals' rights and prioritize disadvantaged groups, reduce inequalities in access to opportunities, and mitigate transport externalities. Lucas et al. (2019) identify a range of possible equity principles that can be applied to assess existing situations as well as transport interventions, and they argue that the former should be guided by an assessment of the former. Lucas et al. (2019) put forth several possible standards to assess existing conditions and their advantages and limitations:

1. **Equality:** Also known as horizontal equity in the literature, this refers to equal distribution of a benefit or a burden across people or populations. Applied to transport, this approach implies that systems to aim to maximize the number of people transported efficiently. However, while intuitive and seemingly ideal, it may not be appropriate for all situations. An example in the case of traffic safety might be where zero traffic collisions in all neighborhoods except for one and a low rate in one neighborhood, although not ideal, may be preferable to a perfectly equal distribution of the same level of across all neighborhoods in a city, leading to a greater overall cumulative exposure to pollution Moreover, a limitation of this standard when it comes to goods, is that not everyone has the same preferences, and so differences between people or groups may be due to choices that involve trade-offs rather than inherent inequities in opportunities.

2. **Proportional equality:** Under this standard, the distribution of benefits and burdens is approximately in proportion to the size of the population size or activities. Traffic injury statistics among a certain group should be put in context of the size of that group relative to the total population.

3. **Maximum gap:** This standard accepts some level of inequality but strives to keep inequalities within a maximum range, recognizing different individual preferences which lead to accepting some trade-offs such as middle-income households accepting lower accessibility in exchange for lower housing costs in the suburbs.

4. **Minimum standards:** This asserts that justice is not rooted in perfect equality but in assuring a certain minimum level of good (such as an acceptable level and quality of public transit services) or a maximum amount of bad (such as a maximum acceptable level of exposure to air pollution).

5. **Basic needs:** This principle is closely linked to notions of vertical equity and requires that each individual's needs to lead a fulfilling life are fulfilled. For example, this implies that designing public transport systems that prioritize service to lower-income and transit-dependent populations are primary.

Next, Lucas et al. (2019) propose three main yardsticks or principles to assess potential interventions:

1. **Equality:** This refers to an equal distribution of the benefits of a project. However, it fails to consider individual preferences or understand existing inequities and can therefore perpetuate them.

2. **Do no harm:** Closely linked with the economics theory of pareto efficiency, this criterion states that while benefits of interventions may only improve welfare for a portion of the population, they should leave no one worse off.

3. **Equalization:** This is based on the notion that projects and interventions should move towards a more equal distribution of benefits and burdens or reduce disparities.

While there is no single yardstick that is recommended for all contexts, this latter principle is particularly relevant for transport benefits and burdens and to improve development outcomes linked to transport projects, given the large disparities in accessibility in the region. Moreover, this measure can be used to rank interventions by their potential to reduce these disparities and foster socially inclusive development.

1.4 Conclusions

Transport systems and their characteristics in relation to urban and rural environments, social conditions, and individuals' needs and abilities have profound impacts on the ability of people to meet even the most basic needs and access opportunities to improve their living conditions. However, the degree of access to opportunities can vary widely between different groups of people and is inextricably linked with where they live, as well as the land-use patterns and transportation system coverage in that area. For the poor and other marginalized groups, such as women, young people, rural populations, and the disabled, who may already face differential access to employment and other economic opportunities, additional transport-related barriers compound existing inequities and further constrain their earning potential. This in turn constrains their ability to lift themselves and their families out of poverty. Moreover, communities experiencing social disadvantage can suffer disproportionately from the externalities associated with the inequitable distribution of urban transport, such as high rates of pedestrian deaths because of limited or no facilities for walking, air and noise pollution that contributes to poor health, and the fragmentation and isolation that can result from the development of large and busy roads in proximity to low-income communities.

Increased access through efficient and affordable transport services that connect to schooling, healthcare, and social and cultural opportunities has a direct bearing on human capital development – an essential ingredient for escaping poverty. Traditional projects that focus exclusively on efficiency goals can result in the needs of the poor or other disadvantaged groups being neglected. This can limit the degree to which disadvantaged groups enjoy the benefits of projects and moreover can result in unintended adverse impacts such as longer walk times, unaffordable fares for public transit, or division effects of large infrastructure that cuts through neighborhoods and/or cuts off access for the poor.

To leverage the potential for transport investments and polices to reduce poverty and inequality and foster socially inclusive development, a new approach is needed that focuses on improving accessibility and addressing the needs of poor and disadvantaged groups. This approach should draw on a clear understanding of the challenges faced by disadvantaged populations in the region and from lessons learned from programs to improve transport with inclusion goals in mind. Such efforts should strive to target investments in transport infrastructure and services to address existing gaps in and barriers to mobility and accessibility to opportunities, and to mitigate adverse impacts of negative transport externalities such as noise and air pollution and traffic injuries and deaths that so often disproportionately affect poor and marginalized groups. Finally, policies, programs, and interventions should increase the inclusion of populations suffering from transport inequalities and inequities in the decision-making process (Lucas et al. 2019). The following chapters will discuss more in-depth the challenges the region faces to achieve equitable and inclusive transport in both urban and rural areas, what has worked, and the lessons learned from policies and practices, and key actions and policies going forward.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One Size Doesn't Fit All: Barriers to Mobility and Accessibility for Disadvantaged and Vulnerable Populations in Urban Areas

2

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High rates of poverty and inequality in Latin America and the Caribbean have historically placed a disproportionally heavy burden on specific population groups. In 1948, the United Nations coined the term "disadvantaged populations" to describe groups that could not fully participate in the social, political, economic, and cultural systems of their societies due to structural inequalities. Women, children, indigenous peoples, LGBTQ+, migrants, and persons with disabilities are considered among the disadvantaged groups (Estes 2014). Today, more than seven decades later, the term continues to be relevant. For example, 4.4 million more women live in extreme poverty than men (United Nations 2018). UNICEF estimates that 1 billion children experience multi-dimensional poverty worldwide and that they are more than twice as likely to live in poverty than adults (UNICEF 2021). Persons with disabilities are also overrepresented among the global population living in poverty and extreme poverty (International Disability Alliance 2015; WHO 2011).

Ending poverty for disadvantaged populations requires a people-centered approach that supports their full realization as human beings (United Nations 2015). As discussed in Chapter 1, equitable access to safe, reliable, and affordable transportation services is a key element to drive poverty eradication and sustainable development (United Nations 2015), as it materially connects people to employment, education, and health opportunities. However, transport systems worldwide fall short of addressing the mobility needs of disadvantaged populations. Frequently, transport infrastructure and the associated services are designed according to efficiency criteria and are therefore focused on mobilizing people during peak hours for work-related trips. This planning approach places primary emphasis on users who travel to work, overlooking the travel behaviors and needs of disadvantaged populations who often have more complex travel patterns, face greater financial and time restrictions, and in some cases have unique infrastructure needs, such as the need for universally accessible and child-adapted infrastructure.

To better serve the diverse array of transport users, the paradigm governing the way transport infrastructure and services are conceptualized, constructed, and operated must be shifted. For many years, the priorities of transport policies focused on closing the infrastructure asset gap (IDB 2020). Moreover, it was assumed that investments in transport infrastructure benefited all users equally. However, a new model that puts services at the core moves the attention towards fulfilling the needs of different types of users. Following that model, this chapter argues that one size does not fit all in the transport world and that considering the needs of diverse and disadvantaged groups is paramount to foster social inclusion through transport. Although transport-disadvantaged groups include a wide range of population groups, this chapter focuses on women, children, the elderly, and persons with disabilities. In other chapters of this book, the unique transport-related challenges and needs of other disadvantaged groups are addressed; Chapter 10 covers indigenous and rural people, while Chapter 7 explores the impact of financial and digital exclusion on access to transport services.

This chapter begins by defining a conceptual framework and providing a diagnosis of the main mobility challenges faced by disadvantaged populations in Latin American and Caribbean cities, highlighting the differences in the travel patterns among transport users while describing transport affordability and urban accessibility issues. The chapter then provides a literature review of the main policies and initiatives implemented across cities in the region to address those challenges. Finally, the chapter proposes policy recommendations for cities aiming to achieve more inclusive and sustainable urban mobility.

2.1 Mobility Challenges for Vulnerable and Disadvantaged Populations

As described in Chapter 1, transport is by and large a derived demand driven by the need to access a wide range of opportunities provided by cities. However, not all user groups enjoy the same levels of accessibility to opportunities, and therefore, demand for trips can be suppressed due to numerous factors that generate transport-related disadvantage and social exclusion. For example, fear of crime and sexual harassment can limit the times of day, contexts, and places that vulnerable user groups choose to travel. Insufficient economic resources can result in the inability to pay for transport services, and the amount of time devoted to care-related trips accompanying other family members can result in time poverty that, in combination with long travel times associated with geographic segregation, can reduce the time available for people to access economic and educational opportunities needed to rise out of poverty. Moreover, as described in Chapter 5, the absence of affordable transportation options for disadvantaged populations can further exclude them from accessing the opportunities and services that tend to be concentrated in cities.

Vulnerable groups are more likely than others to experience transport disadvantage and physical barriers in transport systems. The inability to access universally accessible and safe transport infrastructure services – manifested as barriers in the design of vehicles, public spaces, streets, stations, and bus stops, as well as barriers to transportation, communication, and empathy – can expose vulnerable groups to disproportionate burdens of transport-related externalities. While traffic safety disproportionately impacts many vulnerable populations, children and youth in Latin America and the Caribbean are particularly vulnerable due to unsafe infrastructure. Furthermore, situations of exclusion by the community, drivers, or transportation service officials may arise, as in the case of a bus not stopping for a person with physical disabilities. These circumstances are forms of discrimination and exclusion that discourage people with disabilities from using public transport and, in some cases, render them unable to travel independently (Hidalgo et al., 2019).

Transport services that respond to the travel needs of all its users are critical to foster socially inclusive mobility and access to opportunities (Rodrigue 2020). The next three sections draw on case studies and empirical evidence to provide an overview of the mobility needs of women, children, persons with disabilities, and the elderly. The sections build on the available data that some Latin American and Caribbean cities have begun producing to delineate the linkages between transport barriers, accessibility, and social exclusion.

2.1.1 Women and Mobility: Urban Transport Demand Is Not Gender-Neutral

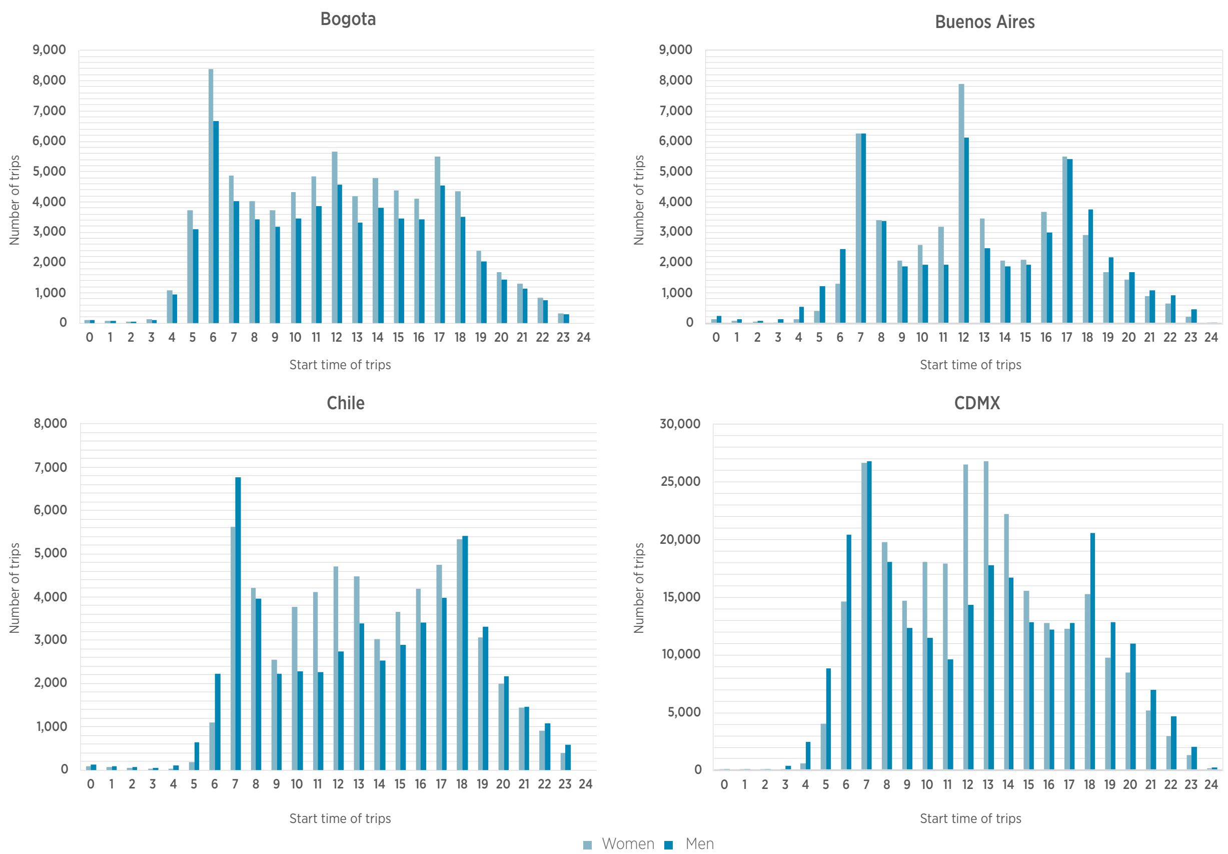
Sources of vulnerabilities and the degree of social exclusion that women face vary depending on the context and socioeconomic characteristics. The influence of gender roles on travel behavior can also intersect with other characteristics such as income, ethnicity, education, or disability (Curtis and Perkins 2006; Mejia-Dorantes 2017; Rivera 2010). In fact, women are a heterogeneous group with diverse travel behaviors. Some women tend to travel shorter distances, spend less time traveling, and work closer to home to manage household- and care-related tasks related to reproductive work(Ferrant, Maria, and Nowacka 2014; World Bank Group and UFGE 2020).[1] More recent literature analyzing women's mobility highlights different travel behavior for certain groups of commuters, such as domestic workers (Buchely and Castro 2016; Fleischer and Marin 2019; Montoya-Robledo undated).[2] This group of commuters tends to be predominantly female low-wage workers who travel long distances between deficiently connected low- and high-income residential areas. They face lengthy commutes that range from up to six hours roundtrip in Bogota to five hours in São Paulo, and four hours in Medellín (Montoya-Robledo undated; Montoya Robledo 2019; Montoya Robledo and Escovar Alvarez 2020). Long commutes restrict their time available to devote to other activities such as education, leisure, care for themselves and others, and political participation (Montoya-Robledo 2019).

Gender is one of the most important sociodemographic determinants of women's travel patterns. Given that women tend to take on a disproportionate share of household work compared to men, the time constraints brought on by this imbalance reduce their time available for commuting and limit their opportunities to participate fully in the labor market (Ferrant, Maria, and Nowacka 2014; World Bank Group and UFGE 2020). In contrast with men, women often make more trips in a day (Figure 2.1) and engage in trip chaining, more non-work trips, and travel during off-peak hours, and they are more likely to travel to accompany others (such as children or the elderly) and to carry packages, strollers, or wheel chairs (Hasson and Polevoy 2011; Jeff and McElroy undated; Pickup 1984; Queirós and Marques da Costa 2012; Soto Villagrán 2019). These travel patterns reflect how care work extends beyond the household and greatly shapes the mobility patterns and needs of women. In fact, pioneering architect and scholar Inés Sánchez de Madariaga (2009, 2013b) has proposed the concept of "mobility of care" to define all travel that originates from responsibilities around caring for the home and others, such as accompanying family members, shopping for daily living, and taking care of children, sick or older relatives, and other family members. These trips are frequently, though not always, made by women.

1. Reproductive work refers to tasks related to ensure and support society's current and future labor force. The term is not limited to biological tasks. Its economic importance is that it serves as the basis for productive work despite the fact that it is usually unpaid and yet not recorded into national accounts (EIGE 2022).

2. According to the International Labour Organization, one in every four female wage workers in Latin America is a domestic worker, accounting for approximately 17 million women in the region (ILO 2013). This informal sector is often underpaid, which means that these women end up only being able to afford housing only in very distant peripheral areas (Montoya-Robledo and Escovar Alvarez 2020).

FIGURE 2.1 Distribution of Person Trips by Start Time and Gender



Sources: Mobility surveys for Bogota (2019); Metropolitan Area of Buenos Aires (2010); Metropolitan Area of the Valley of Mexico (2017); and Santiago de Chile (2012).

Despite the limitations in mobility data for measuring care-related trips, the importance of these trips can be gleaned through specific travel surveys in Latin American and the Caribbean cities. For example, in Mexico City, the second most frequent purpose for women's trips is related to care activities (to go shopping at the supermarket and shops). Moreover, the fourth most frequent purpose is taking children to school or accompanying someone to the doctor. In fact, two out of 10 women reported having made their trips accompanied by one or more adults, according to a survey conducted in modal transfer centers in Mexico City (Soto Villagrán 2019). Other studies conducted in Buenos Aires also revealed that in a typical week, women spent 42 percent of their total commuting time making care-related trips, mostly by bus (79 percent) (Montoya-Robledo et al. forthcoming).

These types of trips to carry out family-related duties have also been overlooked by traditional urban infrastructure planning. Studies in Latin American and Caribbean cities have provided insights on limited mobility infrastructure to perform care work. Mexican women reported narrow pedestrian infrastructure to walk and travel with strollers around modal transfer centers and the absence of functioning public restrooms and rest areas, among other issues (Soto Villagrán 2019). Likewise, women in Buenos Aires reported low-quality infrastructure manifested in the absence of diaper changing stations, functioning escalators, and accessibility ramps, among other infrastructure issues (Montoya-Robledo et al.forthcoming). In Bogota, both men and women consider that women are more vulnerable when cycling with children to school, partly because some areas lack segregated bicycle infrastructure (Pipicano et al. 2021). The situation in the Caribbean is no different: small-capacity vehicles (15 to 26 people) such as those commonly used for paratransit in Suriname, Barbados, Trinidad, and Tobago as well as large buses in Jamaica do not have designated or enough space for women travelling with strollers and large packages.[3]

In terms of transport mode choice, gender roles also influence the way transportation options are used and accessed, with women frequently having fewer and lower-quality options to travel (Babinard 2011). In Latin American and Caribbean countries, women tend to have significantly lower levels of access to a private car, and they are also much less likely than men to have a driver's license (Table 2.1). Women's limited access to drivers' licenses can be related to cultural factors and social norms, and could be one of the factors explaining why, whenever there is a private vehicle at home, men use it more than women (GTZ 2007; Pérez and Caprón 2019; Peters 1998). Other factors explaining women's low vehicle ownership rates are related to financial barriers derived from lower wages and less access to financial services than men (Montoya et al., 2020). Also, research conducted in Spain indicates that even if men and women prefer a private vehicle to travel, women tend to rely on transit or walking for their daily mobility, as reflected in their high proportions of such trips (Peters 1998).

TABLE 2.1 Percentage of Driver's Licenses: Men vs. Women (percent)

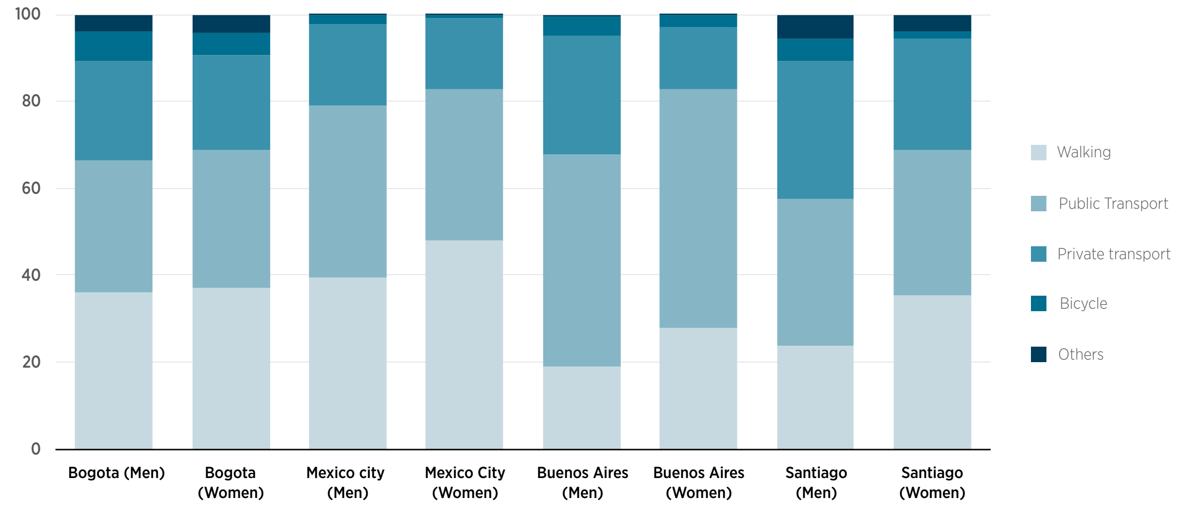
City/Country	Men	Women	Year of Data
Buenos Aires	71.7	28.3	2017
Costa Rica	70.6	29.4	2017
Chile	75	25	2017
Montevideo	70.5	29.5	2015
Paraiba State, Brazil	72.2	27.8	2018
Colombia	73	27	2018
Ecuador	78	22	2017

Source: Rivas, Suárez-Alemán, and Serebrisky (2019).

3. Interview with Christopher Persaud in 2021.

Women in developing countries tend to rely on walking as one of their primary modes of transport (Figure 2.2) (Anand and Tiwari 2006; GTZ 2007; Salon and Gulyani 2010). In the case of low-income women, even if they have access to public transit, they may frequently choose walking because they cannot afford to use the systems available to them (Peters 1998; Salon and Gulyani 2010). As discussed in Chapter 6, walking in Latin American and Caribbean urban areas may present significant barriers for women due to poor quality and inadequate pedestrian and lighting infrastructure, a lack of protection at street crossings, and difficult geospatial terrain. For example, informal settlements are often built-in hilly areas and are characterized by irregular terrain and poor-quality infrastructure, requiring women to climb a maze of steep and winding pathways to reach their destinations. In addition, a lack of paved roads and sidewalks means that during rainy seasons, roads and pathways become flooded and muddy, making even simple walking trips challenging. The fact that women often travel with children's packages and to accompany and help elders compounds these difficulties and can suppress or limit trips. These barriers also limit women's use of bicycles.[4]

FIGURE 2.2 Transport Mode Share by Gender (percent)



Sources: Mobility surveys for Bogota (2019), Metropolitan Area of Buenos Aires (2010), Metropolitan Area of the Valley of Mexico (2017), and Santiago de Chile (2012).

4. Although bicycles could be an affordable alternative for many women, women worldwide use bikes as a transport mode less often than men (Diaz and Rojas 2017; Heesch, Sahlqvist, and Garrard 2012; Moscoso et al. 2020). In Latin America, while 5 percent of total trips are made on bicycles (Quiñones and Pardo 2017), women's share of this percentage is less than 30 percent (Ríos et al. 2015).

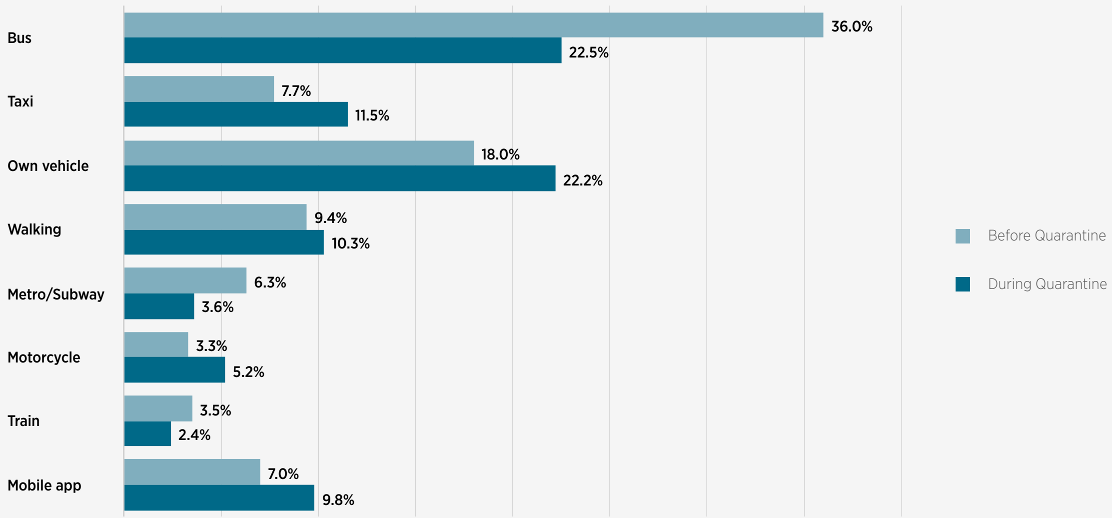
Public transit is also a very important transport mode for women (Figure 2.2), even considering the effects of the COVID-19 pandemic on transport services (Box 2.1). Several studies show that women use public transport at higher rates than men in Latin American and Caribbean cities (Bezanilla Corte and Granada 2016; Hasson and Polevoy 2011; Olmo Sánchez and González 2016; Queirós and Marques da Costa 2012; Sánchez de Madariaga 2013a; Wright and Townsend 2020). Since low-income women tend to live in peripheral areas, work in diverse geographic locations, and travel during off-peak hours, transit systems oftentimes do not meet their needs because they are planned for commuter corridors going to the city center, leading to an increased number of transfers and expenditures (Becerra, Montes Calero, and Bernal 2021). This results in longer waiting times for public transit service and increased walking due to low levels of public transport coverage and connectivity.

BOX 2.1

The COVID-19 Pandemic Has Driven Women into More Expensive Individual Transportation Modes

The COVID-19 pandemic has intensified affordability issues for women due to a shift away from public transit toward private taxis and ride-hailing services. The Inter-American Development Bank financed a mixed-methods study to understand how mobility patterns changed during the COVID-19 pandemic for essential workers (male and female) in 10 cities that are members of the Transport Gender Lab (Figure 2.1.1). Women accounted for approximately 66 percent of survey respondents. The results showed that commuting time decreased on average from 43 to 30 minutes, while the cost increased by between US$.012 cents in San Salvador and up to US$3 in Buenos Aires and Quito. On average, traditional bus and subway (where women are the main users) saw the sharpest declines in ridership. In the case of female bus users, 35.4 percent relied on them before the pandemic, compared to 21.1 percent during the pandemic. In the case of the cities with a subway, 6.3 percent of female essential workers respondents rode the subway before the pandemic, and this dropped to 3.7 percent during the pandemic. Meanwhile, the use of taxis and other transport modes increased for women from approximately 7 percent to more than 10 percent. Since private transportation is more expensive than public transportation, women's transportation-related expenditures increased during the pandemic.

FIGURE 2.1.1 Transport Mode Share for Working Women Before and During the COVID-19 Quarantine (percent)



Note: Cities surveyed in this study include: Ciudad de México (Mexico), Pachuca de Soto (Mexico), Guadalajara (Mexico), San Salvador (El Salvador), Ciudad de Guatemala (Guatemala), Quito (Ecuador), Cali (Colombia), Bogotá (Colombia), Buenos Aires (Argentina) and Santiago de Chile (Chile).

When formal transport alternatives are limited, low-income women may resort to informal transit (World Bank Group and UFGE 2020). For example, a study conducted in Quito found that 6.6 percent of women inhabiting the Jaime Roldós low-income neighborhood had to use informal transit such as mini-buses, jeeps, and taxis because the formal system did not cover specific routes or schedules they had to travel, and because of the long waits they would face (Rodríguez Yánez et al. 2021). In Cali, despite a major public transport reform started in 2006, the use of informal transit is also widespread, especially among low-income women, who cite time concerns, and for travelers who must travel between the eastern and western side of the city, where the current formal transportation does not provide adequate routes.[5] Another example is the case of San Salvador, where public transit stops operating from 9:30 pm to 3:30 am, so women traveling during these hours must find other transportation modes, which are often informal vehicles.[6] In Bogota, many low-income women reported preferring informal transit and traditional buses because they knew

5. Interview with Lina Buchely and Salome Arias in 2021.

6. Interview with Denise Hernandez and Jacqueline Johana Peña in 2021.

the driver and he would often help them with grocery bags, and because they could negotiate the fare for their children.[7] These findings mirror other studies that have revealed that women often rely on cheaper and slower non-motorized informal transit (Peters 2013). Despite the role those informal modes play in filling in coverage gaps in the formal public transport modes for women, due to the lack of regulations of these modes, women can face adverse conditions while using them. For example, informal transit drivers sometimes discriminate against women travelling with small children because they pay reduced fares. Prevalence of sexual harassment is another challenge for women using informal transit. Moreover, women report little support or empathy from other passengers or the drivers when it occurs (Rodríguez Yánez et al. 2021).[8]

Excessive travel times not only create time and transport poverty, but they also reduce access to labor market opportunities and have negative health impacts. Inaccessible public transport (due either to a lack of affordability or coverage) can cause exhaustion and affect the reduced time resources of low-income women (Peters 2013). Research conducted in Jakarta, Indonesia suggested that the number of women commuters above the age of 29 plummeted because of the strain it placed on the need to balance household and work responsibilities (ADB 2015; Rachmad, Adji, and Handiyatmo 2012). Women often entered the informal economy closer to their homes because they could reach their jobs by walking (ADB 2015; Rachmad, Adji, and Handiyatmo 2012). Also, research in the United States found that women who spend more time doing family work at home are reluctant to commute to access job opportunities (Haley-Lock, Berman, and Timberlake 2013). Another study in the United States shows that increasing commutes by 10 minutes diminishes married women's probability of participating in the labor force by 4.6 percentage points (Farré, Torrecillas, and Jofre-Monseny 2020). Moreover, women may further suffer from transport externalities. A case in point is the exposure to air contaminants while using public transit in developing countries (Montoya-Robledo, López Valderrama, and Iguavita 2022).

Poor quality of urban transport infrastructure is therefore another barrier to connect employment hubs and residential areas (including informal settlements) (Chapter 3). Transportation planners have ignored middle- and higher-income residential areas as labor sites for many informal paid care workers, which increases the commuting times for these (mostly women) workers. For instance, in Bogota, there are few integrated buses connecting higher-income sites to the Bus Rapid Transit (BRT) system, Transmilenio, and no aerial cables in steep high- and middle income neighborhoods close to the eastern mountains (Montoya-Robledo, undated). Likewise, high- and middle-income residential sites often lack proper sidewalks and pedestrian paths that connect to transit. Moreover, research conducted in India showed a spatial mismatch between the location of the jobs of low-

7. Interview with Erik Vergel in 2021.

8. Ibid.

paid women and the location of their homes, resulting in longer commutes by low-income than by high-income women (Uteng and Turner 2019). Evidence from Latin American cities also confirms that households in the urban periphery are generally poorer, more likely to be headed by single mothers, face longer commutes, and have less access to public services compared to households in more central urban locations (Libertun De Duren 2017).

As the prior discussion suggests, the lack of affordable transport services can be an important barrier for low-income populations (see Chapter 5 for a more comprehensive discussion of this issue). One example can be seen in the trip rate distribution of women by income in Latin American cities. As illustrated in Figures 5.3 to 5.6, the average number of daily trips positively relates to the level of income, underlining low transport demand for women in the left tail of income distribution. These data suggest that low-income women may experience higher levels of transport poverty because they are unable to afford all the trips they must make, without sacrificing expenditures on basic goods and other services. Moreover, a study in Santiago de Chile, Lima, Bogota, and Mexico City shows that low-income persons use less public transport and engage more in active commuting, while people in the lower-middle-income segment tend to rely more on public transport (Rozas Balbotín and Salazar Arredondo 2015).

FIGURE 2.3 Women's Average Number of Trips in Bogota by Socioeconomic Strata[1]

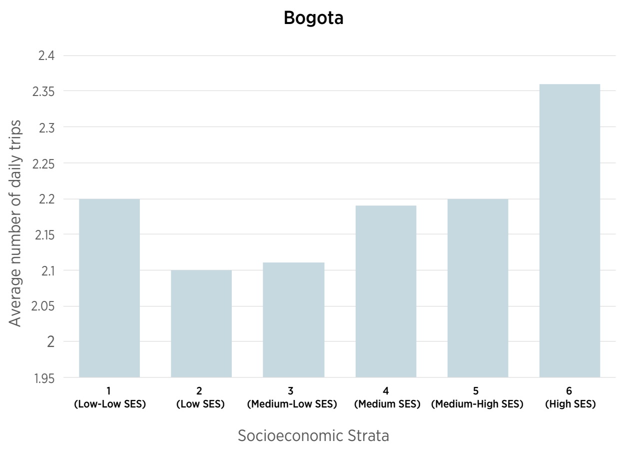


FIGURE 2.4 Women's Average Number of Trips in Mexico City by Socioeconomic Strata

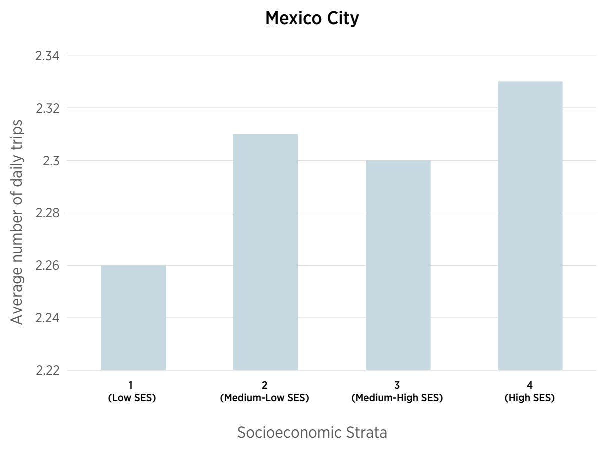


FIGURE 2.5 Women's Average Number of Trips in Santiago de Chile by Income Range

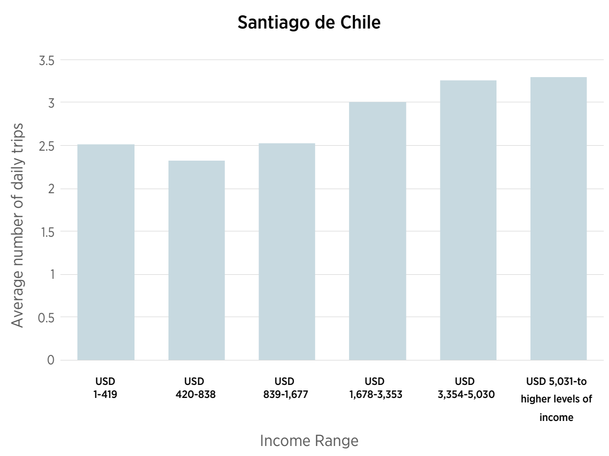
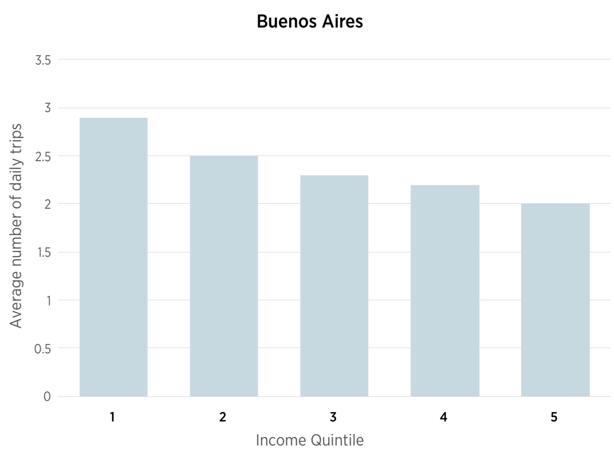


FIGURE 2.6. Women's Average Number of Trips in Buenos Aires by Income Quintile[2]



Sources: Mobility surveys for Bogota (2019), Metropolitan Area of Buenos Aires (2010), Metropolitan Area of the Valley of Mexico (2017), and Santiago de Chile (2012).

Note: Number of observations: Bogota, 35,249; Buenos Aires, 35,889; Mexico, 103,296; and Santiago, 31,679. SES: socioeconomic strata.

1. Colombia's household socioeconomic stratification system is based on the physical characteristics of the dwelling and its surroundings. A value of 1 represents the lowest strata or poorest households, while a value of 6 represents the highest strata or richest households.
2. Buenos Aires classifies households into five groups according to increasing value of the average income per person received by the household, where each quintile represents 20 percent of households.

Low-income women who are not able to access or afford public transport services might face higher levels of social exclusion. While there is limited information about women's suppressed trips and the factors explaining them, travel surveys can provide proxy data because they usually measure immobile people, defined as people who did not report any trips during a certain period (usually one day) (Riera 2018). Immobile people are also those with a restricted range of travel alternatives, especially in the availability of easy-to-use and inexpensive options for travel (Crain and Associates, Byrd, and Omniversed International 1999).

Following these definitions, immobility represents an extreme expression of inequality and reduced accessibility, even compared to a low-income mobile person with gender implications. For example, studies conducted in Bogota and in several metropolitan areas of Argentina reveal that women constitute a vast majority of immobile people (Oviedo and Titheridge 2016; Riera 2018). Although the factors explaining immobility combine sociodemographic, geographic, and cultural issues, affordable and accessible transport is essential to address immobility and foster social inclusion. For example, in Lima and other Latin American cities, a certain percentage of the population does not use public transport because they cannot pay for it, which further reinforces the poverty cycle (Cunha et al. 2018). Moreover, as shown in Table 2.2, mobility surveys from various Latin American and Caribbean cities confirm that low-income women have higher immobility rates than men.

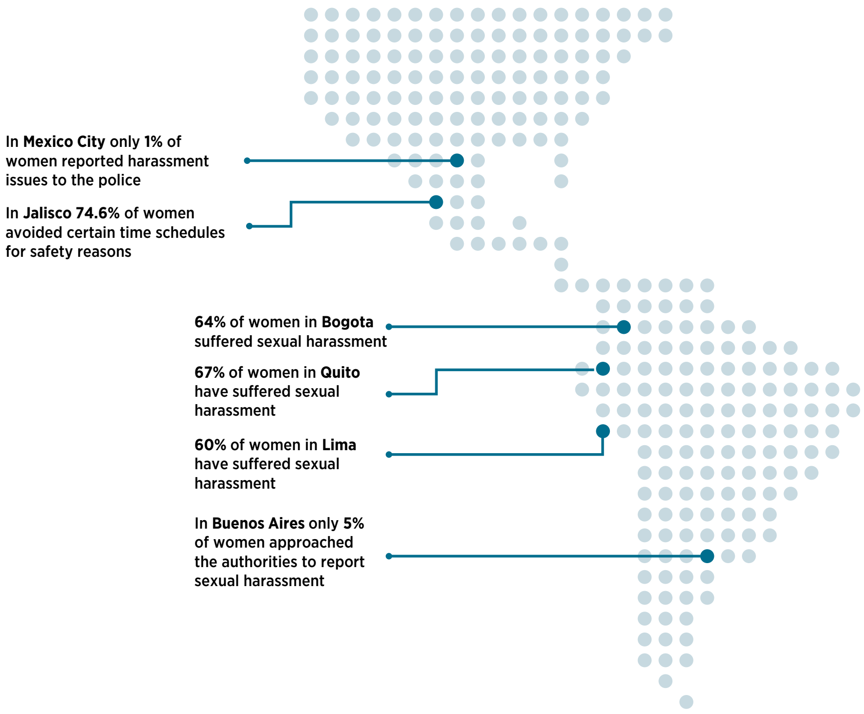
TABLE 2.2 People Who Did Not Travel (Immobile) (percent)

	Buenos Aires	Bogota	Mexico City	Santiago de Chile
Women	55.1	59.3	57.2	57.3
Men	44.9	40.7	42.8	42.7

Sources: Mobility surveys for Bogota (2019), Metropolitan Area of Buenos Aires (2010), Metropolitan Area of the Valley of Mexico (2017), and Santiago de Chile (2012).

The prevalence of gender-based violence, which mostly affects women and the LGBTQ+ population, also causes fear-based exclusion from certain modes, times, and may even lead to trip suppression. Data available for Latin American and Caribbean cities show that most women have experienced sexual harassment while commuting (Figure 2.7) (Kash 2019; Montoya-Robledo 2019; Quiñones 2020; Rodas, Cardona, and Escobar 2020). For example, a survey in 15 cities worldwide revealed that more than 60 percent of women had suffered sexual harassment in public transport in Mexico City, Bogota, and Lima (Thomson Reuters Foundation 2014). However, sexual harassment is frequently underreported (Gardner, Cui, and Coiacetto 2017; Muholi 2004). Reasons for underreporting range from authorities underestimating or responding apathetically to the incident or accusing victims of provoking it, victims normalizing harassment, and bureaucratic and time-consuming processes (Dhillon and Bakaya 2014; FIA Foundation 2016; Montoya-Robledo 2019; Neupane and Chesney-Lind 2014; Quiñones 2020).

FIGURE 2.7 Women's Experiences of Harassment while Commuting in Latin America



Source: Prepared by the authors.

LGBTQ+ persons are also frequently victims of gender-based violence and discrimination in public spaces and particularly in public transit systems. Studies conducted in the U.S. states of Massachusetts and Oregon with transgender persons and people belonging to other gender minorities showed that a high percentage of them had suffered discrimination and sexual harassment in the public space and transportation (Lubitow et al. 2017; Reisner et al. 2015). Another study in New York City found that women reported more frequent discrimination based on their gender-nonconformity than men (Gordon and Meyer 2008). Also, a qualitative study of low-income transsexual sex workers in Bogota showed their socio-spatial exclusion from the perspective of immobility, and how they faced exclusionary practices and verbal abuse (Ritterbusch 2016). Similarly, according to interviewees in Cali, transgender men reported fearing gender-based violence on a particular intermunicipal route connecting to the city of Jamundí controlled by illegal violent groups.[9] Finally, a study in Gauteng, South Africa revealed that lesbian women constantly suffered from physical assaults and sexual violence (Muholi 2004). As in the case of harassed women, this type of gender-based violence also restricts the LGBTQ+ population from accessing urban opportunities.

Women and LGBTQ+ persons adopt various strategies to avoid and mitigate gender-based violence in the public space and on transport, which in turn may limit their social inclusion (Falú 2009, 2017; Soto Villagrán 2017). Strategies range from shouting and physically reacting against the harasser, remaining silent, trying not to attract attention, escaping, changing clothes, modifying their transportation modes and routes (implying longer travel times), and avoiding travel during specific hours.[10] Sometimes women feel extreme anguish due to sexual harassment, which forces them to restrict their commutes (Korn 2018). A study conducted in the social housing area of Santa Julia de Macul in Santiago de Chile revealed that when women felt that a particular area was unsafe, they sacrificed their access to urban opportunities (Figueroa Martínez and Waintrub Santibánez 2015). Therefore, the absence of safe transport negatively impacts educational opportunities for girls, since parents prevent them from attending school when transportation is unsafe (Fernando and Porter 2002), and it also reduces women's participation in labor markets by 15.5 percent (ILO 2017).

Gender-based violence while commuting also adversely impacts women's financial resources. According to a survey conducted in New York City, sexual harassment on public transport places what is called a "pink tax" on women who suffer it because it often forces them to use other types of pricier transportation (Kaufman, Polack, and Campbell 2018). When women change transportation modes at night for safety reasons, their monthly travel expenses can increase from US$26 to US$50, while men face no such financial or safety issues (Kaufman, Polack, and Campbell 2018). Some cities have pioneered options to alleviate this negative impact. For example, Rio de Janeiro's metro provides a "safe space" (segregated space for women) to avoid harassment. An experiment conducted with metro riders concluded that women are willing to pay a 20 percent premium on the fare to use the segregated space. The authors conclude the cost of avoiding physical harassment on public transit is approximately of US$1.45 per incident, constituting a pink tax in a country where women currently earn US$.79 cents for every dollar a man earns (Kondylis et al. 2019). In addition, some literature (Sabogal-Cardona et al. 2021) suggests that women may use private transport modes (taxi, informal transport, ride-hailing) because they feel more secure in certain contexts (places or times of day), even though this can also increase their travel expenses.

9. Interview in 2021.

10. Interview with Lina Buchely and Salome Arias in 2021. See also Dunckel-Graglia (2016), Kash (2019), Korn (2018), Montoya-Robledo (2019), Muholi (2004), Rodas, Cardona, and Escobar (2020), and Soto Villagrán and Castro Reséndiz (2018).

Road safety challenges also have gender-differentiated impacts. Differences in the mobility patterns of men and women can lead to a different level of exposure to the risk of injury and death in road crashes (Cordellieri et al. 2016). The literature suggests that men's higher risk is associated with factors such as their greater access to motorized vehicles, toxic masculine behaviors (e.g., aggressive driving, drunk driving), among others. Additionally, there is evidence that vehicles are generally designed for men, and vehicle safety tests are carried out only with male dummies that ignore the physical differences between women and men. Women drivers or passengers in the front right seat are 17 percent more vulnerable to dying in traffic incidents than men (Barry 2019). Moreover, the probability of a woman using a seatbelt in a vehicle suffering serious injuries in a frontal crash is 73 percent higher than for a man (Barry 2019). Despite women's physical vulnerabilities during a crash, men have more traffic fatalities worldwide. Most women who die in a road crash are pedestrians and car passengers (Burlacu and Gonzalez Carvajal 2021). However, the lack of road safety statistics disaggregated by gender limits in-depth analysis of female fatalities.

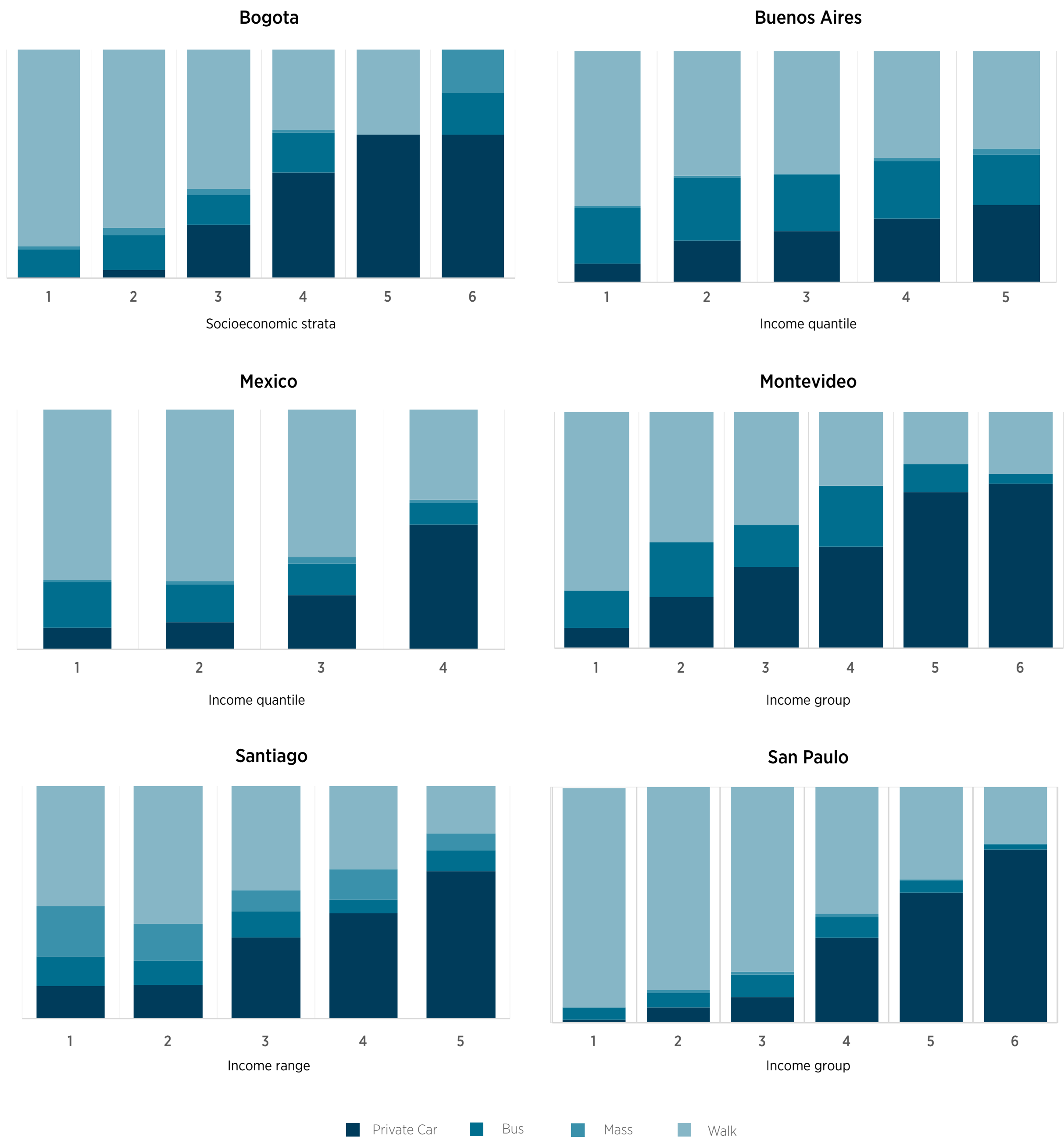
Road collisions increase the care workload mainly for women and also affect the socioeconomic situation of the household. A qualitative study carried out in the Guadalajara Metropolitan Area found that after a road collision with non-fatal injuries, the victim was left in the hands of female caregivers (Pérez-Núñez et al. 2011). In the family sphere, several studies have shown that a fatal traffic crash or one resulting in serious injuries can significantly affect income and spending patterns. In the case of men, given that in many households they are the main providers, their injuries negatively impact the family economy (WHO 2002). For women, since many may be unemployed or in informal jobs, their social security system may not cover the consequences of injuries (WHO 2002). The study in Guadalajara showed that in economic terms, beyond medical expenses and/or initial funeral expenses, the income of households – especially those with limited economic resources – decreased temporarily or permanently after the traffic incident when one or more of its members had to stop working (Pérez-Núñez et al. 2011).

2.1.2 Children's Mobility and Development

Children's travel behavior varies substantially from the typical adult, reflecting their differing needs and vulnerabilities. Studies conducted in the United States and Belgium show that school and leisure activities are a common trip purpose for children (Mackett 2013), and that children's travel behavior varies substantially depending on their age. For instance, infants make half as many trips as 18-year-olds. On the one hand, research in Belgium with children between 10 to 13 years old showed that 43 percent of trips were made with parents and one-fourth were made alone. Around 66 percent of trips were short (no longer than 10 minutes) and 87 percent lasted no more than 20 minutes (Zwerts, Janseens, and Wets 2010). On the other hand, a study in England found that while 80 percent of children ages 7-8 were allowed to go to school alone in 1971, this number dropped to 9 percent in 1990 for the same age group (Hillman, Adams, and Whitelegg 1990). This shows that the age at which children are permitted by their parents to move independently ("children's independent mobility") has risen over the years. This has led to an increase in the amount of time that caregivers devote to accompany those trips and to lower physical activity and spontaneous play among children (Hillman 1997). Moreover, another British study found that 42 percent of the escort trips are made by car and 90 percent of the households with dependent children owned a vehicle, which suggests that the time that children spend in cars increased and walking has decreased, which has negative consequences for physical health and cognitive development (Mackett 2013).

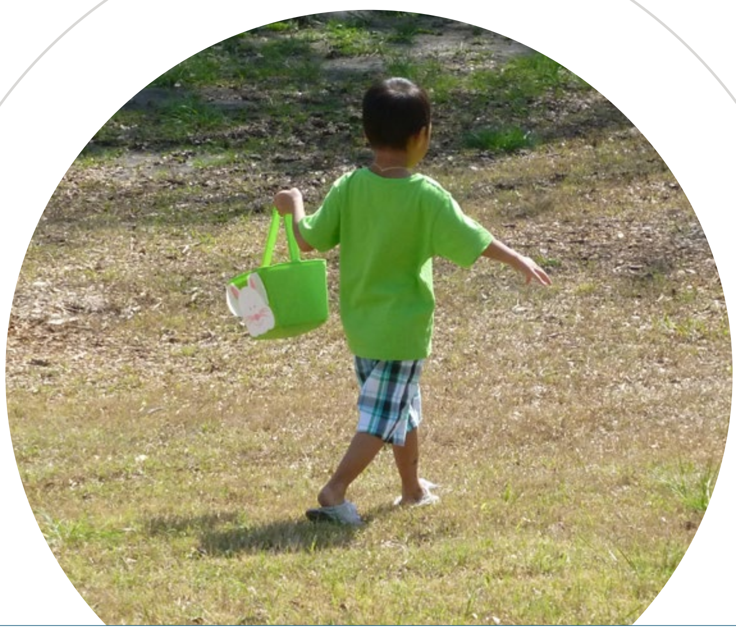
In Latin America and the Caribbean, children and youth primarily travel by foot or motorcycles, with only a small share having access to school transport. For example, in Bogota 43.15 percent of children travel by foot and 18.58 percent use school buses. A survey in Bogota, Buenos Aires, Mexico City, Montevideo, and São Paolo between 2012 and 2018 shows the modal share by income group for 5–14-year-olds. Figure 2.8 shows that the most common transportation mode is walking, especially for low-income children, with a range between 52 to 93 percent, demonstrating the importance of this transport mode for children and youth.

FIGURE 2.8 Mode of Transportation by Income Group for 5–14-year-olds (percent)



Sources: Mobility surveys for Bogota (2019), Región Metropolitana de Buenos Aires (2010), Zona Metropolitana del Valle de México (2017), Montevideo (2016), São Paulo (2017), and Santiago de Chile (2012).

Children living in low-income areas often experience large negative impacts due to lower access to appropriate transport infrastructure and services, adversely affecting their development and their ability to escape poverty as adults. A lack of safe spaces to play and move by active modes, and less access to recreational opportunities, healthcare,[11] and other services in low-income neighborhoods, are associated with poor health outcomes and adverse effects on children's cognitive and social development and their future growth in society (Moreno-Monroy and Posada 2018; Chang and Romero 2008). This also has contributed to high rates of road injuries, as well as and other health problems (Box 2.2). One in five children is either overweight or obese in the region, with lack of physical activity being one of the factors influencing childhood obesity rates (Caballero et al. 2017). Moreover, long travel times to reach schools, associated with sprawling urban development, along with inadequate or unaffordable school transport systems, contributes to lower school enrollment and attendance and higher school dropout rates (Chang and Romero 2008). In addition, there are indirect consequences for the people caring for children due to the amount of time and economic resources needed to accompany children to and from school or other activities.



11. In Panama, mortality rates of poor children are 6 to 8 times higher than for those in the highest socioeconomic decile. Inequality in access to health services is reflected in child mortality, which is concentrated among the poorest 20 percent of the population. One of the reasons for this is the time required to reach health services (double the time for the lowest decile) and the lack of physical access to those services. Also, health services usually are not open at the time of need, considering parent´s jobs, and those that are accessible are far away (Sandiford and Salvetto 2002).

BOX 2.2

The Invisible Threat of Air Pollution for Children's Health

Children's exposure to high levels of air pollution is a silent killer. Approximately 100 million children in in Latin America and the Caribbean live in areas that exceed the limits for PM2.5 particles that penetrate their lungs, causing permanent damage that can lead to premature death. Children suffer more than adults from the effects of air pollution because they breathe faster and absorb more pollutants. In total, 98 percent of children who live in middle- and low-income countries breathe air with PM2.5 levels higher than established safe levels (WHO 2018). According to a study by Greenpeace and the Network for the Rights of Children in Mexico (REDIM), air pollution in Mexico caused 680,000 deaths for children up to 4 years old in 2018 (Greenpeace Mexico 2018). The National Institute of Public Health of Mexico has estimated that reducing the concentrations of pollutant particles from 50 $\mu g/m^3$ to 20 $\mu g/m^3$ could prevent between 6,500 and 14,300 premature deaths in the country (Centro Mexicano de Derecho Ambienta 2013).

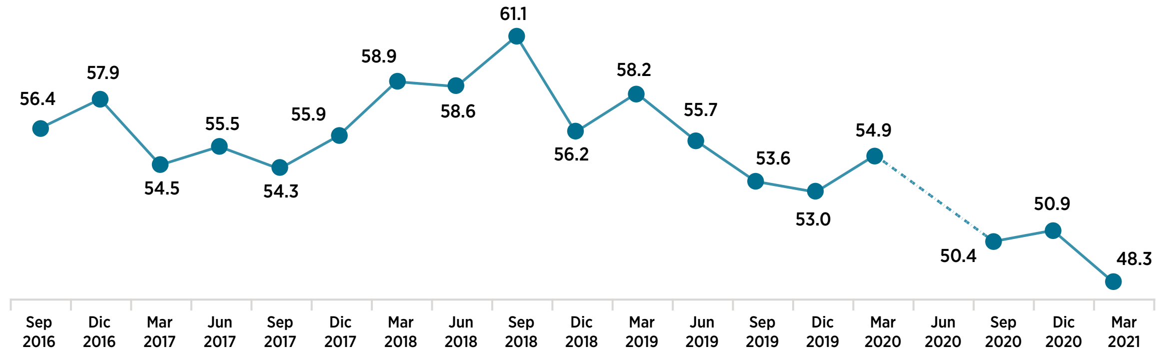
Additionally, the Study of Health and Air Pollution in Latin America (ESCALA) conducted an analysis of the health-related impacts of air pollution on adults and children in nine Latin America cities. The study found that for every 10 $\mu g/m^3$ of exposure to contamination particles, mortality increase by 0.7 percent. The study also found that 36 percent of the population living in the areas with the highest risk of exposure are vulnerable groups such as children and older adults (800,000 under 5 years of age and 1.2 million between 6 and 14 years of age) (Cifuentes, Mehta, and Dussaillant 2011). Complementing this study, an analysis in Mexico City estimated that reducing pollution to safe levels would prevent more than 80,000 childhood respiratory infections and 3,800 children's deaths per year.

Studies conducted in the United States also conclude that children are affected by exposure to air pollutants during commuting trips. When children traveled to more distant schools or activities, daily average cumulative NOx exposure was higher than 340 $\mu g/m^3$ for buses and 175 $\mu g/m^3$ for cars compared to 190 $\mu g/m^3$ and 152 $\mu g/m^3$, respectively, if they went to a local neighborhood school (Wolfe et al. 2017). The effect of air pollution on children can be also seen in a reduction in their ability to concentrate and in slower reaction times, which has an important impact on their neurodevelopment.

A lack of affordable transport services for children also translates into affordability issues for their parents, as they are the ones who must pay for the trips and take the time to ensure that their children are on a safe route. Often this responsibility falls disproportionately on women, since they are more likely to make trips to pick up and drop off children from school, take them to after-school activities, run errands, and go to health appointments with them. IDB research in three low-income informal settlements in the Province of Buenos Aires in 2018 (Gutierrez et al. 2022) shows that mothers are reluctant to walk with their children through the community when taking them to activities for safety reasons. Often, they avoid traveling in certain contexts and at certain times of day, and they use strategies such as traveling with others and relying on public transit even for short distances that would otherwise be easily walkable. Additionally, the lack of sidewalks, along with insufficient run-off water management, makes it almost impossible to walk around the neighborhood on rainy days. A mother in the focus groups for that study stated that "teachers at my children's school already know that if it rains, my kids are not going to go to school that day." Although schools closest to the neighborhoods are located at an average distance of 1.5 to 3 kilometers, families choose to take their children to remote schools to get a better-quality education, increasing household expenditures on transportation. Public transit, intended for the general population, also tends to be overcrowded, and the prohibitive cost of the service leads to the suspension of trips considered less important, including trips to school that compete with trips to work.

Children and youth in the region are also vulnerable to fear-based exclusion from transport services, limiting their transportation options and times, places, and contexts to safely move about and play. This also imposes financial burdens on families that resort to accompanying their children to activities and schooling either via public transport or private motorized modes, reducing children's physical activity and opportunities for social interactions with their peers. In Mexico, the National Urban Public Safety Survey (ENSU) revealed that 48.3 percent of caregivers do not allow their children to leave their home alone because past negative experiences or perceptions of insecurity in the streets, such as violent gangs, robberies, or assaults (Figure 2.9) (INEGI 2021).This limits children from engaging with their environment, which compromises their development. In addition, children are more vulnerable to being kidnapped: 26 percent of the total cases of missing persons in Mexico correspond to persons under 17 years of age (USAID and Data Civica 2019).

FIGURE 2.9 Willingness of Parents to Allow Their Children to Make Unaccompanied Trips (percent)



Source: INEGI (2021).

As explained before, the built environment and a lack of infrastructure for children often impedes their ability to play and travel safely, leading to a host of physical, mental, and social development challenges (Box 2.3). Children's independent mobility is key to enabling and promoting their physical activity and the associated positive health outcomes, including physical fitness, cognitive development, and wellbeing. However, high rates of urban sprawl and motorization, along with issues surrounding traffic safety, have contributed to a decline in children's ability to travel independently of their caretakers, and an increase in the number of their trips via motorized modes. In Latin America and the Caribbean, high levels of insecurity and traffic collisions that disproportionately affect children compound these trends and reduce the use of active transport and the degree of accessibility to opportunities essential to their development, including schooling, healthcare, social venues, and recreation (Figure 2.10).

BOX 2.3

Lack of Physical Activity among Children: One of the Causes of Obesity

An often overlooked but critical consequence of limited transport options, particularly for children and youth, is their short- and long-term effects on health. According to the Global School-based Student Health Survey (GSHS), a third of Latin American children are overweight, which has a direct impact on public health (Campos 2021). Among the many societal causes of this problem, including unhealthy nutritional transition and an increase in nutrient-poor, energy-dense foods, children's limited physical activity contributes to the problem (Hillman 1997). Childhood obesity can result in continuous health problems throughout a person's lifetime (NCD Risk Factor Collaboration 2017).

A British study found that 42 percent of children´s trips are made by car and 90 percent of the households with dependent children own a vehicle, which shows that the time that children spend in cars has increased and walking has decreased, with direct consequences on children's physical activity (Mackett 2013). In Latin American cities, this phenomenon is also related to the urban design in which high-income groups are usually located close to main activity nodes within the urban spatial structure (see Chapter 3), resulting in travel time and distances for low-income groups that are longer, and therefore more likely to be motorized, limiting their time and options for physical activity.

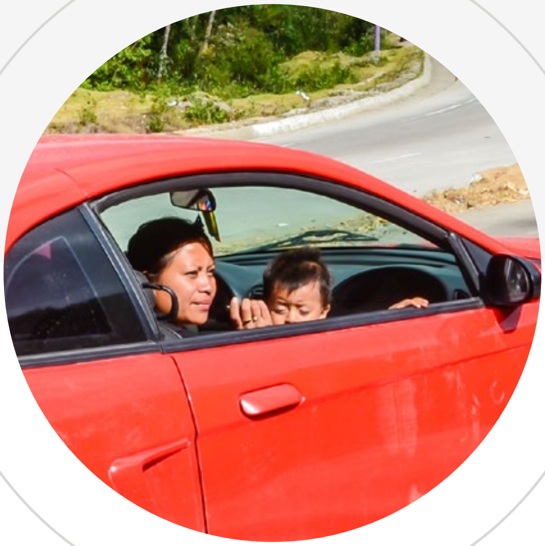


FIGURE 2.10 Conceptual Framework for Children´s Independent Mobility

Physical Environment

- **Home environment:** public transport availability, car/motorcycle/bycle ownership.
- **School environment:** distance from home, school walkability, quality of school.
- **Recreational environment:** parks.
- **Neighborhood design:** degree of urbanism, land use, urban structure.
- **Transport environment:** road safety, traffic, inclusion of child necessities.

Physical Environment

- **Socio-cultural environment:** parents encouragament, pratental rules, mobility licenses.
- **Perceived neighborhood environment as parents:** neighborhood safety, neighborhood friendliness, fear of crime, perception of traffic.
- **Perceived neighborhood environment as child:** neighborhood safety, neighborhood friendliness, fear of strangers.

Socio-demographic characteristic

- Age
- Sex/Gender
- Ethnicity
- Siblings
- Confidence
- Skills

Children's independent mobility

Outcomes

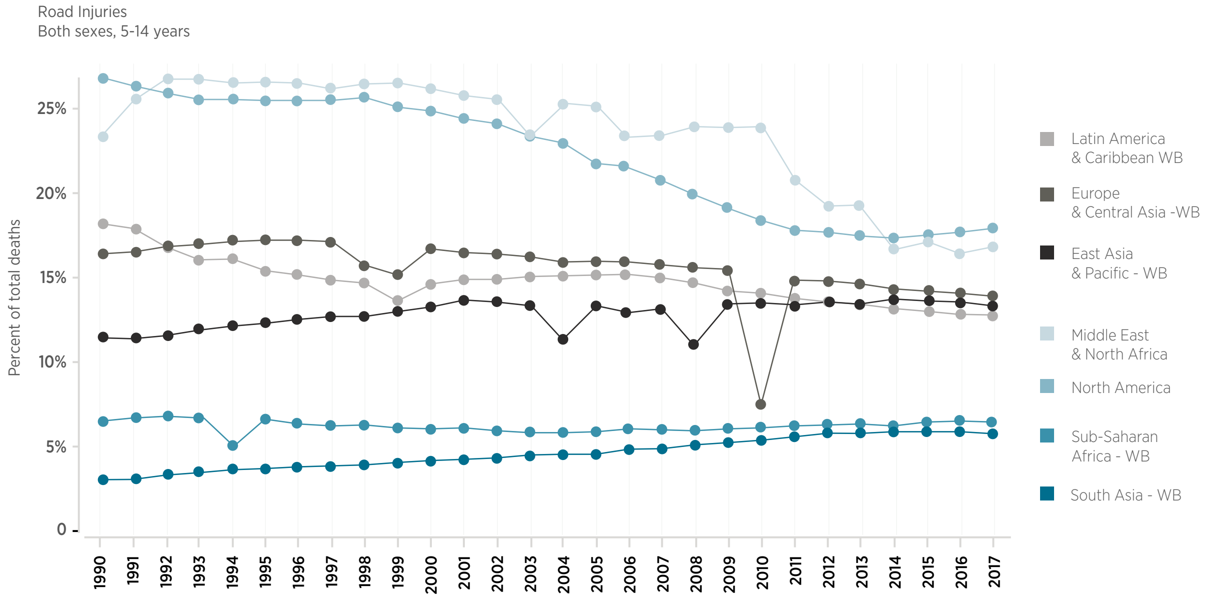
- **Physical:** restriction of physical activity, health problems due to contamination, increment of mortality and lesions due to road accidents.
- **Phychological:** affect to well-being cognitive development.
- **Social:** social competencies, problems for caregivers, dropping school.

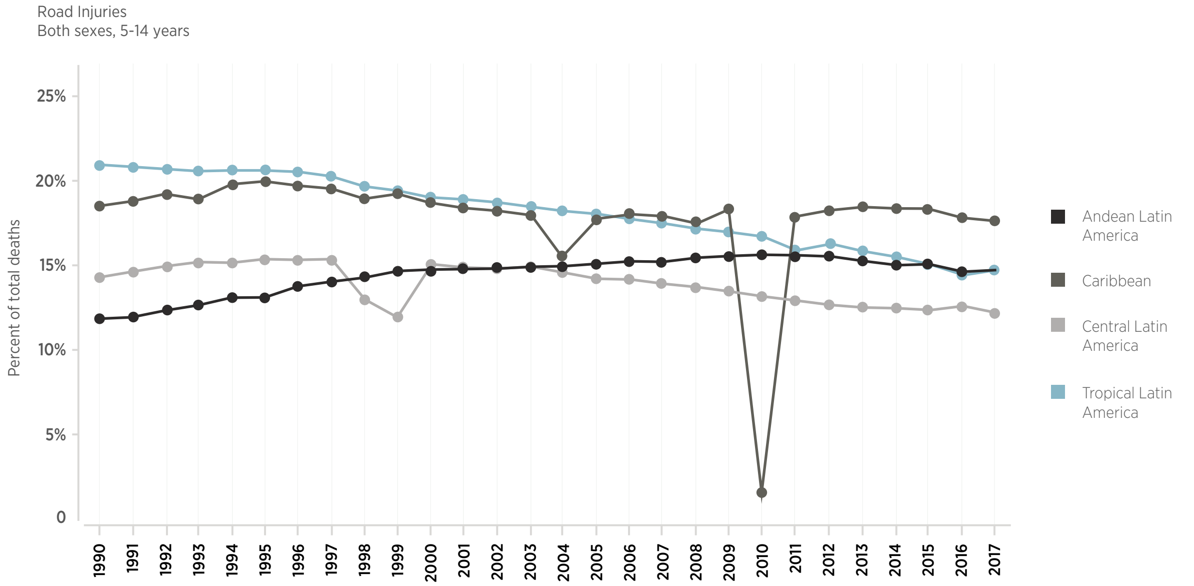
Source: Adapted from Marzi, Demetriou, and Reimers (2018).

Inadequate infrastructure and unsafe roads in the region also impede safe transportation and mobility for children. Every year around 80,000 children and youths in developing countries are killed on the world's roads, often making the journey to schools (WHO 2020). Road traffic injuries are the leading cause of death among children and young adults (5-29 years old).

Latin America and the Caribbean ranks third among global regions most affected by road injuries, with 13.9 percent of total deaths for children between 5-14 years in 2017, behind North America (United States, Canada) and the Middle East and North Africa (17.87 and 16.78 percent, respectively) (Figure 2.11). This ranking is devastating when translated into human lives, as it represents almost 50 children killed every day on roads in Latin America and the Caribbean (UNICEF 2018). In the region, the countries with the highest rates of deaths due to road injuries among children and youths are Ecuador, Venezuela, Haiti, and Costa Rica, with worsening trends in the latter two countries in the past 10 years (Figure 2.12). The respective rankings of Haiti and Costa Rica of 22nd and 9th in 2010 increased to respective rankings of 1st and 3rd in 2017, in both cases due to a longstanding deterioration in road safety. This may be due to increased motorization rates, poor driving habits, and overall high-speed traffic circulation.

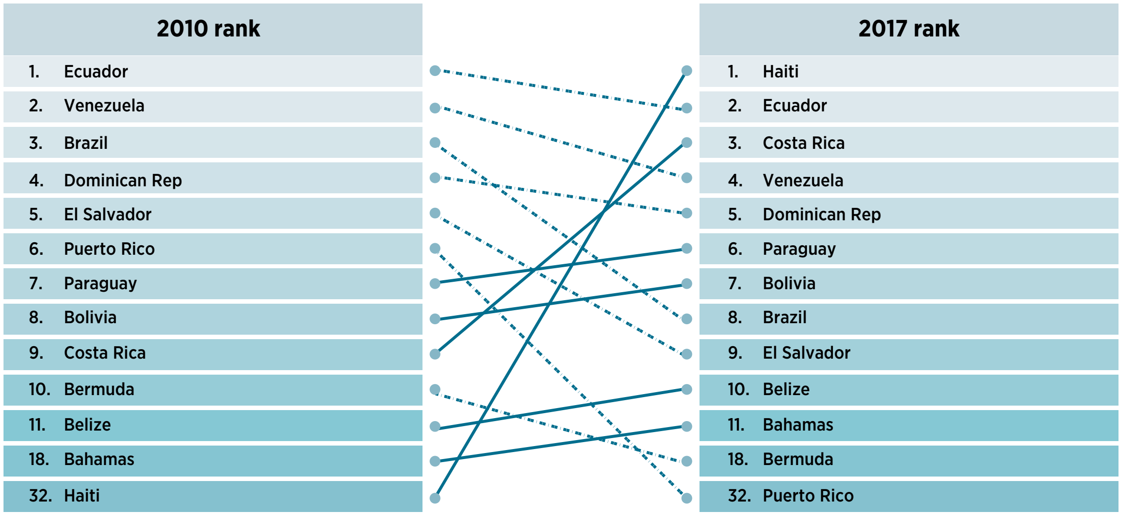
FIGURE 2.11 Share of Road Deaths in Total Deaths of Children 5-14 Years Old in Regions in the World, 1990–2017





Source: Institute for Health Metrics and Evaluation (IHME) website at https://www.healthdata.org/ (accessed in August 2020).

FIGURE 2.12 Share of Road Deaths in Total Deaths of Children 5-14 Years Old: Ranking of Latin American and Caribbean Countries, 2010 and 2017



Source: Institute for Health Metrics and Evaluation (IHME) website at https://www.healthdata.org/ (accessed in August 2020).

Globally, low-income groups are the most affected, with 21.5 road fatalities per 100,000 population, and with 93 percent of child road fatalities occurring in low- and middle-income countries (WHO 2020). Household spending due to hospitalization or rehabilitation after a road traffic injury is often so considerable that it can drive a middle-income household into poverty. This limits their future economic potential, considering that serious injuries and disabilities often have lasting effects, and their social and economic cost is greater when they occur at a younger age. In addition, being involved or injured in a road traffic crash can produce mental health impairment in children, such as post-traumatic stress disorder, which can have negative impacts on their development (LSE, Abertis Foundation, and UNICEF 2019).

Children in low-income and informal communities have a heightened risk of suffering from road traffic impacts compared to children in higher-income communities. Numerous studies show that the highest crash rates are among less-favored socioeconomic strata, where walking and motorcycles are used more (see Chapter 6). In some developing countries, children are even more affected as pedestrians or passengers on motorcycles than passengers in vehicles on their trips to schools. This is due, among other causes, to the lack of basic protections: roads in the region lack pedestrian crossings in areas with speeds greater than 40km/h, and 68 percent do not have formal sidewalks for pedestrians (Draisin and González 2018). The International Road Assessment analyzed 135,000 km of roads in Latin America and the Caribbean using a Star Rating methodology (one star, least secure and five stars, most secure). The results showed that 74 percent of the evaluated roads obtained one or two stars and only 26 percent received three stars or more for pedestrians. The analysis also found that 68 percent of roads with speeds of more than 40 km/h do not have formal sidewalks for pedestrians, and 88 percent of roads with speeds of more than 40 km/h do not have specific crossings for pedestrians (Draisin and González 2018).

Only few countries have regulated speed limits in urban areas. Ecuador, Paraguay, and Uruguay are good examples in the region as they control urban speed limits below 50 km/h. Other countries (e.g., Mexico, Dominican Republic, and Paraguay) only have speed limits below 20-30km/h in school zones. Speed management is important for children because their behaviors and movements are unpredictable, and their bodies are more fragile than adults so they cannot sustain the same impact (Draisin and González 2018). Countries also lack laws enforcing wearing a helmet on motorcycles and standards for helmets, seat belts, and child restraints. These can be considered basic regulations that can save millions of lives; however, they are not applied in all countries due to the cost of the special seats for children, especially considering that they must change when the child grows up depending on their weight (there are five levels of child seats). For example, the cost of the child seat is around US$80 in Ecuador and Colombia, which represents 20 and 32 percent of the minimum monthly salary, respectively, in those countries. Research conducted by WHO has shown that using age- and size-appropriate child restraints (car seats, booster seats, and seat belts) is the best way to save lives and reduce injuries in a crash, and that the use of restraints can reduce injuries among infants by 70 percent (LSE, Abertis Foundation, and UNICEF 2019). Other studies conclude that the correct use of child restraint systems reduces injuries by between 90 and 95 percent for rear-facing systems and 60 percent for forward-facing systems (Gallego et al. 2015).

2.1.3 Urban Transport Systems in the Region Are Failing to Adapt to the Needs of Persons with Disabilities and the Elderly

Persons with disabilities are another heterogeneous group with diverse mobility needs (Box 2.4). The International Classification of Functioning, Disability and Health (ICF) described disability in 2001 as "an umbrella term for impairments, activity limitations, and participation restrictions, denoting the negative aspects of the interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors" (WHO 2011). Apart from the previous concepts of disability, this definition separates disabilities from within the individual and places them in relationship to individual abilities and how these interact with the environments in which they move and conduct their daily activities. Placing disabilities outside the individual and in the full context of the barriers they face in their environment and acknowledging that everyone should have the right to access opportunities in their environment, shifts the burden of reducing or removing those barriers to society and government.

BOX 2.4.

Disability Categories

According to the Washington Group, which evaluates disability in the censuses of Latin America and the Caribbean, disabilities may vary in terms of four levels of severity:

- **Level 1. You cannot do it:** The person has a total disability, their conditions prevent them from carrying out the activity, they usually require help and support from third parties, and they present a high degree of dependency.
- **Level 2. Yes, with great difficulty:** The person has a severe decrease in their ability to perform the activity, usually requires help and support from third parties, and shows a high degree of dependency (e.g., cannot see, hear, or speak well or clearly even with aids).
- **Level 3. Yes, with some difficulty (little-little-slight):** The person finds it difficult to perform the activity but can do it. The person is independent but, in some cases, may require help and/or support from third parties.
- **Level 4. Without disabilities**

The International Classification of Functioning, Disability and Health (ICF), identifies numerous classes of impairment as sociated with different disabilities. The deficiencies have been grouped into physical, mental, and sensory categories, always bearing in mind the great heterogeneity that exists within each person (Red Cross, undated). In relation to travel in public transport, barriers may affect people depending on the type of impairment:

- Physical: Steps; lack of ramps and curbs; absence of elevators in buses and preferential seats in buses; uneven pavement on sidewalks and obstacles on sidewalks that do not allow a wheelchair to transit.
- Sensory (Auditory): Absence of information screens; lack of visual signs for opening and closing doors for the bus, train etc.; unavailability of communications through sign language in videos.
- Sensory (Visual): Lack of tactile paving; lack of audible signage for traffic lights; absence of audio signage for opening and closing doors on buses, trains etc.; unavailability of audible information of stops on buses, trains etc.; lack of safe crossings; lack of street lighting for sidewalks.
- Neurological, cognitive, and intellectual: Absence of clear signage, wayfinding, and information in transport stations; unavailability of personnel to assist people get to the required bus, train, etc.; stress due to congestion and noise.

Source: CBM Disability Inclusion (undated).

Access to safe, efficient, and affordable transport can provide a pathway for people to reach essential services and actively participate in social and economic life. However, persons with disabilities often face severe barriers in terms of physical accessibility to and affordability of adequate transportation services and infrastructure, which prevents them from freely navigating their environment and accessing job opportunities that could help lift them out of poverty. According to a study carried out by the International Disability Rights Monitor, the lack of accessible transportation and chronic economic problems were among the key factors that can exclude persons with disabilities from the labor force (IDRM 2004).[12] According to a socioeconomic study of households in the Dominican Republic conducted by El Sistema Único de Beneficiarios (SIUBEN), for example, having access to transportation is one of the key difficulties reported by persons with disabilities in being able to live independently (United Nations 2021): 27.9 percent of persons with disabilities surveyed reported having great difficulty accessing transportation, and 28.5 percent reported not being able to use public transport.

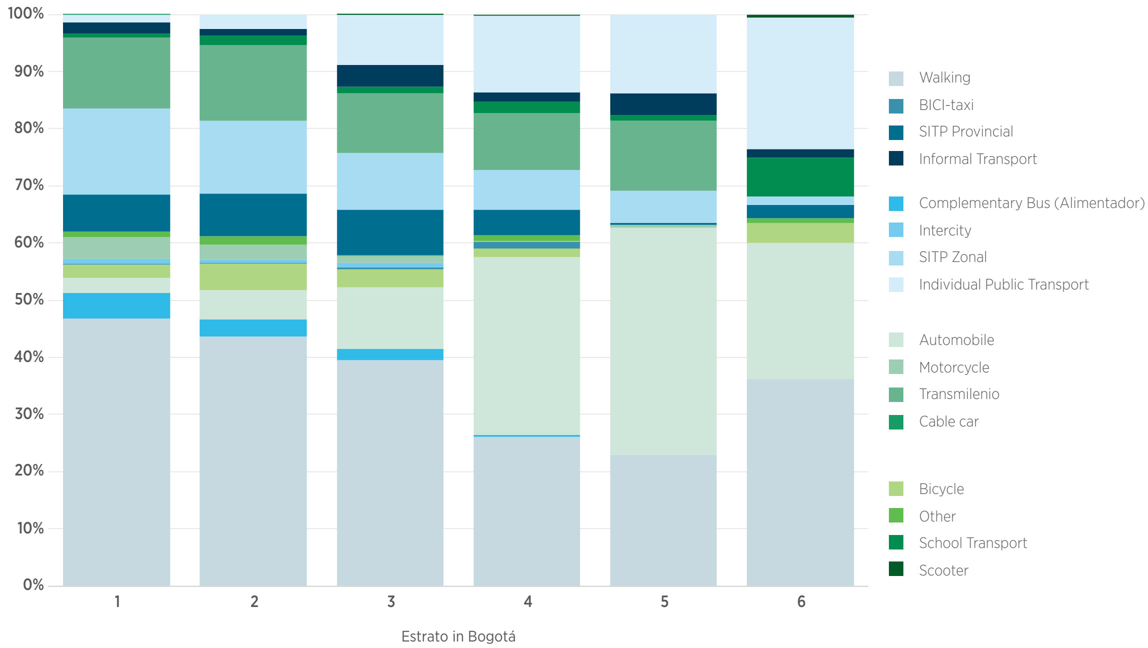
Mobility is also a crucial element for the elderly for overall life satisfaction and active aging, as it ensures independence, good health, and quality of life (Ardila, Guzmán, and Oviedo 2021). In terms of mobility, the elderly could be understood as a group of people with reduced mobility, which means any person whose mobility is reduced due to a physical incapacity (sensory or locomotory) and intellectual deficiency by illness, aging, or any other cause of disability. Like persons with disabilities, some elderly persons require special attention and services adapted to their needs when using transport. For example, according to a study conducted in Great Britain (Banister and Bowling 2004), access to a car/van and the level of quality of life showed clear differences in perceptions, with those having access being more positive about their quality of life. When it comes to the participation of social activities that positively affect quality of life, those with access to a car or to good-quality local transport were consistently more likely to have more social activities (Banister and Bowling 2004).

Mobility decisions of persons with disabilities are highly determined by the degree of accessibility to public transport systems and the affordability of other private transit options. The lack of accessibility to public transport system causes a higher reliance on private transport, reducing the ability and willingness of persons with disabilities to pay for transport services and generating a vicious cycle of disparities in access to employment and other opportunities (Vesper 2019). In Bogota, a 2019 mobility survey found a higher share of persons with disabilities from higher socioeconomic strata using private vehicles and taxis compared to persons with disabilities from the lower strata, who travel mainly by foot and public transport (Figure 2.13). This, in turn can have a significant impact on the family's finances or suppress trips due to affordability concerns (Poveda, Márquez,

12. In Latin America, approximately 70 percent of working-age persons with disabilities were unemployed, compared to 8.4 percent of working age individuals without disabilities in 2004 (IDRM 2004)

and Monroy 2017). As a result, households with a member who has one or more disabilities also spend more on transportation, with the level of spending correlated with the type and severity of the disability, the age of the person, employment status, their support network, and other variables. This lack of accessible transportation reduces opportunities for persons with disabilities to participate in the labor force.

FIGURE 2.13 Modes of Transport and Socioeconomic Strata of Persons with Disabilities in Bogota, Colombia (percent)



Source: SIMUR (2019).

Studies in the region on persons with disabilities have consistently described how transportation barriers also cause time poverty. Physical barriers in transport systems create more delays in travel time for persons with disabilities. As a result, average public transit travel time for persons with disabilities is longer than for persons without disabilities. A qualitative study conducted in Santiago de Chile in 2017 identified accessibility barriers for participants with a range of disabilities, including blindness and reduced physical mobility, and compared their travel times to those of people without disabilities (Emol 2017). The difference in average travel times between the participant with a wheelchair was about 30 percent longer to take a vehicle with a ramp, which translates into 18 minutes more travel time compared to users without disabilities. For the person with blindness, the difference was 35 percent (20 additional minutes) (Mundi Blanco, Galilea, and Raveau 2019). The largest difference occurred on trips that involved transfers. This is because of having to change floors to transfer, particularly difficult for the person with visual disability because of the need to identify the location before moving towards the second transport mode. Survey participants also cited the crowdedness of stations during peak hours (7 to 9 am and 3:30 to 6:30 pm) as a problem. Sight-impaired people had to depend on a third party for assistance, which created a barrier to their independence.

As a result, mobility rates of persons with disabilities and the elderly are lower than those of people without disabilities, with their travel patterns reflecting the various barriers they face. The international survey of local transport needs and priorities of persons with disabilities conducted in 39 countries by the Global Alliance of Accessible Environments and Technologies (GAATES)[13] in 2013 shows that the number of persons with disabilities who do not travel is much higher than that of people without disabilities. Also, according to a study conducted in Belo Horizonte, Brazil, people with reduced mobility, including the elderly, have a high level of immobility compared to people without disabilities (Ardila, Guzmán, and Oviedo 2021; Fontoura et al. 2021). Also, research in Latin American cities such as Tunja (Colombia) shows that the proportion of persons with disabilities who do not travel daily is much higher (40 percent) compared to the population without disabilities (20 percent) (Poveda, Márquez, and Monroy 2017).[14]

Data from cities in Colombia, including Bogota, Bucaramanga, and Tunja provide a window to understand the mobility of persons with disabilities. First, walking is a predominant mode for persons with disabilities and the elderly. For example, the mobility survey in Tunja shows that persons with disabilities walk on average 25 percent more than the rest of the population (Figure 2.14), and the Bogota study also shows more walking among persons with disabilities, though not to the same extent as in Tunja (Figure 2.15). This may be because Tunja is a small and walkable city, but also because public transport is not accessible. Finally, bicycle, and other transport modes (bicycle taxi, scooter, school transport, informal transport, and others) are infrequent modes of travel for persons with disabilities. The study conducted in Santiago de Chile (Vecchio, Casillo, and Steiniger 2020) showed that, in comparison with other demographic groups, the mobility patterns of the elderly show a clear decreasing tendency as they age, especially among retired people, and that walking becomes the principal means of mobility for both elderly men and women.

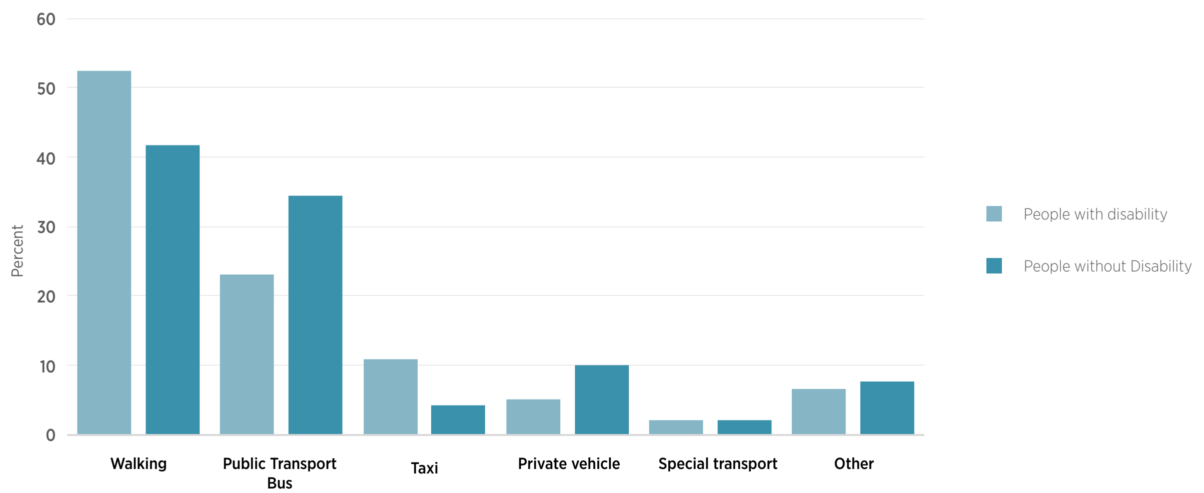
Moreover, among persons with disabilities who can move around outside their residences, the most common transport mode is public transport. However, since public transport is not always

13. The survey included a sample of 257 persons, of whom 76 percent reported at least one disability, from regions across the world. Most participants (88 percent) lived in urban or suburban areas (60 and 28 percent, respectively).

14. A medium-sized city a few hours northeast of Bogota.

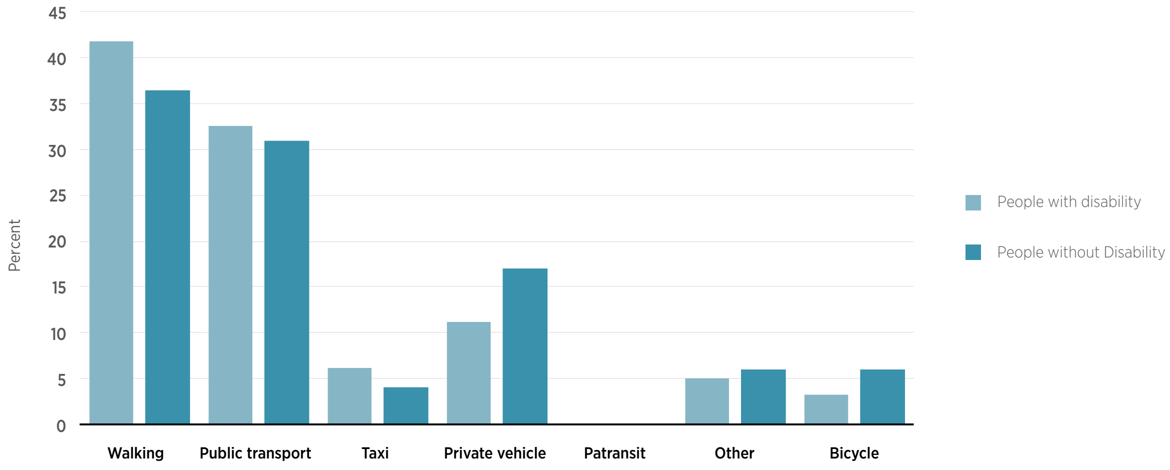
accessible to them, they frequently rely on private transportation systems such as taxis. For example, the research in Tunja shows that persons with disabilities use public transport 33 percent less frequently than the rest of the population due to accessibility barriers. On average, they use taxis 2.6 times more often than people without disabilities, with a clear impact on the family's finances due to spending a greater proportion of income on transportation. In the same survey, around 63 percent of persons with disabilities who use taxi services said they do so because of the lack of transportation alternatives and accessible infrastructure such as sidewalks, ramps, and other services to meet their disability-related needs. In the same context, previous studies in Colombian cities have shown that urban growth patterns (informality), spatial discontinuity, mixed densities, and a strong social stratification are also other factors that explain the lack of accessibility to infrastructure such as the lack of sidewalks, ramps, level boarding on buses, etc. (Escobar 2008). The study in Bucaramanga found that 25 percent of people with physical disabilities interviewed take a bus, followed by taxi (29 percent), and private vehicles (14 percent) (Rodriguez and Gomez 2016). That study did not compare persons with disabilities with people without disabilities, but it shows a high demand for taxis by persons with disabilities (Figure 2.16).

FIGURE 2.14 Transport Mode Shares Disaggregated by People With and Without Disabilities in Tunja (percent)



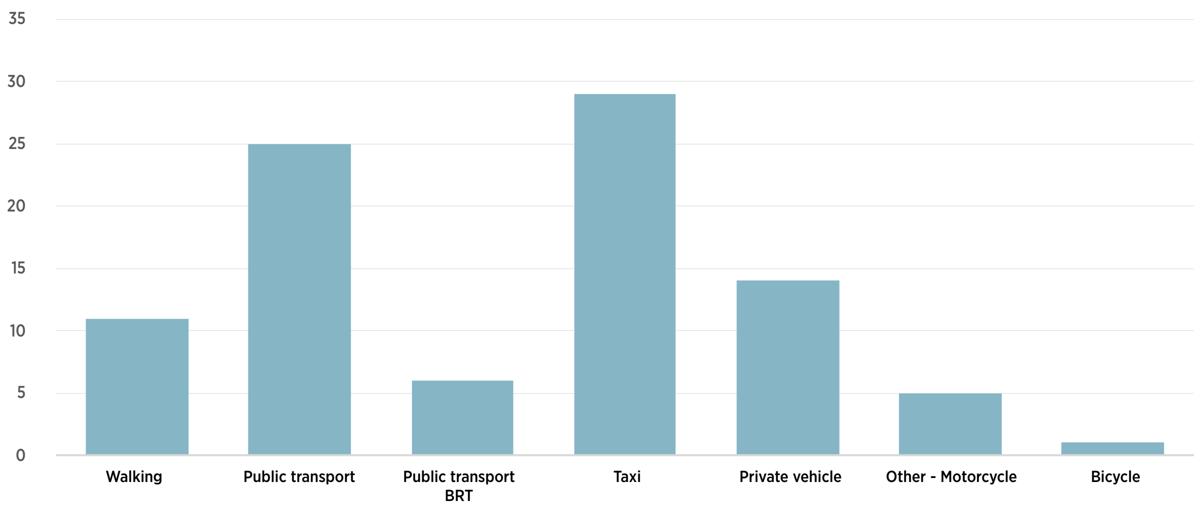
Source: D'Otero, Díaz, and Peña (2017).

FIGURE 2.15 **Transport Mode Shares Disaggregated by People With and Without Disabilities in Bogota (percent)**



Source: SIMUR (2019).

FIGURE 2.16 **Transport Mode Shares of People With Disabilities in Bucaramanga (percent)**



Source: Rodriguez and Gomez (2016).

To identify the barriers to using public transit faced by people with disabilities or reduced mobility in the region, the IDB used the qualitative methodology "Journey Maps" in four cities: Bogota, Santiago de Chile, Medellin, and Curitiba. The "Journey Maps" methodology was developed by the IDB to identify accessibility barriers in transport systems through the user experience, including persons with disabilities. The total sample is 28 participants, seven per city and one for each profile. The methodology is comprised of three main components: (i) Monitoring and collection of data on trips, where the participant is accompanied by an interviewer, (ii) Development of an evaluation matrix during the trip, which is divided into three main stages; before the trip, during the trip, and after the trip, and (iii) conducting a closing interview with the travel participant. The data were collected from participants with distinctive profiles, including physical motor disability, visual disability, hearing impairment, cognitive disability, adults over 65, caregivers, and persons with temporarily reduced mobility. On a scale of one to five, each participant rated the accessibility of their trip, with one indicating extreme dissatisfaction and five indicating extreme satisfaction. The cities were rated based on the participants' overall satisfaction levels.

According to the results by city and user profile (Figure 2.17), the highest level for transport accessibility was for Medellin (4.1), followed by Santiago de Chile (3.8), Curitiba (3.7), and Bogota (3.2). Participants with a physical disability (a person in a wheelchair) in Bogota appeared to score the evaluation lower, followed by the caregiver profile in Curitiba and the visual disability profiles in Medellin and Bogota. The main challenge identified by the physical disability participant in Bogota was cracked and uneven sidewalks, as well as a lack of sidewalk ramps. Another source of contention was the cycle path placement on a very narrow sidewalk, which forced the wheelchair user to move on the cycle path while cyclists passed by at high speeds, potentially creating a risk for a road traffic injury. Visual impairment participants in Medellin and Bogota cited a scarcity of tactile paved roads, traffic lights with auditory signals, signalized crossings, and buses with auditory signals. In Curitiba, respondents remarked on a noticeable lack of training and awareness among station operators on how to attend to the needs of users with certain disabilities.

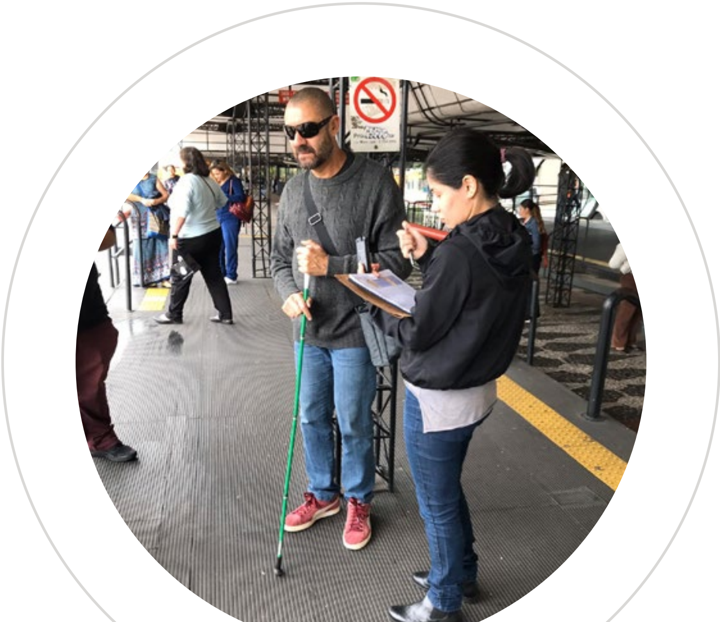
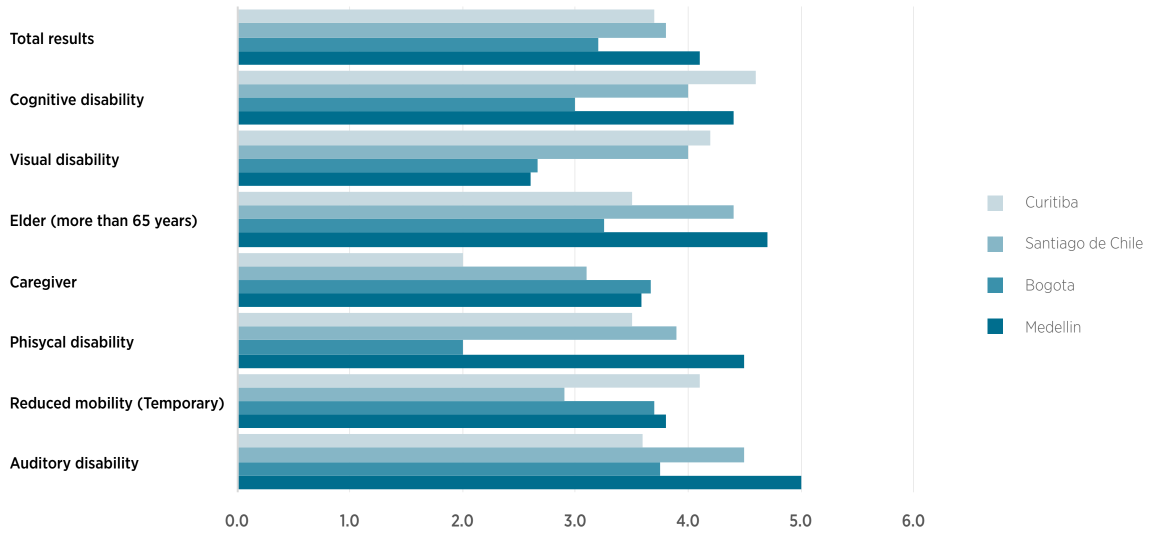


FIGURE 2.17 Results of Public Transport Travel Satisfaction Survey



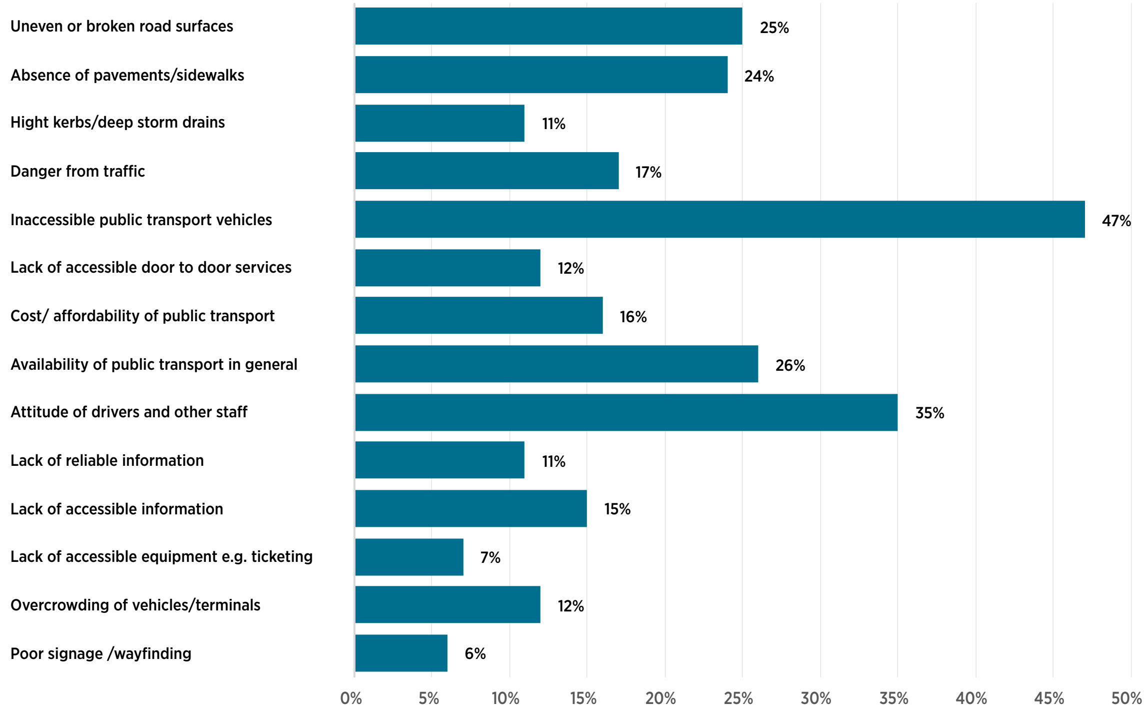
Source: Prepared by authors based on the Hidalgo et al. (2019, 2020a, 2020b) and Pedraza et al. (2020, 36),
Note: A score of 1 indicates extreme dissatisfaction and 5 indicates extreme satisfaction.

The GAATES (2013) also highlights the challenges faced by persons with disabilities and the need to create more accessible public transport systems. When asked to identify the three largest transportation barriers, 47 percent of survey respondents stated inaccessible public transport vehicles, 35 percent negative attitudes of drivers and other staff, 26 percent lack of availability of public transport in general, and 25 percent uneven or broken sidewalks, among other barriers. Figure 2.18 shows the results. Most of the challenges highlighted in the survey are related to physical barriers such as the quality of sidewalks, but there are some that refer to operational and communication barriers such as aggressive behavior of drivers and transport operators.

Among the conclusions of the study were the need to make public transport more accessible (particularly buses), foster staff awareness, strengthen enforcement and monitor access improvements, and pay more attention to making the pedestrian environment accessible.[15] A study conducted in São Paulo (Azevedo et al. 2021) analyzing 30 bus routes confirmed a hypothesis that significant rainfall causes a reduction in the number of daily trips of persons with disabilities and the elderly, pointing to the importance of universal accessibility to public transport regardless of the external conditions.

15. See the ADD International website at https://add.org.uk/why-disability

FIGURE 2.18 Biggest Challenges Affecting Mobility Persons with Disabilities (percent)



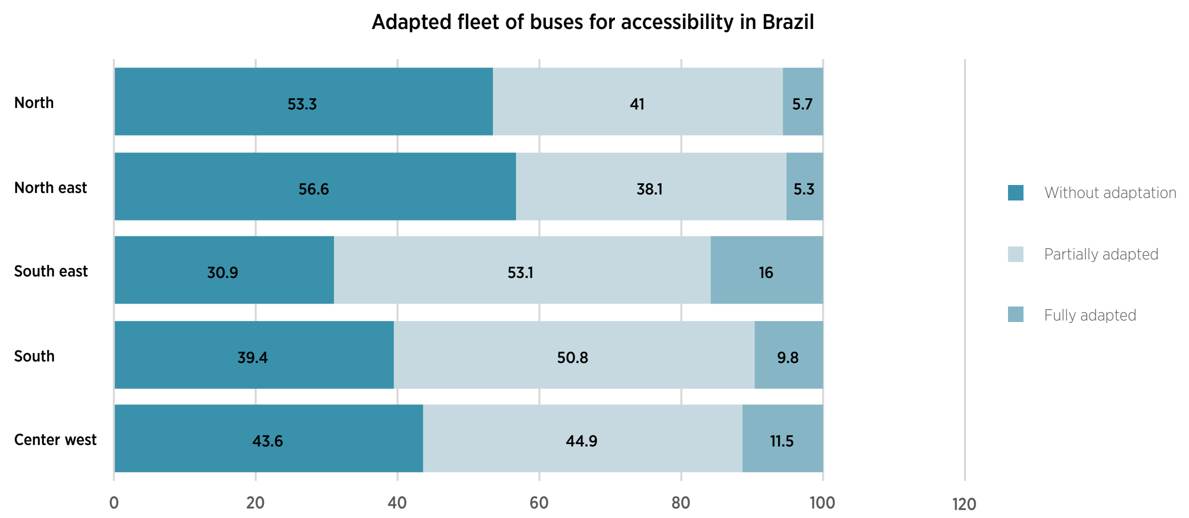
Source: GAATES (2013).

Due to the lack of universal accessible infrastructure and services in urban areas in the region, persons with disabilities frequently confront physical barriers to move freely and navigate their environments. Common challenges that impede the mobility of persons with disabilities in cities include inadequate street maintenance, poor traffic management, insufficient physical separation of pedestrians and bicyclists from motor vehicles, and a shortage of places for persons with disabilities to stop and rest (TUMI and UKAID 2019). Other accessibility barriers include a lack of audible stop signals on buses, ramps that are too steep on pedestrian bridges, and unmarked bike paths on the sidewalks (Hidalgo et al., 2019). Although some Latin American and Caribbean cities have implemented new public transport infrastructure that includes universal accessibility standards (World Bank 2007), most existing infrastructure still does not meet conditions that guarantee accessibility for all. Moreover, public transit systems in the region tend to be highly informal, ranging from 5 percent in Medellin to 40 percent in Mexico and almost 100 percent in Haiti (Tun et al. 2020). In addition, most lack universal accessibility features such as level boarding, spaces for wheelchairs, or signalization and communication protocols to assist passengers with sight impairment or hearing disabilities.

For example, in Brazil, a small percentage of the bus fleet has been adapted to meet accessibility standards, as shown in the 2017 Basic Municipal Information Survey (MUNIC) conducted by the Brazilian Institute of Geography and Statistics (*Instituto Brasileño de Geografia y Estadística* - IBGE). Of the 1,679 municipalities with intra-urban bus public transport, 197 (11.7 percent) had a fully adapted fleet, 820 (48.8 percent) had a partially adapted fleet, and 662 (39.4 percent) had fleets without adaptation. As shown in Figure 2.19, the proportion of municipalities with adapted fleets is higher in the South and Southeast regions and lower in the Northeast and North (IBGE 2017). In the Northeast, less than six buses out of every 100 can be used by people with disabilities in a comfortable, autonomous, and safe way. The lack of accessible buses was also identified in a study conducted in Novo Hamburgo, Brazil to identify ergonomics and accessibility issues faced by wheelchair users and people with limited mobility when using public transport. The study revealed that the primary issues were the quality of services provided, specifically the schedule and number of accessible vehicles (Almada and Renner 2015).

Overall, the compliance of transit systems in Latin America and the Caribbean with international accessibility conventions is uneven, with examples of notable progress but also showing a clear need for greater commitment from governments (Box 2.5).

FIGURE 2.19 Distribution of Municipalities with Public Intra-Municipal Bus Service Fleets Adapted to Be Accessible for People with Disabilities or Reduced Mobility, Major Regions of Brazil, 2017 (percent)



Source: Instituto Brasileño de Geografia y Estadística, Diretoria de Pesquisas, Coordenação de População e Indicadores Sociais, Pesquisa de Informações Básicas Municipais 2017.

BOX 2.5

Rate of Compliance of Transit Systems with International Accessibility Conventions Is Low but Variable in Most Countries

National and city surveys in countries such as Argentina, Bolivia, and Mexico reflect the varying level of compliance in the region with international transport accessibility norms and standards for persons with disabilities. Some countries and cities have achieved impressive levels of accessibility in their public transit modes, but unfortunately these achievements to date are only realized in a handful of cities and for select transport modes. For example, Argentina, after signing Law 25.644 in 2002, retrofitted its bus fleets to make them accessible.[1] Today, 20 years later, the bus fleet of the city of Buenos Aires is 100 percent accessible in terms of physical, communicational and information accessibility, and trains are 60 percent accessible in terms of physical accessibility, 41 percent for communicational accessibility and 60 percent for information accessibility. No percentage is available for technological accessibility. In La Paz, Bolivia, the cable car transport system Mi Teleferico has also incorporated accessibility standards, and the 10 lines and 37 stations covering 30.5 km are accessible for persons with disabilities (Libertun De Duren et al. 2021). In contrast, a study on accessibility to transport services in various cities of Mexico showed that transport systems have low levels of accessibility for users with disabilities. The result of the assessment established that none of the Bus Rapid Transit systems in Mexico are fully accessible or meet national and international technical standards on barrier-free accessible public transport services. Moreover, new lines of a service called Mexibus in Mexico City did not include tactile guides for sight-impaired passengers in their stations, and other systems in the country had no pedestrian traffic lights with audio, tactile routes, safe and level crossings, or level modal transfer centers (El Poder del Consumidor 2016).[2]

1. In Law 25.644, Argentina specified percentages of physical, communicational, informational, and technological accessibility for infrastructure (bus terminals, bus stops, and train stations) and the vehicle fleet (buses and rail).
2. El Poder del Consumidor is a non-profit civil association that defends the rights of consumers.

Attitudinal barriers and a lack of empathy with persons with disabilities make their journey even more difficult. An example is the discrimination against users with disabilities in transport systems when drivers do not stop the bus to pick them up or drive aggressively and do not give the person with disabilities time to sit down, which leads to risks of falling with the bus in motion (Pedraza et al., 2020). According to the IDB Journey Maps accessibility evaluation in Bogota, bus drivers oftentimes did not get off the bus to operate the ramp for people in wheelchairs. Another example is the short opening and closing time of doors in the Santo Domingo subway system in the Dominican Republic, which prevents a person in a wheelchair from having enough time to exit the subway car

(Pedraza et al. 2021). A disability group in Montevideo (RAMPA) held a protest against transport authorities because of the lack of accessibility and safety in buses. Buses are usually not accessible, and those that are usually have equipment that is broken or does not offer security for positioning the wheelchair safely so that it does not slip during the journey. Concerns about safety are also significant in the journeys of persons with disabilities; not only do they fear getting involved in a crash but also of being robbed. According to the Journey Maps interviews conducted in Curitiba, 71 percent of persons with disabilities take security precautions when traveling, such as avoiding walking alone or traveling at night (Pedraza et al., 2020). Intersection with other characteristics such as gender or race may aggravate those perceptions.

2.2 Policy Measures Implemented in Latin American and Caribbean Cities to Foster Socially Inclusive Mobility

Latin American and Caribbean cities have implemented a host of initiatives to better respond to the widely varying mobility and accessibility needs of disadvantaged populations. However, empirical studies assessing the effectiveness of most of these initiatives are limited. First, the diagnosis of the transport needs of vulnerable populations is limited by a lack of disaggregated mobility data. By and large, current planning practice tends to rely on data from origin-destination surveys that do not collect information at a sufficient granularity needed to characterize a diverse range of transport users. More robust data collection in large, medium, and small cities is needed to increase visibility and accountability regarding the travel behavior of disadvantaged populations (Mattioli 2008). Another major challenge is that current planning policy and project practices rarely include strategies for promoting full inclusion of all individuals, leaving behind the barriers faced by women, children, and persons with disabilities (Hassouneh, Alcala-Moss, and McNeff 2011).

This section provides a literature review of the policy measures implemented in the region to improve accessibility and mobility for disadvantaged groups. The measures analyzed can be categorized into three main areas:

1) Policies to improve the affordability of transport services through pricing policies (direct and indirect subsidies) as well as improvements in urban transport infrastructure and services

2) Investments in infrastructure to improve accessibility, safety, and security

3) Strategies to reduce discrimination and violence in the urban environment

Although some policies will benefit specific population groups (i.e., paratransit services for persons with disabilities), many of the solutions analyzed in this chapter have the potential to benefit all users (i.e., universal accessible infrastructure or targeted demand-side subsidies for women, persons with disabilities, the elderly, and children). Also, many transport authorities at both the national and local levels have been implementing institutional strengthening strategies such as the creation of units within transport planning entities that focus on improving data collection, diagnosis, planning, and evaluation of policies to improve equity and inclusion for diverse user groups including the poor, women, children, the elderly, indigenous peoples and Afro descendants, and persons with disabilities.

2.2.1 Affordable Urban Transport Services for Disadvantaged Populations

One frequently adopted policy for transport-disadvantaged and vulnerable populations is the implementation of subsidized fares and services (see also Chapter 5) (Table 2.3). A number of countries across the region have legislation that determines free or preferential rates for public transport for persons with disabilities, women, or children. However, the evidence on the effectiveness and results of these programs is limited, given that few proper impact assessments have been conducted to date.

TABLE 2.3 Targeted Transport Subsidies for Disadvantaged Persons in Selected Latin American Cities

City	Population Group Targeted	Transport Subsidy
Buenos Aires, Argentina	Persons with disabilities	Free
	Retirees	55 percent discount
	Universal assignment per child	
	Domestic workers	
	Progresar scholarships	
	War veterans	
	People belonging to social programs (Hacemos Futuro and Monotributo Social Inscrito en Redes, Argentina Trabaja)	
Bogota, Colombia	Persons with disabilities	10 trips free per month (5 round trips)
	Seniors	13.6 percent discount
	Low-income persons	28 percent discount
Jalisco, Mexico	Persons with disabilities	Free
	Students	
	Seniors	
	Low-income women: Mi Pasaje apoyo a Mujeres	Free (730 pre-paid tickets)
	Teachers	50 percent discount
	Children between 5 and 12 years of age	
La Paz, Bolivia	Persons with disabilities	50 percent discount
Lima, Peru	Persons with disabilities	Free
	Students	Not yet implemented
Medellin, Colombia	Persons with disabilities	23 -15 percent discount
	Students at public schools and universities	Up to 60 percent discount
	Seniors	16 percent discount

Montevideo, Uruguay	Persons with disabilities	Free
	Students	30-50 percent discount depending on the type of student
	Seniors	50-70 percent discount depending on the type of retiree
Pachuca de Soto, Mexico	Persons with disabilities	50 percent discount
	Seniors	
Panama City, Panama	Students	50 percent discount
	Seniors	31 percent discount
	Persons with disabilities	31 percent discount
Quito, Ecuador	Seniors	50 percent discount
	Persons with disabilities	
	Students	
São Paulo, Brazil	Seniors	Free
	Persons with disabilities	
	Pregnant women	
	Obese people	
	New mothers	
Santiago, Chile	Students (67 percent)	67 percent discount
	Seniors (50 percent)	50 percent discount
Uberlandia, Brazil	Persons with disabilities	Free

Sources: Esperón and Ministerio de Transporte de Argentina (2020); Gobierno del Estado de Jalisco (2020); Montoya-Robledo (Undated); Rivas, Serebrisky, and Suárez-Alemán (2018); Rivas, Brichetti, and Serebrisky (2020); and an interview with Oscar Monzalvo in 2021.

Persons with Disabilities

Specialized transport services for persons with disabilities with severe mobility limitations are provided through indirect subsidies. These services, also known as paratransit,[16] involve allocating resources to finance the operation of the provision of services and technologies carried out by public institutions or infrastructure managed by third parties (Minsalud 2021). One such example of a paratransit system is *Atende* in São Paulo. This service started in 1996, and since then 1.3 million have used it each year. It operates seven days a week, with a schedule from 7am to 8pm, primarily for healthcare, rehabilitation, and school trips and during weekends for group trips to cultural and recreational amenities. Atende's budget comes from the operators of 15,000 fixed route buses in

16. Paratransit is a mode of transportation for persons with disabilities who are unable to use their region's normal fixed-route transit system. Paratransit normally provides door-to-door service for people who call to reserve a trip.

São Paulo. The surface transportation agency SPTrans manages the program, which is operated by the City of São Paulo. The Atende fleet consists of 372 lift-equipped vehicles, mainly minibuses. This option is very useful when persons with disabilities cannot use public transport systems.

Although the benefit of paratransit systems is their ability to respond by demand, the systems involve the continuing operating cost of vehicles and staff, which can result in a higher cost per trip than regular public transport. Thus, although specialized transport services might be easier to implement than making all mass public transport free, both direct and indirect subsidies to provide the access to transport services should be implemented in a combined way.

As an alternative to subsidizing fares, one approach might be to provide a certain amount of the direct subsidy or allowance to persons with disabilities to be used for other transit options such as private transport services (taxi) that give them more flexibility and control over their own lives (World Bank 2013). For example, in the United Kingdom, a "mobility component" of the Disability Living Allowance paid as a national social benefit to persons with disabilities assists people with reduced mobility, by offering them financial assistance to help cover the extra costs they may incur because of their disability.

School-age Children

Few programs in the region offer reduced fares for school-age children and youth region. In contrast, countries such as Australia, the United States, and Canada provide free public transport for students enrolled in a public school that is further than reasonable walking distance from their home.[17] One example of such a program in Latin America is the subsidized school transport system in Medellin (Box 2.6).

17. For example, in Australia students are provided free bus service if they live more than 4.8 kms from the school or more than 1.5 kms from the entrance where the school transport vehicle passes (see the Government of Australia School Bus Policy website at https://www2.education.vic.gov.au/pal/school-bus-program/policy).

BOX 2.6

Impacts of Subsidized School Transport in Medellin

The Secretariat of Education of Medellin has been implementing a strategy of subsidized school transport for low-income students since 2016. The program provides three types of subsidies: (i) Full subsidy (100 percent) through contracted transport services with fixed routes and schedules, aiming to facilitate the mobility of students living in areas underserved by mass public transport (the municipalities of Valle de Aburra and the localities adjacent to the metropolitan area); (ii) Partial subsidy (50 percent) for using bus services, which gives students a monthly pass to use the services on business days by paying 50 percent of the current fare; and (iii) Partial subsidy (50 percent) for using the metro system (Metro, Metroplus, Metrocable and Tram), which offers a discount of 50 percent for 60 trips per month, without restriction of schedules and dates, though it does not include bus routes operated by private companies.

The Inter-American Development Bank, in collaboration with Universidad EAFIT, assessed the impacts of these subsidies on the quality of the primary or secondary education institutions chosen by the beneficiaries. Following a quantitative approach, the researchers analyzed administrative data from the universe of students attending public schools in Medellin during the period 2016–2019, as well as socioeconomic and geographic data on the location of both students and schools. Descriptive analysis of the data showed that the socioeconomic stratum of the beneficiaries significantly correlates with the quality of the schools nearby, implying the segregation of families with economic limitations from the best educational institutions (Gibbons, Machin, and Silva 2013). In other words, the high cost of traveling to a distant school means that low-income students will not be able to access the best institutions.

The econometric models showed that partial subsidies (both for buses and the metro system) have a positive causal effect on the quality of the school selected by the students, that is, the students covered by the subsidy choose higher-quality schools. When the effects were analyzed by gender, the analysis found that partial transport subsidies further increased the likelihood of choosing high-quality schools for girls. These findings suggest that the reduction in school transportation costs is positively influencing access to educational opportunities for families, as it allows students to access a better-quality education. The results show how the policies that generate greater accessibility can help mitigate social exclusion in vulnerable populations, allowing access to more and better services in cities.

However, these positive effects do not apply in the case of a full subsidy. Given that the full subsidy is targeted mainly towards rural students, the result should be interpreted with caution, considering that beneficiaries have less flexibility. Because of the distance involved, the family decision often is to send children to the school that is nearest, rather than the school that offers the best quality education.

Source: García et al. (2022).

There are also innovative mobility solutions for school children in the region that promote low-cost transport modes. A remarkable example is "Al Colegio en Bici" ("To School by Bike") program in Bogota, a pioneering initiative to improve children's access to and retention in the district education system by promoting cycling as a healthy and environmentally friendly means of transport (Box 2.7).

BOX 2.7

Programs for Children: Kids First in Bogota

In Bogota, sustainable school mobility solutions implemented since 2013 have been led by the District Secretariat for Mobility (SDM) and the District Education Secretariat (SED). One program, "Al Colegio en Bici" ("To School by Bike"), takes into account that 49 percent of children in Bogota walk to school. The initiative aims to improve children's access to and retention in the district education system by promoting cycling as a healthy and environmentally friendly means of transport. This is done by lending bicycles, organizing daily bike caravans back and forth to schools, and offering cycle expeditions to help enjoy the cultural offerings of the city while learning the safe use of the bicycle. From 2013 to 2019, more than 15,000 low-income children in 12 locations benefited from what is known as the trustworthy routes and expeditions cycle.

Another project developed by the city is "Ciempiés" ("Centipede"), which aims to provide safe roads for children to walk to and from 20 schools located in middle- and low-income locations. The locations selected for the project are Bosa, which is income stratum 1 and 2, and Suba, with stratums from 2 to 5. The program has 10 pedestrian routes designed to provide safe and friendly paths, manned by monitors and volunteer parents, for more than 2,000 children to walk regularly to school. The routes are designed considering road and personal safety and the distance to the school. In addition, as an incentive, 27 children have received "Novato Centipede" badges to reward them for staying in the program.

Both "Al Colegio en Bici" and "Ciempiés" initiatives also contribute to improving children's health, as they increase children's physical activity by encouraging them to walk and use bicycles to go to and from school, creating healthy habits.

Women

Targeted demand-side subsidies directly benefiting women are scarce in the region, but women benefit indirectly from other subsidy schemes. For example, in São Paulo, Law 11.216 of 1992 established that pregnant women have free access to public transport (Montoya-Robledo, undated). This is part of a broader public policy to decrease maternal mortality for low-income women through a country-wide program called the Stork Network. A 2019 decree established free access to public transport for mothers (Mae Paulistana Program) (Montoya-Robledo, undated). Another example can be found in Mexico. The state of Jalisco also provides a specific subsidy for women, offering two daily tickets a week and a free annual subscription to the shared bike system for women under conditions of economic vulnerability. The subsidy targets female heads of the household between 25 and 65 years old who live in areas with a high degree of marginalization, and who have an income of less than US$280 per month. Finally, in Argentina women benefit indirectly from the current demand-side transport subsidies. Women are the main beneficiaries (80 percent) of the subsidies for retirees, domestic workers, Scholarship *Progresar* recipients, people with at least one child, and other groups (Esperón and Ministerio de Transporte de Argentina 2020).

Beyond Subsidies and Fair Discounts

Strategies to improve transport affordability should go beyond subsidies and fare discounts. According to (Litman 2021)particularly those required to access basic goods and activities (healthcare, shopping, school, work and social activities, other types of measures can also benefit transport affordability for disadvantaged populations, including measures focused on improving access to low-cost transport modes, reducing the amount of travel needed to reach goods and services, and reducing the financial costs of transport services for employees. Other examples of such measures include improving access to active transportation (walking and biking), improving land-use accessibility and housing affordability (see Chapter 3), promoting shared mobility (see Chapter 8), providing school trips, and developing employers' commuting programs. Fare integration policies constitute yet another dimension that can improve transport affordability (Chapter 5). For example, Bogota, Medellin, Santiago de Chile, and São Paulo have integrated tickets that allow users to switch between vehicles inside mass transit systems without paying an additional fare, within set timeframes. [18]

18. Interview with P. Jirón in 2021. See also Montoya-Robledo (undated).

2.2.2 Making Urban Transport Safe, Fair, and Inclusive for All Users

In recent years, Latin American and Caribbean cities have begun planning and building transport infrastructure and services that respond to the needs of vulnerable and disadvantaged transport users. For example, the city of São Paulo intentionally built the Lilas line of the metro system directly connecting low- and high-income residential neighborhoods to improve mobility for paid and unpaid care workers, usually women. According to domestic workers, the line has reduced their commuting times up to two hours roundtrip (Montoya-Robledo, undated). Also, Bogota is currently working on the Care Circuit in Scholar Environments (*Circuito de cuidado en entornos escolares*) project to improve road safety for children and caregivers through mechanisms that include tactical urbanism and adapting the infrastructure to respond to care-related mobility in active transportation modes (Ávila 2020). It is important to highlight that these policies built around care should consider that mobility is a source of freedom and autonomy for women. Thus, building gender-sensitive cities should promote women's mobility, but with careful attention not to create static ghettos for women to remain in their neighborhoods.[19] Moreover, these interventions must be designed to benefit all persons performing care activities, independently of their sex and gender identity. Other good practices for implementing universal accessibility in the transport sector can also be highlighted. As in the case of other transport interventions, there are no assessments of these programs.

2.2.3 Safe Infrastructure for Children and Youth to Play and Move

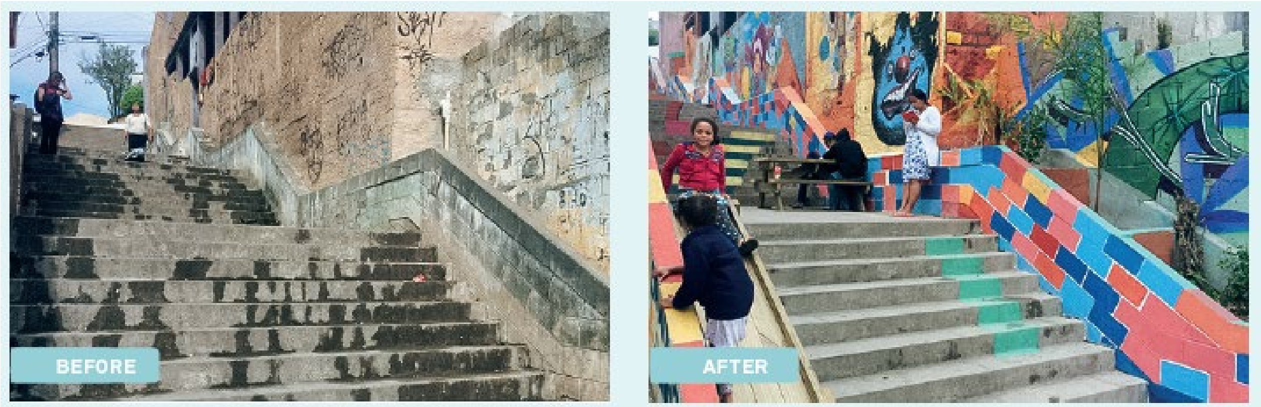
A key measure to foster mobility for children is the overall improvement of transport infrastructure with their needs in mind. According to the report "Designing Streets for Kids" by the Association of City Transportation Officials (NACTO) in 2020, the design or redesign of urban streets through the lens of children can improve road safety and mobility for everyone. This guide promotes street improvements in relation to reliable mobility choices, space, visibility, play and learning, places to pause and stay, social interaction, security, and a safe environment. These improvements should be made in order to upgrade the actual design (meet basic needs), set minimum standards to improve safety accessibility and mobility, control speed (child traffic fatalities are preventable by designing for safer speeds), and extend the street experience into adjacent spaces. These elements can be addressed on different levels, scales (cities, neighborhoods, blocks), and budgets (from low-cost measures to large capital projects), while being adapted to the specific context of each project.

19. Interview with Lina Buchely and Salome Arias in 2021.

Streets that are safe are also enjoyable and inspirational for children and caregivers. In fact, helping children in their formative years interact with their environment improves their cognitive development and educational achievement and builds a strong foundation to make them independent and responsible adults.[20] Some cities in the region have already implemented several actions mentioned above, such as considering pedestrians as a priority and reshaping intersections (to make them smaller and easy to cross), among others, especially in low-income areas where the impact is even greater. The section below describes specific examples of how to renovate and create safer environments for children and youth that benefit their independent mobility, enhance safety, and contribute to improved child health.

The Mind Your Step Project in São Paulo

The Mind Your Step (*Olhe o Degrau*) project renovates abandoned and degraded stairways into a pedestrian mobility network. This project was implemented in Rua Agamenon Pereira da Silva, a low-income community in São Paulo that is near two public schools, a daycare center, a health center, and other services. After painting a new pedestrian crossing and wall murals, and installing street furniture and play elements, children increased their presence on the improved street by 40 percent. Moreover, their perception of safety increased to 100 percent, compared to 30 percent reported before implementation (NACTO 2020). The changes in the built environment contributed to make children's trips safer, as they reduced their risk of the children being exposed to a road traffic injury.



São Paulo – Mind Your Step. **Photo:** NACTO.

20. See the Urban Child Institute website at http://www.urbanchildinstitute.org/why-0-3/baby-and-brain (accessed November 19, 2019).

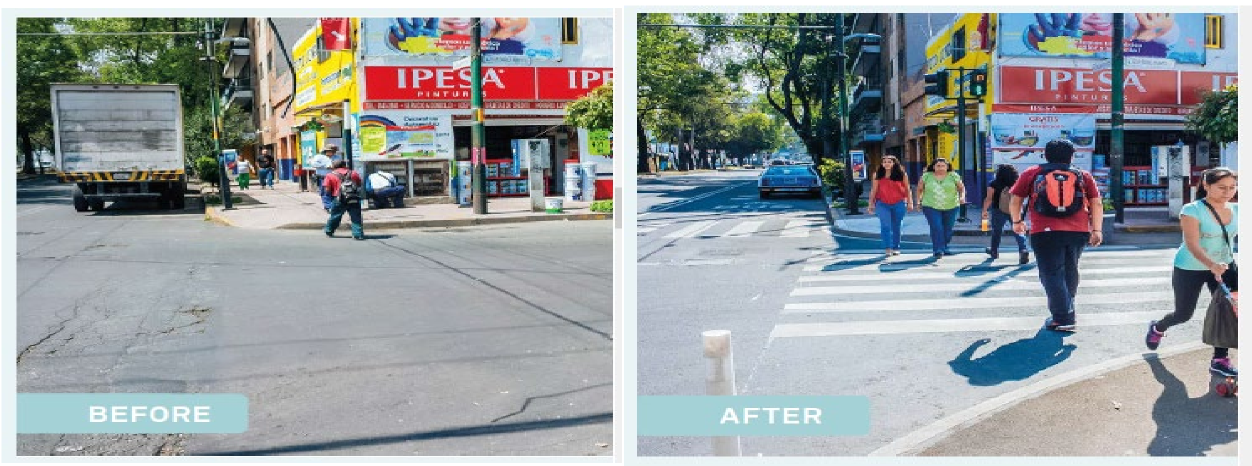
The Urban 95 Initiative in Lima

Improving walkability in cities can also reduce transport expenditure for children and caregivers. A key example is Lima's Urban 95 Initiative, which changes public spaces to improve the interaction and movement of children around the city. This program was implemented in the hilly neighborhood of Alto Peru located on the slopes of Morro Solar in the district of Chorrillos (Lima), home to 20 families and more than 30 children up to 3 years of age. Before this project, mothers used a mototaxi to take their children to their childcare center, which was only three blocks away. Poor conditions of the pedestrian infrastructure and safety concerns discouraged mothers from walking and forced them to spend around US$3 per week on transport (1.5 Peruvian soles per trip). Eliminating debris and trash, building retaining walls, planting trees, creating rest spaces along the corridor, and implementing a handrail at holding height for a two-year-old created a safer walking route. Today, most residents walk to the nursery and other nearby destinations. This tactical urbanism strategy saved money for caregivers while improving the lifestyle of the families, especially for children. Enabling children to interact with their surroundings, have more contact with nature, and develop their autonomy and self-sufficiency, enhances their early development.

Urban 95 Initiative, Alto Peru (Lima). **Photo:** NACTO.

Pasos Seguros in Mexico City

Pasos Seguros (Safe Crossings) is a project to redesign intersections (54 interventions) with high concentrations of road traffic crashes in Mexico City. The initiative is aligned with the city's road safety regulations and mobility policies and prioritizes the safety of children. The redesigns included painting markings, installing traffic signage, redesigning refuge islands, and removing or relocating obstacles like posts, signs, and street furniture. One year after implementation, there were 44 percent fewer road traffic collisions and 53 percent fewer conflicts involving pedestrians. This project is also aligned with the global program "Vision Zero for Youth," an international program to eliminate all traffic fatalities and severe injuries while increasing safe, healthy, and equitable mobility for youth. In 2018, Secundaria No. 4 "Moisés Sáenz" was the first pilot to be launched. The intervention consisted of a newly designed intersection changing its geometry into a permanent street transformation.



Mexico City – Pasos Seguros. **Photo:** NACTO.

Bogota – Vision Zero Zone "Barrio El Inglés"

The Vision Zero Zone Project in Bogota transformed a roundabout where motor vehicles often travel at unsafe speeds. The design reduced the size of the intersection, connected the public space at the center, increased space for pedestrians and cyclists, and encouraged vehicles to drive at safer speeds. This project came about after the community requested improvements in road safety in the area. The actions implemented included reducing the pedestrian crossing distance from 32 to 8.5 meters (73 percent narrower) and reducing vehicle travel lanes, reclaiming space for pedestrians in the central plaza. Metrics collected during the intervention period showed that there were 60 percent fewer conflicts (70 pedestrian-vehicle conflicts were reduced to 28), and conflicts between pedestrians and heavy vehicles were reduced by 79 percent (from 48 conflicts to 10 at the same peak hour).

Bogota – Vision Zero Zone. **Photo:** NACTO.

Increasing the physical activities of children and youth, including less dependence on cars for urban mobility, would create healthy habits and lifestyles changes, which in turn would translate into better health as adults and savings to health systems. An example of such a program related to transport in Latin America is the City of Bogota's "Kids First in Bogota," which created the "Al Colegio en Bici" ("To School by Bike") and "Ciempiés" initiatives to increase children's physical activity by encouraging them to walk and use bicycles to go to and from school, creating a healthy habit for children. While there are examples of transport programs in Latin America designed to increase physical activity, such as Bogota's "Al Colegio en Bici" ("To School by Bike") and "Ciempiés," such programs are few and far between and it is clear much remains to be done on this front in the region.

Photo: Secretary of Mobility of Bogota.

2.2.4 Universal Accessible Infrastructure

A key approach to improving accessibility to transport and public space for diverse user groups is the application of universal design principles. Echoing the term "universal design" first coined by the architect Ronald Mace, public space and transport infrastructure should be designed in a way that they are accessible to everyone, regardless of the users' abilities.[21] According to the Center for Universal Design at North Carolina State University, this philosophy of universal design was built around seven principles:

- Equitable use for people with diverse abilities
- Flexibility in use that accommodates a wide range of individual preferences and abilities
- Simple, easy to understand, and intuitive regardless of the user's experience, knowledge, language skills, or current concentration level
- Perceptible information regardless of ambient conditions or the user's sensory abilities
- Tolerance for error that minimizes hazards and the adverse consequences of accidental or unintended actions
- Low physical effort with a minimum of fatigue
- Size and space for approach and use regardless of user's body size, posture, or mobility

These universal design principles are applicable to both new and existent infrastructure. When it is not possible to build new projects or renovate existing infrastructure, reasonable accommodations can be proposed as an option (Hidalgo et al., 2019). Often, universal design is perceived to be costly,[22] but sometimes concerns about its cost are based on lack of knowledge and experience and on inaccurate estimates of the actual construction cost (Snider and Takeda 2008). Research has shown that providing full-access facilities from the outset has additional costs of approximately 1 percent. However, the cost of making adaptations after a building is completed is far greater, rising to as much as 5 percent or more of the total cost depending on the modification of the architectural features of the building (Snider and Takeda 2008). Thus, in order to adopt universal design in the transport sector, governments need to include it in the budgets since the first stages of the projects.

The implementation of universal design and accessibility standards in transport can ameliorate inequalities associated with the barriers faced by persons with disabilities. These standards are supported by the Convention of Rights of Persons with Disability (CRPD), the international treaty

21. See the Urban Child Institute website at http://www.urbanchildinstitute.org/why-0-3/baby-and-brain (accessed November 19, 2019).

22. The major cost incurred in incorporating universal design is to retrofit various features to accommodate specific needs. When managed appropriately, however, this retrofitting cost can be minimized. Good practices of cost-effective universal design include its early incorporation and local stakeholder participation in it.

that came into force in 2008 and has been ratified by 182 countries. The countries that adopt the CRPD are bound to provide accessibility to built environments, transport, communication, technologies, and systems both in urban and rural areas (United Nations 2006). In Latin America and the Caribbean, 26 countries have adopted the CRPD and have proper accessibility laws that regulate the rights of persons with disabilities and have passed legislation to protect their rights (see Table A2.1.2 in Annex 2.1). However, the Committee on the Rights of Persons with Disabilities reports that there is a lack of proper application, verification, and compliance with disability-related legislation in the region.

Implementing universal design in transport benefits all users, not only individuals with disabilities. Research in Norway found that universal design projects, such as low-floor buses, provide important benefits in terms of travel time savings while entering and departing buses and improved comfort for both impaired and non-impaired users, as well as efficiency gains for transport operators (Odeck, Hagen, and Fearnley 2010). Moreover, when universal design principles are well implemented, infrastructure is more likely to meet the needs of a wide range of users, as well as facilitate gender mainstreaming, to the extent that universal design facilitates trips for caregivers who often accompany others such as children and the elderly with strollers or other gear in tow.

2.2.5 Stopping Discrimination and Violence against Disadvantaged Populations

Cities worldwide have implemented different policies to reduce gender-based violence in public transport systems.[23] Some programs include promoting bystander interventions against gender-based violence through awareness campaigns, empowering victims to report incidents, training public transit operators and users on access to justice protocols, prosecution of gender-based violence cases, and on medical and psychological first aid responses. Other strategies are focused on panic buttons, proper lighting of public space and transit, creation of solidarity networks among shops close to transit, women-only (sex-segregated) transportation, and collection of better data on gender-based violence (DiDomenico et al. 2021). However, fewer strategies have focused on diminishing girls' and women's fear of certain public spaces and of using public transit. There are also few strategies in place to transform the culture to stop sexual harassment,[24] although a program in Quito is working toward that goal (Box 2.8). Moreover, there is limited rigorous evidence on the impacts or results generated by these policies.

23. See Montoya-Robledo et al. (2021) for a more comprehensive description of strategies implemented in Latin American and Caribbean cities.

24. Interview with P. Jirón in 2021.

BOX 2.8

The "Bájale al acoso" Strategy to Prevent and Respond to Sexual Harassment in Quito

The *Bájale al acoso* ("Stop Harrassment") strategy In Quito includes two main axes. First, it provides a comprehensive system for attention to sexual harassment cases using a digital reporting tool and text messages, as well as a response and follow-up protocol for cases occurring inside the transportation system. Second, it promotes awareness and social sanctions through training for system officials and users to make sexual harassment unacceptable and promote usage of the digital tool. The training includes topics such as the meaning of masculinity as well as the strategy itself. In 2018, 4,000 people received training (Montoya-Robledo et al. 2021), and in that same year the strategy is credited with helping to reduce sexual harassment incidents by 34.5 percent (Transport Gender Lab 2018).

Several key lessons emerge from the program: (1) Including technology that allows for universal access was key to reaching a range of user groups, particularly low-income populations that have limited access to smartphones and the Internet; (2) Ensuring inter-institutional and inter-sectorial coordination was key to providing efficient responses to victims and supporting their access to justice; and (3) Using language strategically designed to attract a younger audience and the general public was important because it did not necessarily condemn the wrongdoer (Montoya-Robledo et al. 2021).

Cities are also designing transportation infrastructure that prevents incidents of gender-based violence. Since 2019, the private operator Redbus Urbano, which operates public transit in Santiago de Chile, has been working with the government to implement a pilot for safe bus stops in a low-income area. Before building the bus stops, Redbus Urbano surveyed area inhabitants to understand their needs, including questions on gender-based violence, before deciding to build a technological totem with cameras and resting spots. A similar initiative is being implemented in Curitiba, Brazil, where a walkability index with a gender perspective was applied in one of the main corridors of the city. This methodology allowed for identifying changes in the infrastructure design to improve women's safety and accessibility. However, no assessments of either the Santiago de Chile or Curitiba interventions have yet been conducted.

2.3 Conclusions and Policy Recommendations

Urban mobility and accessibility are essential elements for a dignified life and the full development of people and societies. The ability to move and have access to efficient, affordable, and safe transport are key conduits to access education, healthcare, jobs, participation in civic life, and ultimately to reduce poverty and inequality. This is particularly relevant for disadvantaged and vulnerable populations that face high levels of social and economic exclusion and poverty. As such, governments need to prioritize the social inclusion agenda in urban transport policies, ensuring a holistic approach that considers both the physical infrastructure and the services used during the whole trip, as well as the role that land use and urban planning plays in facilitating travel for vulnerable populations. Moreover, inclusive transport should be considered a human right, like the right to health or education. This implies the allocation of specific budgets oriented towards closing accessibility and inclusion gaps in transport systems.

Gender- and diversity-sensitive data play a crucial role in understanding the mobility needs of disadvantaged populations, the underlying determinants that influence their mobility decisions, and inclusive planning. Mobility planning that fosters social inclusion and reduces poverty and inequality requires data disaggregated by diverse population groups, including women, children, persons with disabilities, among others (Allen 2018). Examples of these data include transport mode choice, travel times, distances, and purposes of trips, disaggregated by socioeconomic data such as sex (and gender identity), age, disability, household composition, and income, among others (Allen 2018). Data should reveal how users respond to the existent mobility services and their specific needs (Allen 2018). Origin-destination surveys should include detailed information on a range of trip purposes (in addition to work trips), including chained trips related to the "mobility of care" (ECLAC 2019). Digital technologies such as cell phone data that allow for faster and less-expensive data collection can help to close data gaps.

Specifically, understanding mobility through an integrated, intermodal, intersectional, and interdependent lens is fundamental to respond to the travel needs of diverse women, LGBTQ+ persons, persons with disabilities, and children.[25] This comprehensive perspective will facilitate a better connection of transportation with the built environment, and the services a city provides. This will also allow for a better understanding of the mobility needs of diverse users. For example, looking into racialized dynamics that diverse female users experience can contribute to improved understanding, and bringing those ideas into formal transportation planning can help to better respond to actual users' needs.[26] As will be discussed in Chapter 4, efficient and safe public transport sys-

25. Interviews with Lina Buchely and Salome Arias, and with Erik Vergel, in 2021.

26. Interviews with Lina Buchely and Salome Arias, and with Erik Vergel, in 2021.

tems should be designed to provide access to urban opportunities for all, including highly excluded disadvantaged and vulnerable populations.

For example, an impact evaluation conducted in Lima found that infrastructure investments in public transport (specifically a BRT and metro line) focused on making public transport faster and safer could have positive impacts on women's employment outcomes and earnings in the labor market (Martínez et al. 2018). Likewise, comprehensive strategies to reduce and mitigate gender-based violence in the urban environment is a key path to promote inclusive cities for all[27]

Helping children survive and thrive is one of the most important global health and development goals. All children and youth have the right to access free and quality education and adequate healthcare through efficient and safe transport systems. Targeted action is urgently needed to protect children and youth from the disproportionate burdens they now face in terms of transport externalities such as road traffic crashes and pollution. The creation of safer infrastructure, and subsidies for school transport, are both interventions that have been tested and repeatedly shown to be effective in many countries. Considering that low-income children and youth are the most affected by traffic-related injuries and deaths and a lack of safe and affordable mobility options, it is necessary to create specific plans in these areas, both urban and rural, to correctly diagnose the problem of road insecurity and affordable school transport and provide solutions so that children can travel safely to school and other activities.

Public authorities should actively address road safety by investing in better infrastructure for safer streets, vehicles, and speeds for all users but particularly for vulnerable user groups such as children, the elderly, and persons with disabilities. Constructing infrastructure to separate road users, traffic lanes for cyclists and motorcyclists, and sidewalks for pedestrians (including designs centered around children in areas with large populations of children and families) can go a long way towards improving children's mobility and access to safe spaces to play, attend school, and engage in social and recreational opportunities critical to their cognitive development and well-being. In particular, accessibility to elementary and secondary schools should be improved by providing protected corridors for cycling and walking with adequate infrastructure (leveled sidewalks with passable coverage on rainy days, clearing of obstacles, maintenance and protection of ditches, lighting, bike paths, bicycle kennels, etc.).

Additional road-safety regulations and awareness should be addressed by establishing and enforcing reduced speed limits for vehicles around schools and residential and play areas in order to reduce the number and severity of injuries in case of traffic crashes. These policies to improve road

27. Interview with P. Jirón in 2021.

safety can also benefit women and persons with disabilities. The use of protective equipment in vehicles such as child passenger restraint systems, booster seats, and seatbelts, as well as the use of helmets for cyclists and motorcyclists, needs to be encouraged. Compliance can be enhanced through legislation requiring use by all ages, public awareness campaigns, and by making helmets affordable. Teaching road users to share the streets is also essential to improve road safety and improve their awareness of vulnerable road actors such as persons with disabilities.[28]

Universal accessibility to transportation is a necessary condition to enable access to opportunities and services for people. Universal design is a non-exclusive design concept whose goal is to benefit the entire population, not just persons with disabilities. While paratransit services may be a useful stopgap measure in cases where mass transit systems are limited, when a person with a severe disability cannot access public transport, the priority should be to make the entire transport system accessible due to the co-benefits of added accessibility for all (parents with strollers, small children, elderly, etc.).

A stronger commitment is needed to comply with universal accessibility regulations within transport systems. Although the 26 Latin American and Caribbean countries that are members of the IDB have transport accessibility regulations in place, and accessibility standards may be included in new transport projects, the rate of implementation of universal accessibility retrofits to date appears to be slow, and more systematic monitoring of progress is needed at the local and regional levels. Also, many countries do not effectively track their own improvements in terms of transportation accessibility, and without data it is impossible to determine whether progress is being made in this area or to measure the effectiveness of solutions implemented. Governments should monitor and assess the barriers within the transport system as well as in the urban environment that may limit users' accessibility, considering all the stages of a given trip.

Transport planners should also design and build infrastructure to make it easy for trips related to reproductive work, considering the interactions between transport, housing, and land use. Infrastructure should also connect informal worksites located in residential areas, particularly those where women are overrepresented (such as paid care work), to proper public transit and pedestrian infrastructure (Montoya-Robledo, undated). Studies in Latin America have suggested best practices and recommendations in terms of infrastructure to respond to the mobility needs linked to unpaid care work. Regarding the first type of mobility, Mexico City's CETRAMS study recommended building diaper-changing stations in station bathrooms, digital kiosks to pay for utilities and run bureaucratic errands, accessible signaling and maps of care-related resources, and resting places and playgrounds close to stations, among other recommendations (Soto Villagrán, 2019). In

28. Interview with P. Jirón in 2021.

addition to these measures, complementary policy actions are needed to promote a more balanced distribution of the care-related activities between men and women.

Affordability of transportation services for vulnerable populations must be another priority for local and national governments. Subsidies for persons with disabilities can be provided in several ways, including allowing free travel inside the system to account for longer travel times and transfers for these groups, a reduced rate of the total ticket cost, or monetary reimbursement for transportation trips, alongside the accessible transport infrastructure and services. Technological advancements could help to empower persons with disabilities by addressing their mobility needs and improving their confidence to travel on public transport. Likewise, the cost and benefits of targeted demand subsidies for children and women must be analyzed to better inform policymaking in the region.

In addition, more research and data are needed to better understand the challenges and conceptualize the mobility barriers faced by other marginalized groups in the region, such as indigenous and afro-descendant groups. More sophisticated approaches and actions are required to illuminate the intersectional and multi-dimensional vulnerabilities, including their historical, geospatial, and economic dimensions, and the interaction with the ways in which the transport infrastructure and services perpetuate their vulnerability within the city. The user experience of these groups on public transport should also be carefully observed in terms of any types of discrimination or violence-related incidents, and their perspectives of using public transport should be considered to inform the design of effective policy programs implemented explicitly targeting those groups.

Intersectoral policies are needed to carry out holistic and cross-sectoral actions so as to respond to accessibility needs efficiently and inclusively in transport systems. This requires the creation and coordination of mechanisms that facilitate interaction between the different sectors involved (political, technical, and social, including the users). Transport authorities as well as organizations advocating for persons with disabilities must oversee accessibility legislation and the implementation of universal design principles in projects. Likewise, construction supervision and sanctions must be employed to monitor those who do not follow the rules. This requires the political will of governments, as well as identification of the socioeconomic benefits provided by transportation accessibility. In this sense, participatory planning and policymaking are fundamental to ensure that infrastructure addresses everyone's needs. Persons with disabilities should be included in participatory processes and audits of existing services. Similarly, women and LGBTQ+ persons must occupy planning, building, and operating positions as well as positions of leadership in the transport sector to ensure that their diverse views are considered.[29]

29. Interviews with Christopher Persaud and Jean Pol Armijos in 2021.

Multilateral organizations, the public and private sectors, and academia should prioritize the social inclusion agenda in the transport sector. They can strengthen local ministries and secretariats through interdisciplinary and academic dialogue that spotlights the importance of introducing a gender and diversity perspective into transport programs and plans.[30] Given a limited understanding of how to mainstream a gender and diversity perspective within the transport sector, training and knowledge dissemination around those topics should be carried out.[31] One example of such an initiative is the development of campaigns for transport officials, drivers, workers, and the general public that examine aspects of social inclusion, unconscious biases, empathy towards persons with disabilities, and the correct use of preferential seats on public transport. From a financing perspective, structuring debt instruments (i.e., social bonds) to incentivize the incorporation of social inclusion objectives into project designs could foster transport systems that more effectively meet the needs of disadvantaged and diverse groups. In fact, experts suggest that multilateral organizations could condition loans on the effective inclusion of a gender and diversity perspective into mobility and infrastructure projects.[32] Moreover, to avoid the replication of planning models that do not respond to the mobility needs of region- and country-specific populations, organizations should develop policies that are tailored to the specific context of Latin American and Caribbean cities.[33]

Finally, there is an increasing need to generate empirical evidence on effective policies to address transport-related social exclusion among disadvantaged and vulnerable populations. While there is a growing body of evidence and research on the needs of and barriers faced by vulnerable populations in terms of transport systems, little research to date has focused on specific programs designed to improve accessibility and mobility for these groups. Rigorous quantitative and qualitative evaluations of the impacts of initiatives to foster socially inclusive transport systems are needed to understand what is working and what can be improved to inform evidence-based approaches to policymaking. In addition, cost-benefit or cost-effectiveness analysis of programs designed to improve accessibility and mobility for traditionally excluded groups (such as women, persons with disabilities, children, and the elderly) can help contribute to building a business case for such investments. Key areas for future research include the impact of safe school transportation options on children's development and poverty outcomes, the effectiveness of affordability measures targeting particular groups of commuters, and the effectiveness of specific measures to prevent and redress gender-based violence against women, persons with disabilities, children, and youth.

30. Interviews with Jean Pol Armijos, and with Denise Hernandez and Jacqueline Johana Peña, in 2021.

31. Interview with S. Vieria in 2020.

32. Intervew with Erik Vergel in 2021.

33. Interviews with Lina Buchely and Salome Arias, and with P. Jirón, in 2021.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Annex 2.1

TABLE A2.1 Selected Latin American and Caribbean Countries and Territories: Economically Active Persons with Disabilities Aged 15 and Older, by Type of Disability (percent)

Country	Vision	Hearing	Speech	Learning	Conduct	Mobility	Upper extremities	Self-care	Other	Total share of people of 15 or older by type of disability	Total share of people of people 15 or older without disability
Latin America											
Brazil	50	40			19	31				48	63
Colombia	36	25	21	17	16	24	28	14	28	33	53
Costa Rica	42	27	18	14	19	24	27			36	56
Ecuador	40	36		22	24	36				38	59
El Salvador	39	27	25		15	28	31	18	79	28	54
Mexico	36	30	22	17	11	27		10		31	58
Panama	43	28	17	23		22	24			26	60
Uruguay	40	25		20		19				35	66
Caribbean											
Antigua & Barbuda	52	37	34	13	20	27	24		40	40	69
Aruba	33	23	7	10		14		3		25	61
Barbados	17	16	13	16	13	11	20		28	19	66
Belize	36	28	22	14	15	19	20	5	27	33	51
Bermuda	31	14	12	19		18	29	13	25		73
Cayman Islands	50	28	22	24	33	29	27		50	42	80
Granada	23	29	14	8	10	14	43		24	20	53
St. Lucia	24	28	20	17	14	20	18		37	26	57
St. Vincent & the Grenadines	22	17	19	14	5	15	12		19	20	49
Trinidad &Tobago	25	15	11	9	6	10	13		12	19	46

Sources: ECLAC (2012) on the basis of the following: Brazil: Population Census 2010; Colombia: General Census 2005; Costa Rica: Population and Housing Census 2011; Ecuador: Population and Housing Census 2010; El Salvador: VI Census of Population and Housing 2007; Mexico: Population and Housing Census 2010; Panama: Population Census 2010; Uruguay: Population and Housing Census 2011. The Caribbean: Population and Housing Censuses of Antigua & Barbuda (2001), Aruba (2010), Barbados (2000), Belize (2000), Bermuda (2010), Cayman Islands (2010), Granada (2001), St. Lucia (2001), and St. Vincent and the Grenadines (2001).

TABLE A2.2 Accessibility Legislation and Indicators on Accessibility to Transport Infrastructure and Vehicles in Selected Latin American Countries

Country	Legislation	Accessibility to Transport Systems (Infrastructure and Vehicles)	Indicators
Argentina	Law 22.431 1981: Buses should be renovated to make them more accessible. Have doors that can be raised or lowered to allow a wheelchair to enter. Two seats have been set aside for people with disabilities. Allow people with disability passengers to board or exit the bus through either of the doors. Have areas where the elements that the person with a disability requires to get around can be found. Post the line name, branch number, and other details on easily readable posters. Law 25.635 allows for travel in the different types of collective land transport subject to control of the national authority at no cost by presenting the disability card.	Bus terminals	33 with physical accessibility (62 percent) 20 with communication accessibility (38 percent) 18 with accessibility to information (34 percent) 11 with technological accessibility (20 percent) 53 Total
		Bus stop	732 with physical accessibility (93 percent) 205 with communication accessibility (26 percent) 1 with accessibility to information (0.12 percent) 0 with technological accessibility (0 percent) 783 Total
		Subway stations	9 accessible stations (11 percent) - 83 total stations
		Train stations	With physical accessibility: 171 (63 percent) With communicational accessibility: Hearing: 208 (76 percent); Visual: 122 (45 percent) With information accessibility: Signs 235 (86 percent) With technological accessibility: The railway operators with metropolitan passengers have their own websites. Total infrastructures: 272 (Metropolitan Area of Buenos Aires)
		Urban collective transport (bus) (Buenos Aires Metropolitan Area) Vehicles	With physical accessibility: 9,601 (100 percent) With visual communication accessibility: 9,601 (100 percent) With auditory communicational accessibility (missing at stops) With information accessibility: 9,601 With technological accessibility: Some lines have apps communicating schedules. Interurban collective transport: 0
		Rail transport - Vehicles	With physical accessibility: 864 (60 percent) With communication accessibility: 587 (41 percent) With information accessibility: 864 (60 percent) With technological accessibility: the railway operators have their respective websites Total rolling stock: 1,419
		Taxis	Not available
		Public personnel trained to provide accessible transportation service	Training module for drivers on the integration of persons with reduced mobility into transportation by the National Traffic and Road Safety Commission (period 2010/2015) (Vice Ministry of Transportation)

Country	Legislation	Accessibility to Transport Systems (Infrastructure and Vehicles)	Indicators
Bolivia	Law 223, Articles 17, right to accessibility, and 29, subsidies	Bus terminals	It is being implemented in the ramp accesses in the various terminals of the country
		Bus stop	There are no measures
		Train-metro stations	Does not apply
		Urban collective transport (bus) mobile units	Only gondolas from Mi Teleferico
		Rail transport mobile units	There are no measures
		Taxis	There are no measures
		Public personnel trained to provide accessible transportation service	100 percent of the personnel of the Mi Teleferico Program is trained to provide assistance to people with disability (Vice Ministry of Transport)
Brazil	Decree 5296, which regulates Law 10,048, of November 8, 2000, which gives priority of attention to persons with disabilities, and Decree 10,098, of December 19, 2000, which establishes general norms and basic criteria for the promotion of accessibility.	Urban collective transport (bus) mobile units	197 municipalities (11.7 percent) have a bus fleet for adapted transportation services. Another 820 municipalities (48.8 percent) have a partly adapted fleet, while 662 municipalities (39.4 percent) have no fleet adapted at all (IBGE 2017)
Chile	Decree 33 | Modifies decree No. 142 regarding Public Transport 03/20/2013 - Ministry of Social Development Decree 142 | Norms on Equal Opportunities and Social Inclusion of Persons with Disabilities, relative to Public Transport 07/09/2011 - Ministry of Planning Decree 122 | Fixed Dimensional and Functional Requirements to Vehicles that provide Urban Collective Locomotion Services Decree 212 | Regulation of the National Services of Public Passenger Transport - Ministry of Transport	Bus terminals	Not available
		Bus stop	TranSantiago system has 35 transfer stations that includes 344 accessible bus stops 2 accessible extra vehicular pay stations
		Subway stations	68.4 percent of subway stations in Santiago Metro and 30 percent of Valparaíso Metro subway stations are accessible
		Train stations	47 stations with ramps
		Urban collective transport (bus) mobile units	87 percent of the fleet has accessibility elements
		Rail transport mobile units	35 accessible trains
		Taxis	Information not available
		Public personnel trained to provide accessible transportation service	Information not available

Country	Legislation	Accessibility to Transport Systems (Infrastructure and Vehicles)	Indicators
El Salvador	Decree No. 888 of 2000, Law on Equalization of Opportunities for People with Disabilities	Bus terminals	5.26 percent of accessible bus terminals
		Bus stop	0.1 percent accessible bus stops
		Metro stations	Information not available
		Train stations	Information not available
		Urban collective transport (bus) mobile units	1 percent nationwide (buses and minibuses)
		Rail transport mobile units	Information not available
		Taxis	Information not available
		Public personnel trained to provide accessible transportation service	Trained SITRAMSS driver staff
Guatemala	Law of Attention to Persons with Disabilities, Decree 135-96 (1996)	Bus terminals	2 transfer terminals
		Public personnel trained to provide accessible transportation service	Citizen guides and trained station personnel
Paraguay	Law 4934: Accessibility to the Physical Environment for People with Disabilities. Law 6057: Right to Access, Walk and Stay in Public Places and Public Transport Services to all Persons with Disabilities Accompanied by a Guide Dog	Transport system	170 accessible buses. No more information available

Sources: Prepared by the authors based on OAS (2016) and IBGE 2017).


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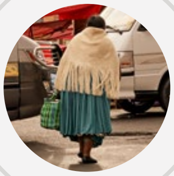
Location Matters: Land Use, Urban Development Patterns, and Transport Inequality



3

Juan Pablo Bocarejo
Erik Vergel Tovar
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Cities are essential for economic development and are a source of opportunities for low-income populations in Latin American and Caribbean countries. The concentration of populations and economic activity in urban areas facilitates access to better employment opportunities and services. In addition, characteristics such as size, density, location of activities, and transport accessibility greatly influence the potential of cities to generate sustainable economic welfare through economies of scale and productivity gains. However, the uneven distribution of activities and employment centers, and transport systems that do not adequately serve all urban dwellers, can result in unequal access to housing, jobs, and public services, generating socio-special inequalities that deepen socioeconomic divides and exacerbate social exclusion. For example, the poorest, who often have the fewer options to choose their place of residence and work, must expend more effort and resources to access the full spectrum of activities offered by the city, and they may face lower-quality environmental conditions and be exposed to greater health risks. Limited access to efficient means of transportation exacerbates those inequalities.

Latin America and the Caribbean is the most urbanized developing region in the world, with over 80 percent of the population living in cities (UN-Habitat 2020). Therefore, understanding the role of urban development and land-use patterns in the region is critical to ensuring equitable and sustainable growth. This chapter examines the interconnectivity between urban mobility and land-use factors associated with poverty and inequality in Latin America and the Caribbean. Multiple concepts regarding urban economics, land markets, planning, and governance are reviewed to assess this complex topic and to propose ways to mitigate inequalities. First, the chapter explores how urban development patterns can contribute to, or even compound, inequality. Second, it provides a theoretical framework to understand the relationship between density and land-use patterns and the disadvantages for low-income groups. Third, it examines the trade-off between residential location, travel patterns, and access to opportunities in urban areas. Finally, it presents policy recommendations for better land-use, housing, and transport coordination and planning to foster social inclusion.

Throughout the chapter, accessibility issues as they relate to urban spatial structures and transport are examined using case studies from five Latin American capitals: Buenos Aires (Argentina), Bogota (Colombia), Quito (Ecuador), Mexico City (Mexico), and Lima (Peru). These cities are home to an important share of their national populations, and account for a major share of the countries' national GDP. They are also characterized by significant inequalities, reflected and exacerbated by land-use patterns and the way citizens access opportunities and services. The rapid changes faced by these cities and their investments in public transportation projects provide interesting cases for research and policy development.

Urban areas generate opportunities for economic and social development through agglomeration economies that increase efficiency, productivity, and the potential for economic and social growth. Many Latin American capitals enjoy heightened levels of productivity and wealth, with some urban areas having land values similar to those in the richest developed cities. However, access to opportunities offered by urban areas is not distributed evenly among all urban households. The way that land use is distributed across the city, the urban structure, the distribution of activities, and population density also generate different conditions for development, and often negatively affect the most vulnerable populations.

Low-income groups generally can only afford to access lower-value land in peripheral areas, which comes with the additional burden of longer travel times and a larger number of transfers when traveling to main activity hubs within the urban centers. For example, the location of employment centers far from poor neighborhoods, which in turn have poor-quality coverage of transportation infrastructure, limits possibilities to access jobs, affecting the global labor market. The location of housing for urban residents has a significant influence on the level of inequality, mostly because large groups of the urban population have at best only limited options to access land ownership or housing. Housing location has an impact on housing quality, public services, environmental quality, health risks, transportation expenditure, access to high-quality education, and issues associated with environmental hazards due to the location of some housing developments. The trade-off between the cost of housing and the cost of transportation is decisive for the most vulnerable households. The capacity to provide better location for housing is also a challenge for public institutions in charge of affordable housing projects.

People's access to the opportunities is strongly linked to land use, housing affordability, and commuting costs, as well as to the characteristics and availability of transportation modes. One of the main attributes that enhances the value of an area is its ease of access or its proximity to main activity nodes. As a result, mass transit projects that increase access may generate increased land value in the most convenient areas, which might cause unintended effects of gentrification, and, eventually, displace the poor. This increase in property values might be captured by the private sector in the absence of value-capture mechanisms to ensure benefits to the public sector and society in general, given the accessibility benefits and spillover effects of mass transit investments. Moreover, if the implementation of value-capture mechanisms is part of a coordinated strategy between the transportation, land-use planning, and housing sectors, there will be opportunities to generate funding sources to finance transit projects as well as affordable housing projects, especially near the transit infrastructure. However, with the exception of Brazilian and Colombian cities, this strategy has not been applied extensively in the region due to challenges related to coordination between the abovementioned sectors.

Finally, transit-oriented development (TOD) is frequently promoted as a best practice when investing in transit. Such development is understood to be a strategy that integrates transportation and land-use planning to promote sustainable urban development, thereby improving the quality of urban life and reducing environmental as well as social impacts. This strategy has gained traction worldwide and has been used in multiple urban development plans. Transit-oriented development strategies can have both desired and undesired effects, however. For example, while such strategies can promote more compact and sustainable urban development that fosters walkability and transit use, it can also promote real estate development processes that may exclude the poorest populations. Latin American cities have had important opportunities to promote transit-oriented development, with rapid responses from the private sector in terms of generating new developments next to mass transit projects, and there have been some experiences of coordination between the transportation and land-use planning processes in certain cities.

By reviewing these dynamics in five Latin American capitals based on data availability, this chapter provides information on a range of inequality indicators, the impact that plans in the housing and transportation sectors have had on addressing inequalities, and the challenges to developing more inclusive policies in the future. The analysis explores Bogota as an example of a city that highlights the complexities of coordinating investments both in its transit system and in housing projects in a way that promotes social equality. The chapter examines mobility issues in informal settlements in Buenos Aires, and the relationship between mass transit investment and real estate development in Lima. It provides a critical perspective regarding housing policies in Mexico City, Bogota, and Brazil in terms of generating large-scale, affordable housing projects with several accessibility implications. Finally, the chapter looks at the emerging interest in promoting transit-oriented development strategies as part of rail-based projects in Latin America and the Caribbean, including the potential of promoting it with the design and expansion of Bus Rapid Transit systems. The discussion regarding transit-oriented development issues also addresses the possibility for unintended consequences regarding potential scenarios such as social displacement. To conclude, the chapter provides some guidelines based on lessons learned regarding issues that could be part of transit-oriented development strategies in the region.[1]

1. In some cases, especially when the chapter dives into a detailed examination of the impact of mass transit projects, information is not available for all of the projects under discussion.

3.1 Conceptual Background: Urban Spatial Structure, Accessibility, and Social Inclusion

Urban spatial structure, understood as the spatial distribution of land use, job opportunities, density, and infrastructure for transportation, affects accessibility and social equality. Monocentric cities usually have the highest concentration of jobs in one main center, where land values also tend to be higher. The polycentric city has the distribution of jobs and land values across several clusters where there is a level of specialization of activities and land uses. The trade-off households' face involves the decision to live close to job opportunities but pay higher rent or live far from job opportunities and thus pay less rent but spend more time and money commuting. Low-income households tend to be limited to certain areas based on what they can afford, so they have less choice in housing location and have to live in areas with lower rents further from activity nodes and job opportunities. The trade-off also relates to the constraints posed by low-income households' limited budgets with respect to balancing their limited housing options far from the central business districts and their higher travel expenses (Cervero et al. 2006). Low-income households usually have limited options to access land and housing in a better location that will allow them to access job opportunities, though in cities with greater informality they often are able to access housing through informal settlements. This trade-off also implies that low-income households may decide to live in overcrowded conditions to obtain a better location in relation to job opportunities, thus reducing travel expenses.

Changes in urban spatial structure have several inequality implications with respect to urban households' access to opportunities and the role of transport and mobility in exacerbating or reducing the opportunity gap (mostly for low-income groups). High-income groups in Latin America and the Caribbean tend to be located close to main activity nodes that provide better access to job opportunities and other urban services (Ingram and Carroll 1981). However, urban growth in Latin America and the Caribbean is generally characterized by informal developments at urban peripheries that increase the segregation between low- and high-income groups with the latter generally residing close to main activity nodes (Sabatini, 2003).

Although there is a contrast between the experience of cities in North America and those in Latin America in terms of the location of high-income groups, during the last two decades the emergence of gated communities at urban peripheries or in suburban areas of urban agglomerations in Latin American cities suggests that this urban growth might follow some similar patterns observed in the decentralization dynamics of metropolitan areas in North America (Buzai 2016). However, the gated communities in Latin American cities are located in some cases close to informal settlements that were part of unplanned urban expansion, creating dynamics with unforeseen outcomes (Sabatini, Robles, and Vásquez 2009). In fact, there is still a higher concentration of job opportunities at urban cores within urban agglomerations in Latin America, so a potential decentralization similar to that of the United States is unlikely. Figure 3.1 shows the urban spatial structure in Bogota and Buenos Aires. Both cities are examples of the transition from a monocentric city towards a mono-polycentric model in which the main activity node expands by consolidating interconnected sub-centers. Both maps highlight the relationship between main activity nodes (job centers) and the location of affordable housing or informal settlements. Affordable housing refers to housing typologies that have as a target population low-income and disadvantaged groups and households that need support from government to access land and housing. The location of low-income groups within the urban spatial structure in these two cases has several implications in terms of social equality. Developers promote affordable housing following two key requirements: land values must be relatively low, and land parcels must provide the opportunity to generate large-scale housing projects. These developments are taking place where vacant land fulfills these two requirements, which is usually far from the main activity nodes. At the same time, low-income groups face constraints on their housing options because their limited capacity to pay requires that they access either affordable housing projects (far from activity nodes) or informal settlements. Figure 3.2 highlights the outcomes of these dynamics in Bogota and Buenos Aires.

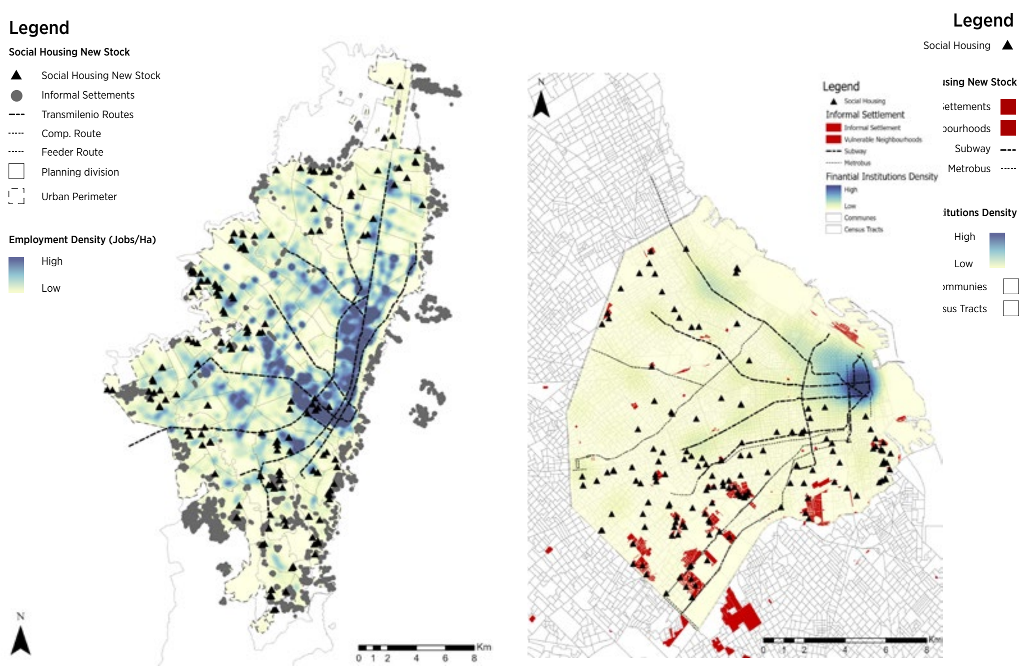
FIGURE 3.1 Urban spatial structure, land rents, affordable housing and informal settlements

BOGOTA **BUENOS AIRES**

Sources: Goytia and Negri (2021), Negri (2016), SDHT (2021), Infraestructura de Datos Espaciales para el Distrito Capital (IDECA) (www.ideca.gov.co/), and Buenos Aires Data (data.buenosaires.gob.ar).

FIGURE 3.2 Affordable housing, informal settlements and main activity nodes

BOGOTA **BUENOS AIRES**



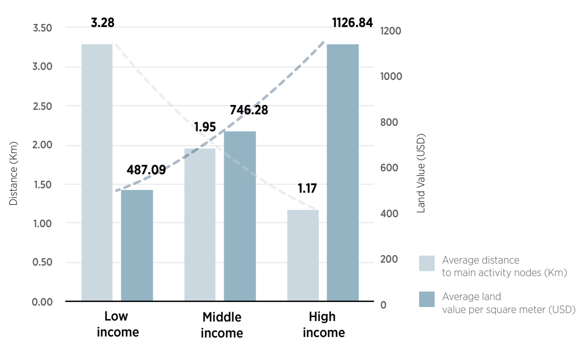
Sources: Goytia and Negri (2021), Negri (2016), SDHT (2021), Infraestructura de Datos Espaciales para el Distrito Capital (IDECA) (www.ideca.gov.co/), and Buenos Aires Data (data.buenosaires.gob.ar).

Figure 3.3 shows the intra-city differences in average distance to main activity nodes and the average land value per square meter for Bogota and Buenos Aires in terms of three housing markets stratified by income levels (the definitions are provided in the keys to the figure panels). When considering the average distance from activity nodes, low-income housing is at a clear disadvantage compared to more expensive housing developments, as declining housing value is associated with steadily increasing distance from key activity centers. In Bogota, low-income housing is 3.28 kilometers away on average from the closest activity node, nearly three times as far as high-income housing, which is, on average, 1.17 kilometers away. In Buenos Aires, low-income housing is located further away from activity nodes, and a similar pattern is found in Bogota's low-income housing stock. Relative to higher-income housing in Buenos Aires, which is located on average 5.29 kilometers from activity nodes, low-income housing is nearly double the distance on average (1.65 times further). So, although inequalities in relation to distances to main activity nodes are more marked in Bogota, Buenos Aires tends to have longer distances between housing and activity centers overall. This highlights the strong differences between income groups in terms of mobility and access to opportunities and services in Buenos Aires, emphasizing how local territorial conditions, in addition to differences in income levels, increase socio-spatial inequalities (Blanco and Apaolaza 2018).

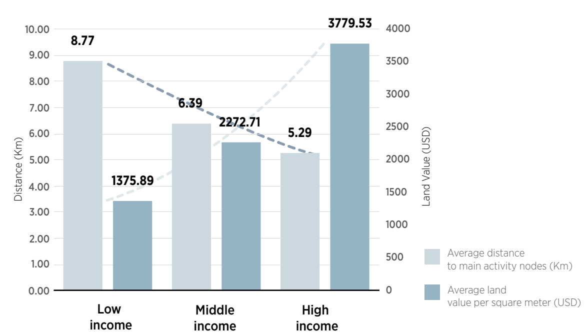
Data from Bogota and Buenos Aires also confirm that their urban spatial structure is correlated with the location of low-income housing. The distribution of land values shows how affordable housing and informal settlements are located where land values are low and far from the concentration of job opportunities. This has implications in terms of longer commuting times and higher transportation costs for low-income groups. Attributes of urban spatial structure (Figure 3.3), such as land values, explain the type of relationship this structure has with the location of affordable housing. The maps in Figure 3.3 show that most planned low-income housing developments are located at urban peripheries where there is vacant land for large-scale developments, in some cases next to informal developments also located at urban peripheries. Few low-income housing developments (formal or informal) are close to main activity nodes, with some exceptions such as high-density developments. When looking at average land values per square meter, high-income housing in Bogota is 2.3 times more costly than low-income housing. In Buenos Aires, the difference between the land value of a high-income housing location and that of a low-income housing location is 2.7 times. These findings have some implications for low-income groups in terms of accessibility, that is, they suggest that, for low-income groups, there is a difficult trade-off between an affordable location and the commuting costs of the distance to opportunity areas.

FIGURE 3.3 Housing Segments and Urban Spatial Structure Variables: Distance to Main Activity Nodes and Land Values per Square Meter

a. Distance to Main Activity Nodes vs. Land Value in Bogota



b. Distance to Main Activity Nodes vs. Land Value in Buenos Aires

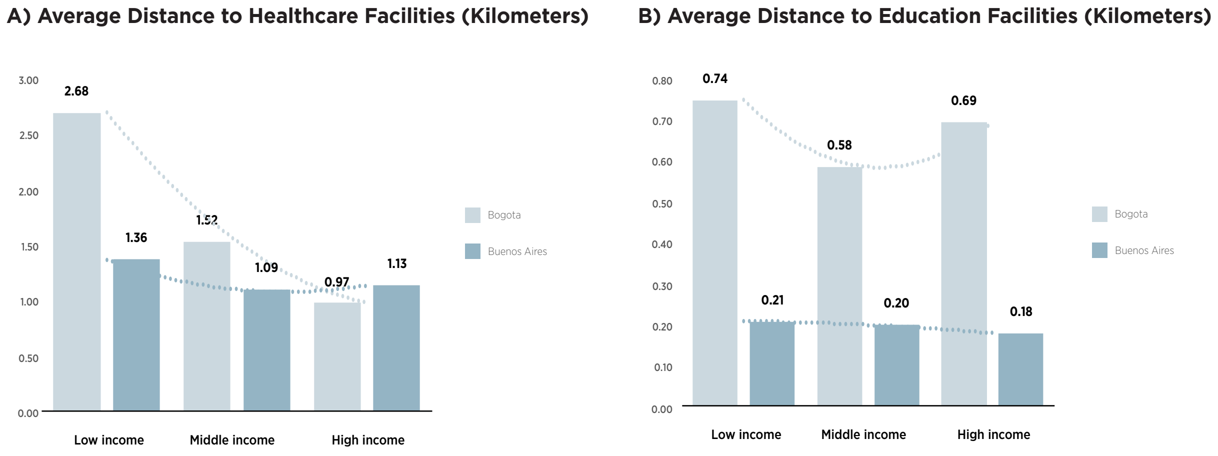


Sources: Goytia and Negri (2021), Negri (2016), SDHT (2021), Infraestructura de Datos Espaciales para el Distrito Capital (IDECA) (www.ideca.gov.co/), and Buenos Aires Data (data.buenosaires.gob.ar).
Note: In Bogota, CAMACOL (2021) data provided the ranges for income levels: Low-income<=150smmlv; middle-income<=500smmlv; and upper-income>500smmlv. In Buenos Aires, income levels were defined according to residential land classifications in Marcos et al. (2015). Land values for 2020 are estimates of the average at the block level.

Urban spatial structure also affects equality in access to social services such as education and healthcare facilities. Figure 3.4 compares the distances to healthcare and education facilities by income group in Bogota and Buenos Aires. First, the data highlight the challenges for low-income groups in Bogota to access healthcare facilities and also show that educational facilities are distributed more equally in both cities, but distances are longer in Bogota. For example, in Bogota, low-income groups in affordable housing projects are located on average 2.68 kilometers away from the closest healthcare facility, 2.8 times further than the average distance for high-income groups from such facilities. In Buenos Aires, the distance for low-income groups to healthcare facilities is 1.36 kilometers on average, compared to 1.12 kilometers on average for high-income groups, or a 21 percent longer distance, suggesting that in Buenos Aires the difference is less for these income groups than in Bogota.

Second, distances to education facilities suggest less variation among income groups within the urban spatial structure in both cities. The location of education facilities is regulated by the local government through master plans in Bogota (Bogotá 2019) and by school districts in Buenos Aires (Buenos Aires 2021). These regulations, defined by the master plan and the districts, promote a distribution of education facilities at multiple locations within the urban area. Distances to the closest education facility are longer in Bogota than in Buenos Aires but, within each city, the differences between income groups in terms of distances to education facilities are shorter. In both cities, there are public and private education facilities, but there is an important difference in terms of their spatial distribution, with some commuting implications. Public education facilities provide access to education services to the population according to the jurisdiction of each facility (school districts in Buenos Aires). However, the location of private education facilities is determined by other factors such as proximity to high-rent areas and access to large parcels of land at urban borders or in expansion areas. In the case of Buenos Aires, the privatization process implies that some low-income groups are also making a shift from public schools to subsidized private schools (Judzik and Moschetti,2016). In Bogota, there is an increasing gap between low- and high-income groups not only with respect to access to education facilities, but also in terms of the quality of such facilities, which increases socio-spatial segregation given that low-income groups have difficulties accessing public facilities, thus reducing their opportunity to improve their quality of life (García Villegas, and Quiroz López 2011). For low-income groups in Bogota, the distance to the closest education facility is 0.75 kilometers on average, while for high-income groups this distance is 0.69 kilometers on average, showing an average difference of 0.16 kilometers between these groups. For low-income groups in Buenos Aires, the distance to the closest education facility is 0.21 kilometers on average, while this distance for high-income groups is 0.17 kilometers on average, which constitutes a difference of only 0.04 kilometers between the groups. The trade-off between location and travel times is further explored in the next section.

FIGURE 3.4 Housing Segments and Urban Spatial Structure Variables: Distance to Social Services



Sources: Goytia and Negri (2021), Negri (2016), SDHT (2021), Infraestructura de Datos Espaciales para el Distrito Capital (IDECA) (www.ideca.gov.co/), and Buenos Aires Data (data.buenosaires.gob.ar)..

3.1.1 Residential Location Choice and Spatial Inequality

Location choice is a function of a myriad of factors including socioeconomic factors, the built environment or neighborhood layout, the density of activities, housing affordability, and transport system attributes (Frenkel, Kaplan, and Bendit 2013; Shiftan, Hershkovitch-Sarusi, and Prashker 2008; Montgomery and Curtis 2006; Weisbrod, Ben-Akiva, and Lerman 1980). People consider a range of variables in their housing location decisions in order to maximize their well-being within their budget constraints. These factors include cultural and socioeconomic issues, housing characteristics and costs, proximity to services, activities, and facilities, quality of the neighborhood, density, and transportation costs. These factors, in turn, are a function of the degree of connectivity, coverage, and quality of transport services and infrastructure. In particular, the cost of public services (especially transportation) and the location of the work site have an important influence on the selection of the location of housing (Weisbrod, Lerman, and Ben-Akiva 1980).

An analysis of consumer trade-offs between residential location and transport costs for poor and very poor households in Bogota (Bocarejo et al. 2017) calculated substitution costs to determine the most likely choice of either time savings or housing area for lower-income populations using revealed preference models and stated preference survey analysis. For the poorest households in Bogota, housing costs represented between 43 and 53 percent of total income and transportation represented up to 20 percent. Households with higher incomes were willing on average to pay more for housing to reduce their commuting time, while those with lower incomes traded off higher transport costs to obtain lower housing prices. Very poor households were willing to increase their travel time by 2.6 minutes per commute to acquire an additional square meter of space in their household. According to the analysis of affordable housing projects in Bogota, housing location close to extended central business districts was not a priority for low-income households because of the higher rental cost and size of the affordable housing units available.

In the case of Mexico City, Atuesta et al. (2018) found that moving 1 percent closer to employment centers increased the cost of housing by up to 3 percentage points. Likewise, depending on income level, having public transportation or highways nearby is more valuable. This trade-off also generates segregation in cities, as low-income households located far from employment centers have more limited access to opportunities due to their longer commutes, or even because they are relegated to informal or low-wage jobs near their place of residence (Negrete and Paquette 2011). These dynamics are further explored in the next section in the description the growth of urban peripheries.

During the second half of the 20th century, unplanned urban growth through informal settlements accounted for a large portion of the expansion of many cities in Latin America and the Caribbean (UN-Habitat 2003). That unplanned growth was exacerbated by a lack of local capacity to respond to the corresponding increase in demand for urban infrastructure, housing, and services, propelled by the migration of rural populations to urban areas, and associated with the growth of informal housing settlements among people without access to formal land and housing markets (Angel and Blei 2016). In some cases, migration to cities was also the result of violence, internal conflicts, and economic crisis. Oftentimes, the invasion of rural land in peripheral areas results in informal settlements located in lower-land-value or environmentally hazardous areas, which are usually far from or disconnected completely from transit corridors (Câmara and Banister 1993).

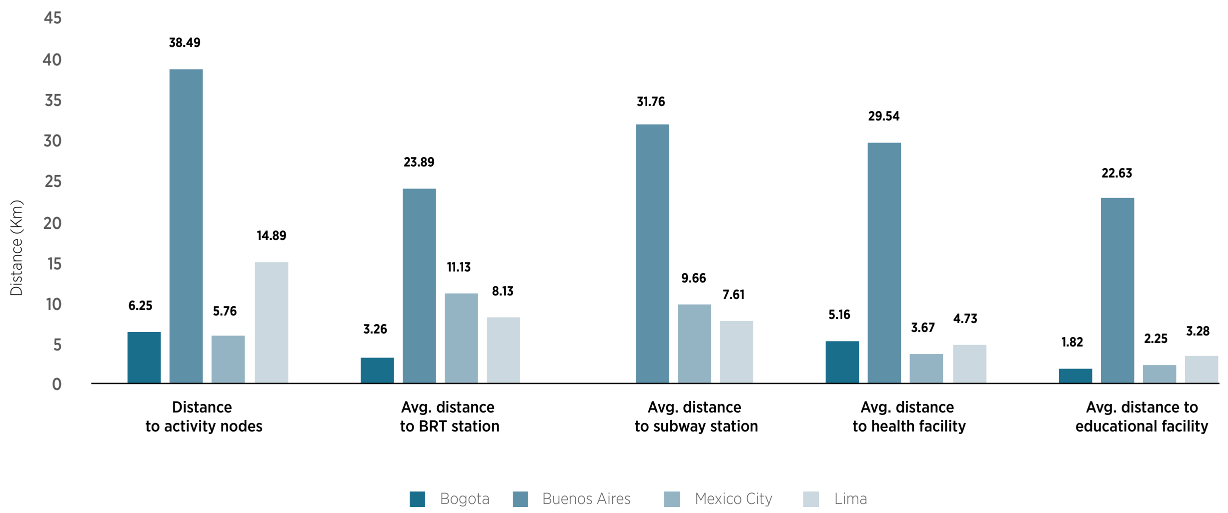
The built environment in the region's cities is also frequently characterized by narrow streets with high population density and overcrowded housing conditions. Given the strong link between informal urban growth and the expansion of cities in Latin America and the Caribbean described previously, providing transit in the built environment in informal settlements is challenging. This is because of the difficulties associated with transit vehicles accessing high-density residential areas through narrow roads, and with the lack of universal accessibility, especially for the elderly and children. Such areas that lack public transportation are known as "transit deserts."

As a result, transportation demand in informal settlements is strongly associated with a similarly informal transport supply. Studies of transportation demand of informal settlements in Africa, Asia, and Latin America and the Caribbean suggest that an informal transport supply usually emerges in order to fill the gap within these transit deserts (Cervero and Golub 2007). Mapping projects that document informal settlements' use of informal transport to improve access to activity nodes (job centers) within urban agglomerations in Africa and Latin America and the Caribbean suggest that informal transport and informal urban growth are strongly linked (Goldwyn and Vergel-Tovar 2018; Hernandez and Titheridge 2016; Klopp and Cavoli 2019; Vergel-Tovar et al. 2021; Williams et al. 2015).

The recent use of cable cars in several cities in Latin America and the Caribbean is one way to address the accessibility issue by providing transit services to hilly areas where access to informal settlements was previously difficult. Although cable cars provide an opportunity for these hilly settlements, little is known about their urban development impacts. To date, studies have looked at other issues such as the reduction of travel times, associations with reductions in criminality, improvement in social cohesion, the provision of public facilities, and the enhancement of the public space around the stations (Bocarejo et al. 2014; Canavire-Bacarreza, Duque, and Urrego 2016; Cerdá et al. 2012; Garsous, Suárez-Alemán, and Serebrisky 2019).

Figure 3.5 presents estimates of the average distance to key destinations from informal settlements in Bogota, Buenos Aires, Mexico City, and Lima. The estimates for Buenos Aires were conducted at the metropolitan level, which explains the differences between Buenos Aires and the other cities. In the Buenos Aires Metropolitan Area, distances from informal settlements to primary destinations are more than 20 kilometers due to the fact that key destinations such as activity nodes (job centers) are mostly located within the City of Buenos Aires. The estimated average distances to mass transit stations are more than 7 kilometers in Lima, Mexico City, and Buenos Aires, but in Bogota the estimated average distance to BRT stations is less than 4 kilometers. In all cases, the average distances from the informal settlements to the main activity nodes are greater than 5 kilometers. In terms of the distances from informal settlements to social services such as education and healthcare facilities, there is an important difference: education facilities are more widely distributed and thus also serve residents in urban peripheries. However, heterogeneity in the spatial distribution of education facilities, as shown in Figure 3.5, has been found in other Latin American. The data shown in Figure 6.5 confirms the pattern also found in Concepcion, Chile, which shows that challenges remain for low-income groups in terms of spatial accessibility to these facilities (De la Fuente et al. 2013). Box 3.1 provides a detailed description of the implications of transport disadvantage for households in an informal settlement in Greater Buenos Aires.

FIGURE 3.5 Informal Settlement Proximity Indicators: Average Distance to Key Destinations (Kilometers)



Sources: Goytia and Negri (2021), Negri (2016), SDHT (2021), Infraestructura de Datos Espaciales para el Distrito Capital (IDECA) (www.ideca.gov.co/), Buenos Aires Data (data.buenosaires.gob.ar). Procuraduría Ambiental y del Ordenamiento Territorial (paot.org.mx) and Instituto Catastral de Lima (sit.icl.gob.pe).

BOX 3.1

Accessibility in Informal Settlements: Costa Esperanza, Costa de Lago, and 8 de Mayo in Buenos Aires, Argentina[1]

Integrating informal settlements into the urban fabric by providing sustainable mobility solutions for their inhabitants is the key to facilitating accessibility to opportunities for employment, education, healthcare, and social and recreational opportunities. The Socio-Urban Integration Program for Vulnerable Settlements in Greater Buenos Aires, funded by the Inter-American Development Bank (Loan AR L1288) and initiated in 2018, aims to improve living conditions in the informal settlements in Buenos Aires. The project includes the generation of knowledge products to enhance the understanding of mobility challenges faced by residents in the informal settlements. The study draws on data from electronic payment transit cards (*Sistema Único de Boleto Electrónico* - SUBE), cell phone data, a mobile survey, and 13 focus groups conducted in August and September 2018. It targeted residents of three neighboring informal communities in San Martin (see below), a municipality of Metropolitan Buenos Aires: Costa Esperanza, 8 de Mayo, and Costa del Lago (CC8) (Gutiérrez et al. 2022).

The study finds that residents of the settlements travel less often and under worse conditions, making an average of 1.88 trips per person per day versus 2.64 trips for the rest of the Buenos Aires Metropolitan Area. Moreover, only 45 percent of the respondents had made a trip the previous day. Residents of the informal neighborhoods frequently endure unpleasant and dangerous commutes, with packed buses, speeding drivers, and limited routes and hours of service.

Residents mainly travel for work and restrict their travel to areas that are close to the settlement. Work trips represented 61 percent of all trips, with most trip destinations (67 percent) in the surrounding areas of the San Martin municipality and only 12 percent to downtown Buenos Aires (Figure 3.1.1). The focus groups revealed that daily individual work trips (mostly made by men) vary in terms of their destinations and distances due to the men's unstable and informal employment.

The residents face three main barriers to mobility: (1) poor quality or an absence of formal infrastructure, (2) high levels of insecurity and lack of traffic safety, and (3) poor quality and coverage of transportation services. These barriers restrict residents' trips and result in a reliance on local bus lines for many trips over distances that, under better circumstances, could have been made by bike or foot. This means that 71 percent of trips are by bus, 98 percent of which are clustered into a single line that passes near the area of the neighborhood. These barriers imply significant limitations on accessibility, reducing the amount and quality of employment, education, and healthcare opportunities for residents of these neighborhoods.

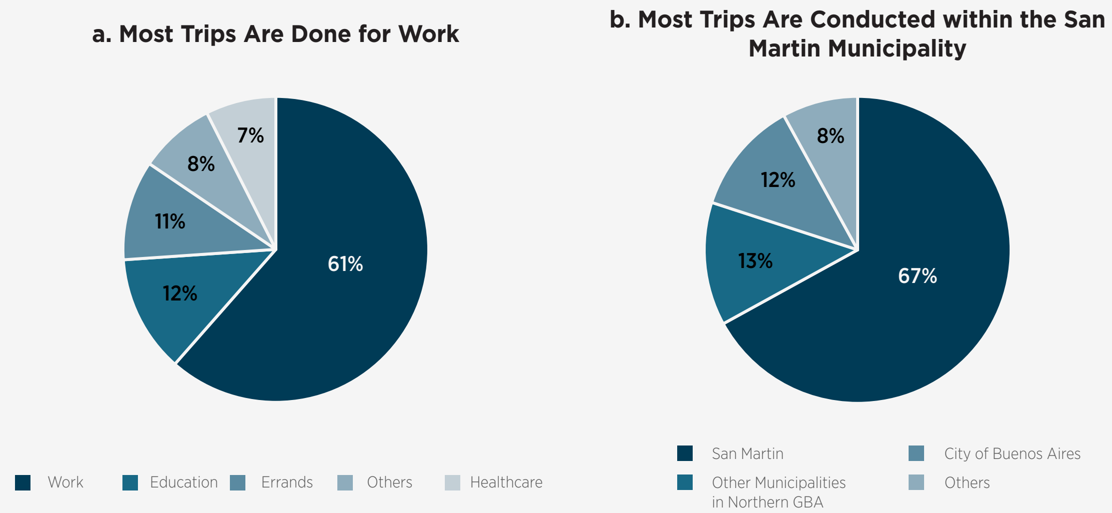
Mobility and access to it are negatively affected by the fact that the settlements are surrounded by two water courses and a highway, with limited safe options to cross any of these pedestrian or other infrastructure barriers, and by the overall condition of the physical environment. The lack of sidewalks, plus insufficient run-off water management, makes it almost impossible to walk around the neighborhood on rainy days. Many residents work in a recycling facility on the other side of the highway connected to the neighborhood by only one undercrossing that floods extensively when it rains, forcing workers to choose between paying for a taxi or risk crossing the highway by foot. As one focus group participant stated, "…either you take a remis (private taxi), or you cross the highway by foot. Since there is no traffic light, you have to run real fast, otherwise, you are done…."

Inhabitants of the settlements feel unsafe in the neighborhoods and are forced to limit their mobility as part of their preventive strategies. Although 42 percent feel unsafe or very unsafe when using public transportation, this number increases to 70 percent when other people are waiting at the bus stop. Women and the elderly point out that they do not leave their homes before dusk, at mid-day, or after sunset. Neighbors and family members deploy a wide range of strategies to minimize the risks, such as forming groups to walk together or asking for someone to accompany them. However, people dismiss the use of bicycles, even if they own one, due to the fear of theft.

Additionally, the poor quality and coverage of bus service discourages mobility, causing people to suspend "least important" trips (recreation, family visits). No bus lines enter the neighborhood, and its inhabitants must walk to its borders to take the bus. Focus groups systematically raised the issue of overcrowded buses, bus drivers skipping stops, speeding, reckless driving, and even situations of physical and verbal violence. Additionally, bus stops are not signaled by drivers as well as abrupt changes to routes without due notice. In terms of affordability, the fare structure requires payment of the full fare for each transfer, resulting in large overall expenditures on transport, as residents of CC8 tend to take buses even for short trips as a safety measure.

These barriers also disproportionally affect women, who travel 6 percent less than men. This difference increases to 20 percent when taking longer trips into account. Moreover, the focus groups showed that women have more diverse trip purposes and destinations (disproportionally conducting more caregiving trips and family/personal errands), which tend to be closer to their households. One relevant caveat is that among those who said that they did not have money to make the trip, 66 percent were women and 34 percent were men, suggesting that women have lesser financial independence and fewer financial resources.

FIGURE 3.1.1 Purpose and Spatial Distribution of Trips Originating rom the Informal Settlements of CC8



Source: Gutiérrez et al. (2022).
Note: GBA: Greater Buenos Aires.

Poor mobility limits access to employment and educational opportunities, and this limitation has long-lasting implications for the sustainable and inclusive development of cities. As seen above, in the context of safety and infrastructure barriers, walking or cycling are not options. Hence, the poor quality and limited coverage of public transit discourages both recreational and utilitarian trips (e.g., children do not go to school when it rains) and increases transportation costs (in time and money) to participate in different aspects of urban life. The findings of the study suggest a need to break the connection between the lack of safety and poor public space conditions, while working with the municipality to develop case-specific solutions to improve accessibility to key destinations such as schools, healthcare centers, and primary employers in the area.

1. This box was prepared by Enrique Pelaez and Lynn Scholl.

https://publications.iadb.org/publications/spanish/document/Movilidad-y-accesibilidad-en-asentamientos-informales-barrios-de-Costa-Esperanza-Costa-del-Lago-y-8-de-Mayo-Buenos-Aires-Argentina.pdf

3.1.2 Land Use and Accessibility to Opportunities

As discussed in Chapter 1, accessibility is defined as the ability of an individual to reach potential activities (Hansen 1959)**.** The distribution of land-use and spatial dynamics form a key determinant of the degree of access afforded to individuals in cities.

Accessibility indicators are key to evaluating how a city's transport system facilitates access to opportunities or, to the contrary, generates social exclusion (Ben-Akiva and Lerman 1979). The estimation of accessibility to different types of facilities (healthcare, education, recreation, or parks) can also provide important insights into where new facilities should be developed. In particular, access to activities is conditioned by an "impedance," mainly defined by the time and cost of transportation linked to the individual's ability to pay (affordability). Table 3.1 presents a comparison of time and cost impedance between cities according to income level. In this case, travel time for commuting is included, as the indicator of accessibility to employment in the cities will be analyzed later. For travel time and expenditure on transportation, only public transportation is analyzed since it is the predominant mode in all of the Latin American cities under study.

TABLE 3.1 Travel Impedance for Commuting on Public Transit in Latin American Cities

City	Average Travel Time: Low-income Population (minutes)	Average Travel Time: High-income Population (minutes)	Average Expenditure: Low-income Population (percent)	Average Expenditure: High-income Population (percent)
Bogota	98	83	35	6
Buenos Aires	58	48	20	5
Quito	87	60	42	6
Lima	54	51	20	8
Mexico City	95	90	14	3

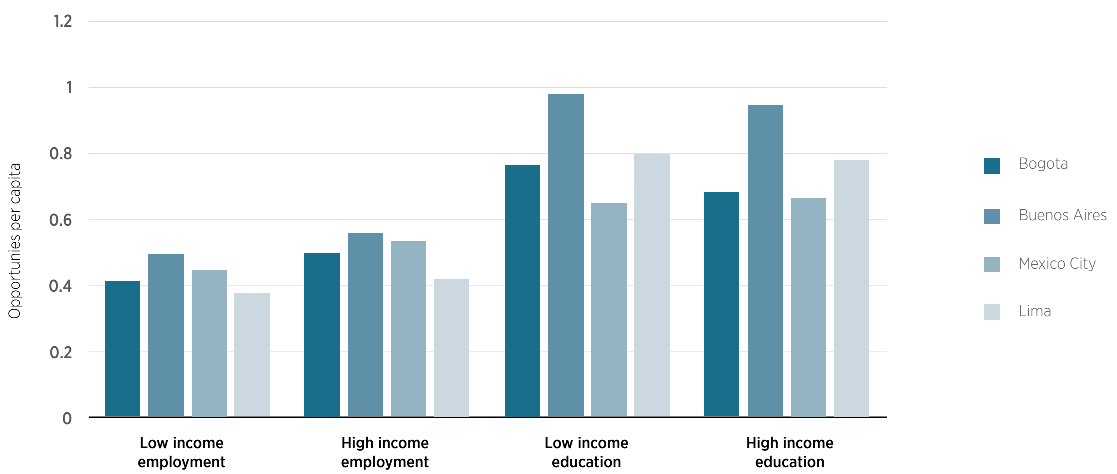
Sources: Data collection from focus group surveys in Bogota (2019), Buenos Aires (2010), Lima (2013), and Mexico City (2017).
Note: The low-income population is defined by the two lowest income quintiles, and the high-income population is defined by the two highest quintiles. Transit expenditure is defined as a percentage of household income.

Table 3.1 shows that low-income populations are often faced with greater travel impedance in terms of time and money due to the spatial dynamics of the cities. As shown above, there is a trade-off in housing location: low-income populations tend to locate farther from employment and other activities in the cities in order to find more affordable housing prices. Comparing travel times between city income segments and averaging across them, low-income populations generally have travel times 15 percent longer than high-income populations, although in Quito the travel time is some 31 percent longer. In terms of transit expenditure, the difference between income levels averages 76 percent, representing a significant barrier to mobility for the poorest population. Quito again has the most inequality (86 percent), followed closely by Bogota (83 percent), Mexico City (79 percent), and Buenos Aires (75 percent). Mexico City and Lima have the smallest differences in travel time between the poor and wealthy quintiles. Mexico City's low-income population has access to a well-developed and affordable mass transit system that competes with the very congested road network.

There is less inequality in terms of travel cost in Buenos Aires than in Bogota or Mexico City due to a relatively more dispersed pattern of employment locations and a faster transport system. These impedances are reflected in the changes in accessibility levels of income groups, as they generate greater limitations for the poorest population to access employment, education, or leisure opportunities.

Figure 3.6 shows average accessibility to employment and education in the cities under study. The measure of accessibility was defined as the number of potential opportunities reachable within a one-hour trip, using the chosen mode of travel by income group. The accessibility indicator represents the number of employment or educational opportunities reached by a person in one hour of travel, based on an approximation made with data from mobility surveys. The education indicator considers all levels of education.

FIGURE 3.6 Accessibility to Employment and Education



Source: Data collection from Origin and Destination surveys in Bogota (2019), Buenos Aires (2010), Lima (2013), and Mexico City (2017).
Note: The low-income population is defined by the two lowest income quintiles and the high-income population is defined by the two highest quintiles

In general, for the four cities under study there is a higher level of accessibility to education than to employment, and Buenos Aires stands out. This may be related to the fact that education centers (especially primary and secondary) are not concentrated in certain areas of the cities but are distributed more uniformly. The opposite is true for employment, which is generally concentrated in activity nodes where the residences of the higher-income population are located. This can be seen in the difference between income groups in these cities, where the difference in access to employment is about 16 percent, while for education it is only 3 percent. Another factor of interest is that Buenos Aires and Lima, the cities with the lowest impedances (Table 3.1), have greater accessibility to employment than the other cities.

3.2 Experience in the Region with Transportation, Affordable Housing Investments, and Transit-oriented Development: What Do We Know about Their Impact on the Poor?

3.2.1 Density and Land Use: Accessibility Benefits, Mass Transit Investments, and Potential Effects

Accessibility benefits generated by proximity to mass transit, especially stations, influences urban form through its effects on land values. The proximity of land parcels to mass transit stations can promote greater housing density given that the reduction of land values is a result of more intense land use, but this relationship is largely mediated by land-use-planning regulations (Suzuki, Cervero, and Luchi 2013). Coordination between transportation and land use requires achieving a balance in terms of the diversity of the urban space by providing compact urban forms with gradients between high intensity of land uses close to mass transit stations, and lower density when moving away from the core infrastructure. This coordination often seeks to promote compact urban forms with a mixture of land uses that may reduce the necessity to travel long distances. In the long term, the successful alignment of transportation and land use is intended to promote sustainable urban development that includes active transport, commuting via other sustainable modes, reduction of greenhouse gas emissions, and increased revenues for local governments. Coordination between transportation and land use requires the work of multiple actors from both the private and public sectors, including participation by the communities affected within the framework of key intervention areas where transport and infrastructure and land-use planning instruments promote shared goals.[2] The challenges related to the coordination of transportation and land use are related to a range of factors such as institutional fragmentation, a lack of expertise at the local level, limited experience in urban transportation management issues, and insufficient time and funds of transport planning institutions (Cervero 2013). It is also challenged by lags that can occur in the timing of transportation investments and those of subsequent urban development processes. Although transport projects often have a more precise time frame, urban development may require several years, depending on factors such as urban norms and regulations, real estate dynamics, and demographic trends (Rodriguez, Vergel-Tovar, and Gakenheimer 2020). In addition to timing coordination, another challenge to successful coordination between transportation and land-use planning is the articulation

2. Vergel-Tovar, C. Erik, Examining the reciprocal relationship between bus rapid transit and the built environment in Latin America, 2016, Doctoral Dissertation. https://cdr.lib.unc.edu/concern/dissertations/rr171x488

of actions between multiple stakeholders. To achieve a greater level of integration, the accessibility benefits generated by transportation projects must be integrated with the effects of such projects on the urban form and modal split through land-use planning and urban management instruments. More recently, there has been an emerging interest in achieving better coordination between transport and land use in order to reduce socio-spatial inequities by improving accessibility for low-income groups. (Beard, Mahendra, and Westphal 2016).

The effects of mass transit investments on local accessibility by increasing proximity to stations, and on regional accessibility by reducing travel times to main activity nodes, also influence land rents and urban form (Cervero et al. 2004; Hanson and Giuliano 2004). These effects may also occur at the station level by generating changes in the spatial distribution of land values and promoting variations in urban density in closer proximity to these stations (UN-Habita, 2013b). Box 3.2 presents the case of Lima, where transportation investments have influenced the city's real estate dynamics.

BOX 3.2.

Housing Market Responses to Urban Transport Investments: The Case of Lima, Peru

Transportation infrastructure investments, to the extent that they improve accessibility, induce households and businesses to settle in areas surrounding stations (Debrezion, Pels, and Rietveld 2007; McIntosh et al. 2017) and potentially lead to an increase in property values around newly connected areas (Agostini and Palmucci 2008; Guzman, Enríquez, and Hessel 2021). The increased value of property is also theorized to stimulate land-use change by increasing the attractiveness for development or redevelopment of parcels near the stations (Rodriguez and Mojica 2009). Previously vacant parcels may become more attractive to real estate investors, and those that are built up may become targets for more intensive development or infill.

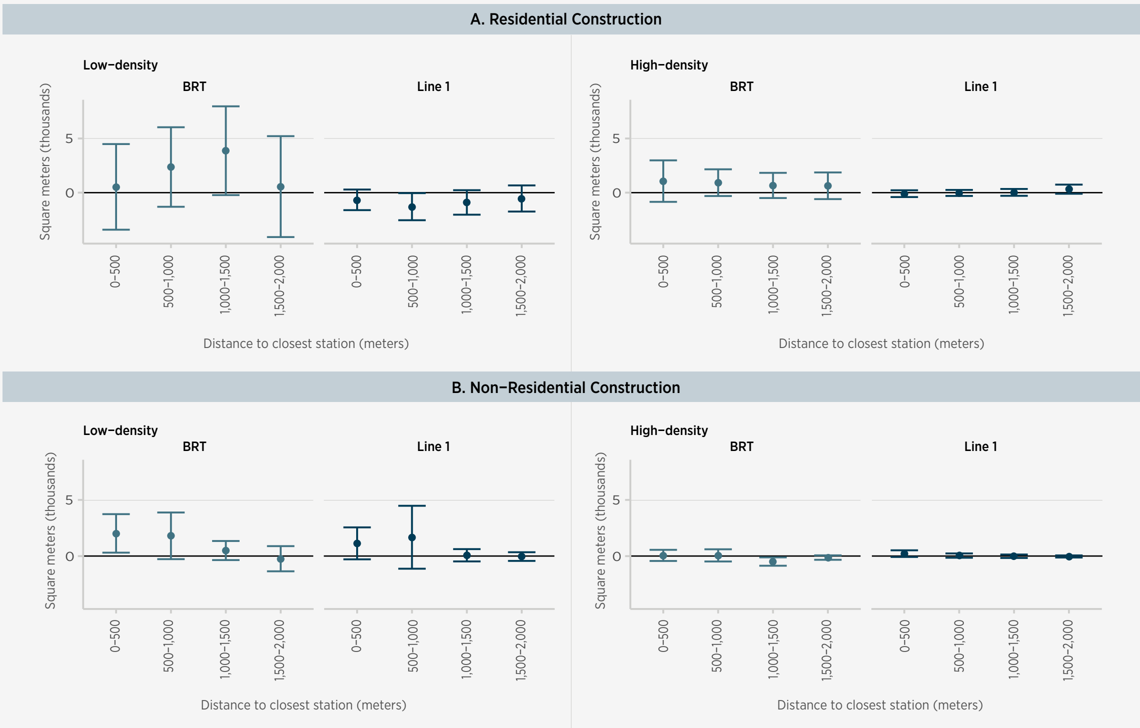
An evaluation conducted by teams from the Inter-American Development Bank (IDB) and IDB Invest (Martinez et al., forthcoming) explores the causal impacts on land-use changes generated by the opening of two important public transport systems in Lima: a Bus Rapid Transit System (BRT), better known as the "Metropolitano," and an elevated light rail, known as Metro Line 1. Both systems were built gradually; they began offering services in 2010 and were fully completed by 2014. The two systems were designed to connect two of the fastest-growing areas of the city and were also intended to connect, through feeder lines, lower-income neighborhoods in the northern and southern cones of the city with the financial district and the downtown area. The evaluation is focused only on areas around the BRT and metro stations, where the location of stations is well defined.

To analyze land-use changes, the study uses geo-referenced data on construction projects collected by the Peruvian Chamber of Construction (CAPECO) between 2008 and 2017. CAPECO conducts an annual census of all ongoing construction projects in the Lima metropolitan area. Focusing on newly initiated construction projects, the evaluation compares changes in construction activity in comparable areas at different distances from the BRT and Line 1 stations using inverse weighted propensity score difference-in-differences models with data organized in equal-size cells.

The evaluation reports a statistically significant increase in non-residential construction within a 500-meter buffer area of the BRT system and, particularly, in areas that had lower population density prior to development of the BRT system (Figure 3.2.1). Newly initiated non-residential construction increased by around 2,000 square meters per cell annually in this buffer area, representing a five-fold increase compared to the baseline comparison area (equivalent to 3 percent of the average area available for construction, 65,000 square meters, in each cell). Non-residential construction also increased in low socioeconomic status (SES) areas within a 1,500-meter buffer from the systems, where there was an average annual increase of around 400 square meters in newly initiated non-residential construction. This is equivalent to a two-fold increase with respect to the baseline in the comparison area. However, no significant impacts were observed in areas close to the Metro Line 1 stations.

The timing of these effects was delayed. For both of the mass transit systems, statistically significant impacts were observed in the full-operation period (2014–2017) but not in the initial ramp-up period (2010–2013). This could be due to the fact that while land-price impacts can be instantaneous, land-use changes tend to be slower, partly due to institutional lags such as those related to securing building permits and performing zoning amendments, among other issues (Perez, Martinez, and Ortuzar 2003). When examining the type of non-residential construction generated around transport system areas, most of the increase came from non-residential buildings of five floors or more.

FIGURE 3.2.1 **Impacts by Pre-Treatment Density**

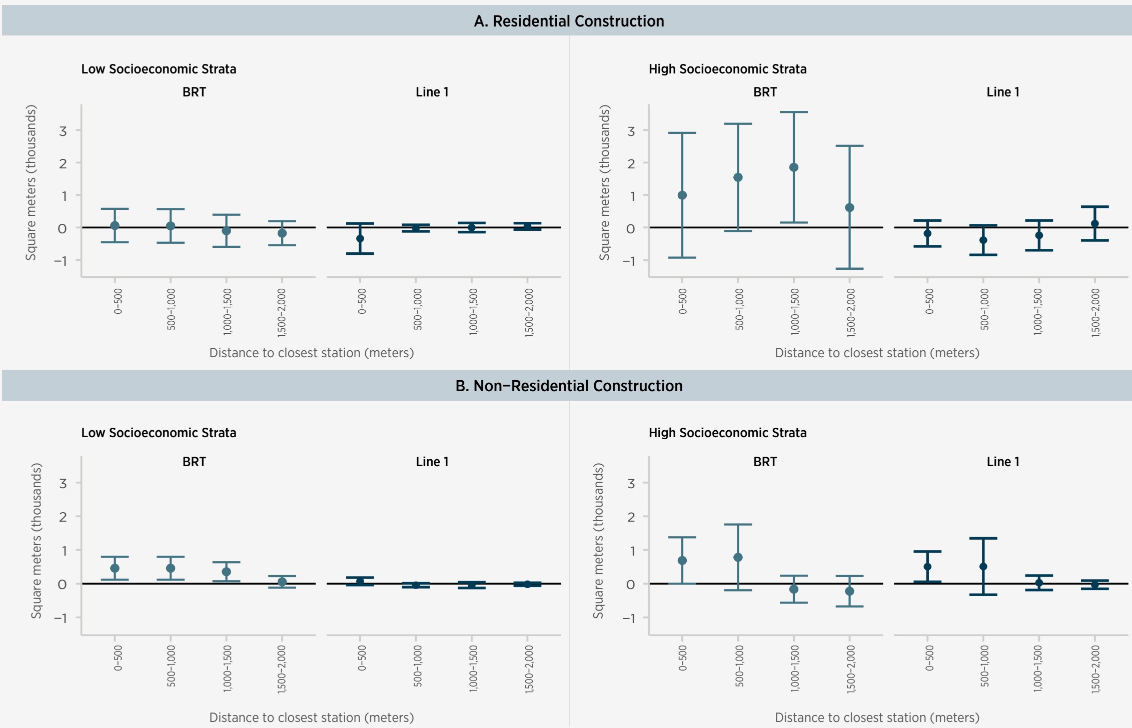


Source: Martinez et al. (2021).

The results of the study indicate that urban transport systems can lead to important land-use changes, particularly in areas that were less developed in the baseline. Moreover, the improved accessibility generated by these systems led to an increase in the construction of non-residential properties, which suggests that additional economic activity is potentially being generated around the stations. However, further research is needed to quantify these impacts using firm-level data.

In terms of the land-use changes registered around lower-SES areas, the results also point towards increases in non-residential construction (Figure 3.2.2), which could suggest a possible displacement of lower-income households. However, it is important to keep in mind that the sample of low-SES areas in the evaluation is small, as it is drawn from areas around the main trunk of these systems, where stations are well defined, and does not include feeder areas where most of the low-SES areas are concentrated. Given the relevance of including social inclusion goals while integrating transport and land-use planning in developing countries, more research is needed to better understand the impacts of these investments on housing affordability and the welfare of lower-income groups.

FIGURE 3.2.2 Impacts by Pre-Treatment Socioeconomic Status

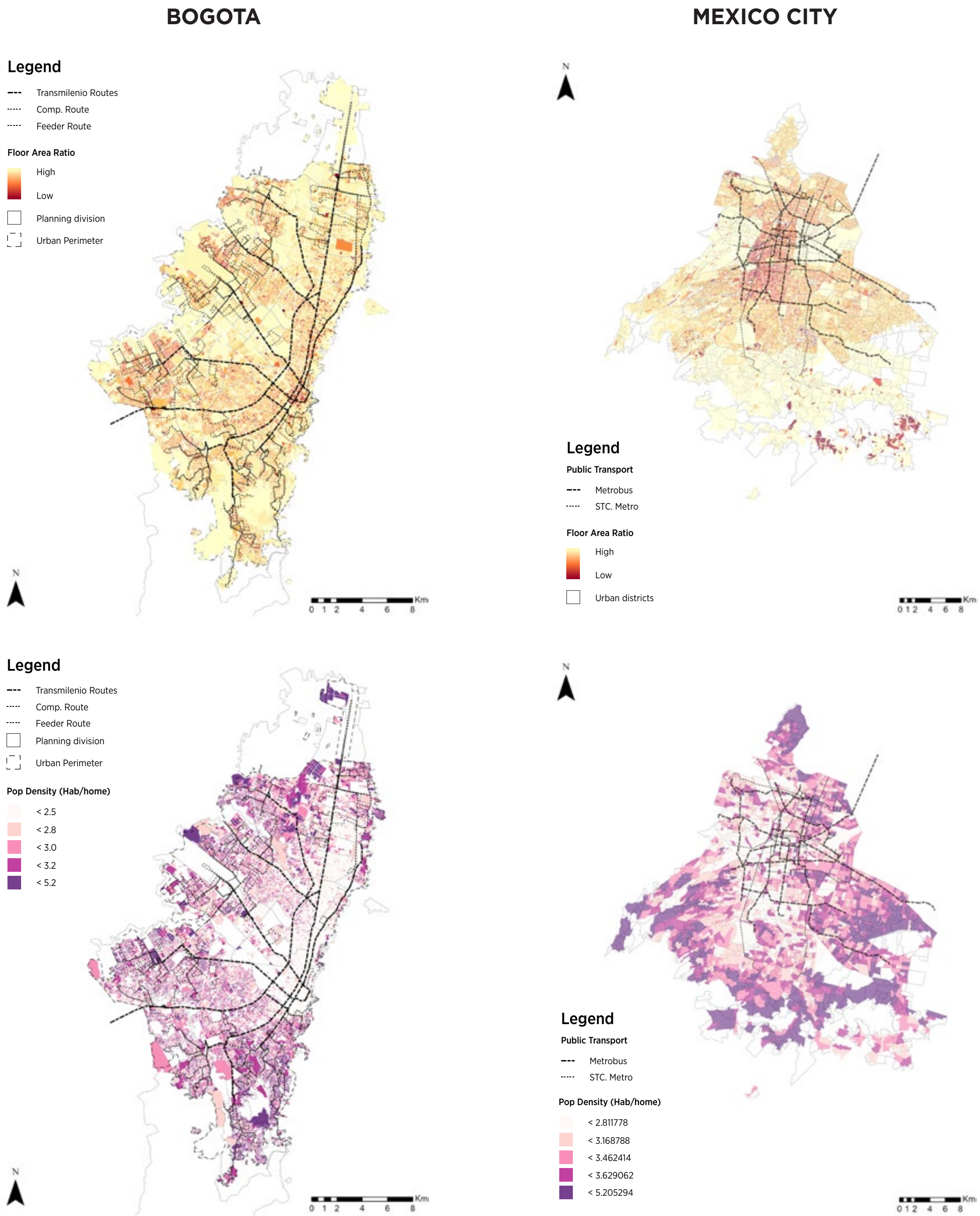


Source: Martinez et al. (2021).

1. This box was prepared by Daniel Martínez, Oscar A. Mitnik, Edgar Salgado, Lynn Scholl, and Patricia Yañez-Pagans.

These changes in land rents and urban form at the level of the city or the mass transit station may reduce accessibility for low-income groups because the consolidation or emergence of activity nodes around stations, in turn increasing land rents, may reduce housing affordability and access to land for low-income groups. Additionally, although transportation planners seek to respond to transportation demand in areas with high population density through mass transit projects and infrastructure improvements, the correlation between mass transit infrastructure, with its frequently higher land values, and the increased density of high-rise developments implies a conundrum involving transportation, land values, and affordable housing. This trade-off between residential location and accessibility is further explored in the next section. Figure 6.7 shows population density in Bogota and Mexico City and the floor area ratio estimation at the parcel level. The maps show an important difference between population density and built-up-area density. Areas with higher population density are located at urban peripheries in Bogota and Mexico City. More built-up areas are the main centers of both cities and there are also higher built-up areas in some activity nodes. Both cities highlight the contrast in Latin American cities between urban peripheries and main activity nodes with higher land rents. Urban peripheries concentrate a higher amount of the population, mostly due to informal urban growth. Main activity nodes where land rents are higher, as explained in the previous section, promote more intense land use where building technologies allow for higher floor area ratios.

FIGURE 3.7 Floor Area Ratio and Population Density



Sources: Government of Mexico City, Datos Abiertos de la CDMX (datos.cdmx.gob.mx), and Infraestructura de Datos para el Distrito Capital (IDECA) (www.ideca.gov.co/).

3.2.2 Experiences and Challenges with the Integration between Transportation and Land Use through Affordable Housing Projects

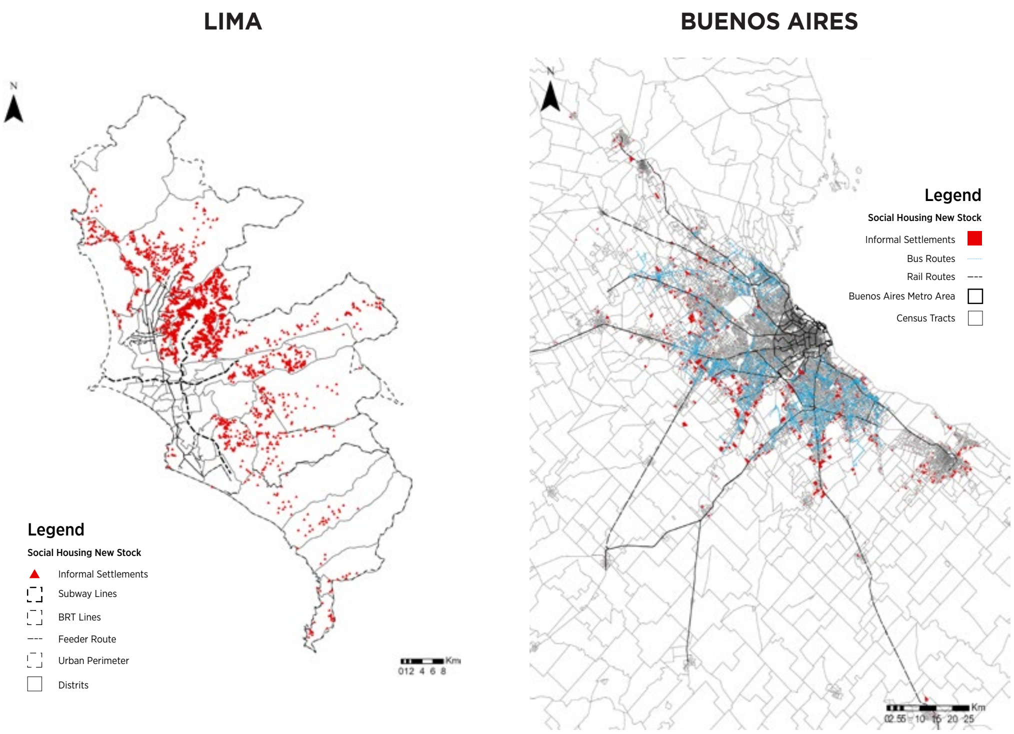
The rapid urban growth experienced in the region has imposed significant challenges on cities in Latin America and the Caribbean in terms of the capacity to respond with policies that meet increasing housing demand by new urban households through planning processes and new investments in infrastructure (i.e., water, sanitation, roads, transit infrastructure) to support new housing construction. All are needed to enable formal housing and other types of buildings to function.

Affodable housing projects developed by public and private institutions in the region's cities have tended to prioritize implementation costs rather than accessibility, sacrificing location to afford more units or better housing quality (Balchin and Steward 2001) . Since the 1970s, several cities have implemented resettlement measures as an initial response to address informal urban growth. After several efforts at resettling their informal residents, cities realized that any additional such measures would be unsuccessful due to the strong links residents have with their place of residence in terms of social cohesion. Resettlements have taken place when residents are settled in high-risk prone areas where upgrading measures are not feasible. Over several decades, there has been a transition from resettlement policies to slum upgrading measures with community participation (UN-Habitat 2003; Vergel Tovar 2010). This policy shift occurs after the city recognizes the cost-effectiveness of slum upgrading versus the high social cost that a resettlement has on households given the disruption to their livelihoods associated with changing the location of their residence. Recently, mixed measures have also been undertaken such as combining slum upgrading with the generation of new affordable housing units within informal settlements.

Since the beginning of the 21st century, policy measures for informal settlements have shifted towards more inclusive and comprehensive approaches. First, housing policies focused on the Millennium Development Goals, specifically developing measures intended to improve the lives of 100 million slum dwellers in line with the United Nations Goal 7. Later, the United Nations promulgated the Sustainable Development Goals (SDGs), which included measures to achieve Goal 11 (Make cities inclusive, safe, resilient, and sustainable), which constituted a more comprehensive approach to urban upgrading measures for informal settlements. Goal 11 mentions not only traditional approaches regarding water and sanitation, security of tenure, and housing improvements, but also includes measures that increase access to key destinations through transit solutions, especially for low-income households and disadvantaged groups (UNDP 2021).

Figure 3.8 shows the location of informal settlements in Lima and Buenos Aires at the metropolitan area scale. In both cases, informal settlements have contributed to the expansion of the city to peripheral areas. Lima is a pioneer in implementing regularization measures for informal settlements based on the idea of providing security of tenure to households as a main priority within the housing policy framework (Fernandes 2011). Most urban upgrading measures promoted in Latin America and the Caribbean have focused on infrastructure provision, but issues regarding comprehensive urban integration together with improvements in accessibility to good and services (especially to activity nodes) are understood to be part of the failures of these interventions (Goytia and Dorna 2019).

FIGURE 3.8 Informal Settlements in Lima and Buenos Aires



Sources: Instituto Catastral de Lima (sit.icl.gob.pe), Goytia /2021), Buenos Aires Data (data.buenosaires.gob.ar), and Infraestructura de Datos Espaciales para el Distrito Capital (IDECA) (www.ideca.gov.co/).

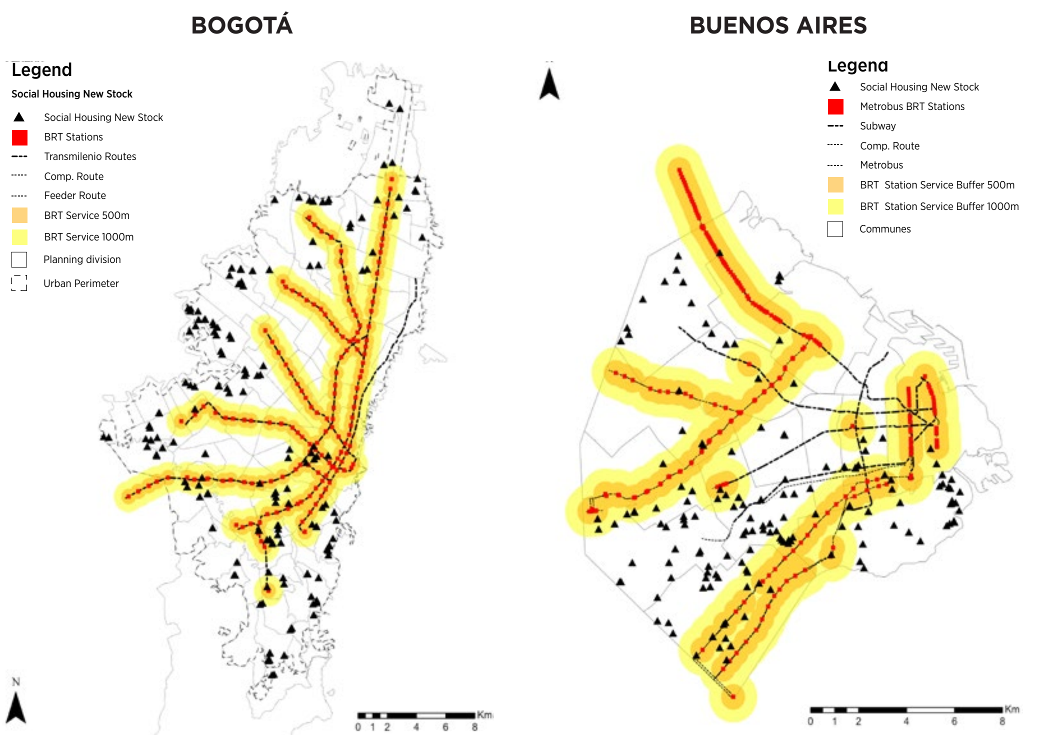
In order to address the housing deficit, governments have focused on estimating the extent of the gap between housing demand and supply in both quantitative and qualitative terms, where *quantitative deficit* refers to the difference between the number of housing units available and the number of households. The *qualitative deficit* refers to overcrowding conditions such as two or more households sharing one housing unit, with difficulties in terms of access to water and sanitation services or deficiencies in housing conditions (bathroom and kitchen) due to the high concentration of users. High levels of overcrowding with three or more occupants in one bedroom also imply a qualitative housing deficit. Policymakers have focused on estimates of the quantitative and qualitative housing deficits in terms of the relationship between the number of households and the number of housing units. These estimates vary widely between countries given a lack of reliable data on each country in the region (UN- Habitat 2011).

In Latin America and the Caribbean, the quantitative housing deficit fell from 8 percent in 1995 to 6 percent in 2009, while the qualitative housing deficit also declined (especially due to greater provision of water and sanitation infrastructure) from 25 percent of households in deficit in 1995 to 16 percent in 2009 (Rojas 2016). The housing sector in the region faces problems related to the lack of infrastructure access, poor building materials in the housing stock, lack of security of tenure, overcrowding conditions, and the housing deficit. These problems are associated with issues such as high housing prices in relation to household income levels, which in turn make it difficult for low-income households to access land and housing. At the same time, households have difficulties accessing mortgage credit, especially low-income households and those in the informal economy. That dynamic, linked to increasing urban land prices, constitutes a barrier to access to land and housing for all households (Bouillon 2012). In this context, affordable housing has been one of the key targets of housing policies in the region. Affordable housing is understood as available housing generated by the public or private sectors to address the quantitative deficits in affordable housing for low-income groups, vulnerable population groups, and households in poverty (UN- Habitat 2003, 2013a).

The generation of large-scale affordable housing projects has been the dominant paradigm of housing policies in the region. This type of housing policy strategy seeks to generate a high volume of housing units to significantly reduce the quantitative housing deficit. Cities implementing such projects have developed this strategy to prevent informal urban growth. This policy response promotes the expansion of cities, suggesting challenges in terms of the balance between expanding cities and the existing urban fabric (Buckley, Kallergis, and Wainer 2016). This scheme is promoted by governments that intend to create new formal neighborhoods where economies of scale allow private developers to obtain returns with higher population density in a clear uniform and homogeneous layout (Libertun de Duren 2018b). Although these schemes are increasing the housing supply for low-income groups, thereby promoting homeownership, the results of such a policy response suggest that households settled in these large developments are socially isolated, have difficulties accessing transit services, and are located far from activity nodes (Barandier, Jr., Bodmer, and Lentino 2017; Libertun de Duren 2018a; Wainer and Vale 2021).

Accessibility benefits generated by mass transit investments have been demonstrated to have effects on the prices of property served by the new infrastructure (Agostini and Palmucci 2008). However, this positive effect of increasing housing values might have unintended consequences such as difficulties in the development of affordable housing. Figure 3.9 shows the results of an analysis of the affordable housing supply within the buffer area of the BRT system in Bogota and the subway system in Buenos Aires. Only 0.12 percent of affordable housing in Bogota falls within the 500 meter buffer area, but 25.1 percent of affordable housing projects fall within a 1 kilometer buffer area. In the City of Buenos Aires, 16.34 percent of affordable housing projects fall within the 500 meter buffer area of the subway system, and this number increases to 30.72 percent within the 1 kilometer buffer area. The overlap between mass transit and affordable housing projects has posed challenges. Cervero (2005) describes how difficult it was for Bogota to match the BRT system and large-scale affordable housing projects promoted by METROVIVIENDA. Although mass transit investments and large-scale affordable housing projects are both promoted by the public sector, it is difficult to match them in space due to land prices, vacant land availability, and issues involving the implementation of planning instruments and tools employed to integrate transport and land use (Rodriguez et al. 2020).

FIGURE 3.9 Spatial distribution of affordable housing projects, mass transit corridors and stations



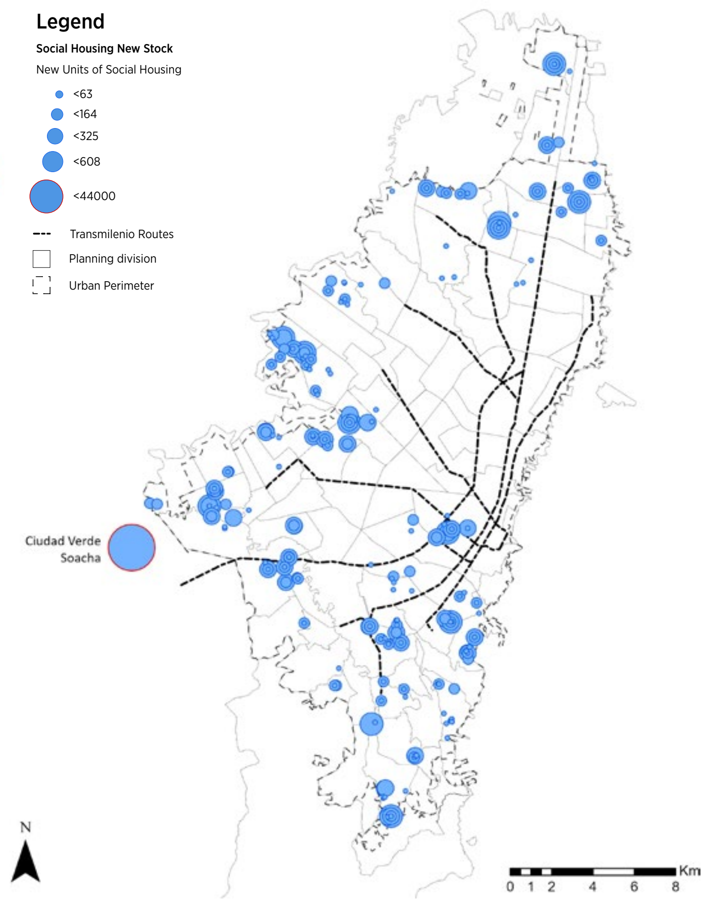
Sources: Transmilenio SA (2021), Goytia and Negri (2021), Negri (2016), SDHT (2021), and Buenos Aires Data (data.buenosaires.gob.ar).
Note: BRT: Bus Rapid Transit.

From a public policy perspective, there is a trade-off between transport and housing costs when deciding between large-scale affordable housing projects at the urban periphery versus small-scale affordable housing projects located closer to main activity nodes. Figure 3.10 shows the differences between location and scale of affordable housing projects in Bogota. Large-scale social housing projects developed at urban peripheries, such as the Ciudad Verde in the Soacha Municipality (next to Bogota), not only promote planned urban growth but also generate more than 40,000 housing units that clearly reduce the quantitative housing deficit. The total housing deficit in the urban agglomeration of Bogota and its surrounding municipalities was estimated in 2017 to be 140,626 households (quantitative deficit of 66,520 households and qualitative deficit of 74,107 households) (DANE 2017). In contrast, small-scale affordable housing projects located closer to main activity nodes, such as the Plaza de la Hoja in Bogota, may provide fewer housing units (about 500), thereby reducing the quantitative housing deficit less, but offer the advantage of not suffering urban peripheral issues such as low accessibility, long travel times to primary destinations, or the discouragement of travel by households. As described in Box 3.3, there are two issues. The first is the economies of scale approach implemented by developers at urban peripheries where there is vacant land for large-scale affordable housing projects, which has the disadvantages of lower accessibility to main activity nodes and services and higher commuting and transportation costs. The second issue is that better location of affordable housing projects requires planning instruments and urban management tools that facilitate the generation of more dense affordable housing projects that are better integrated with the context and the urban transportation network.

The two policy responses clearly highlight a trade-off for households. Those living in a large-scale affordable housing project such as Ciudad Verde have longer commute and travel times (about 80 minutes to main activity nodes, with at least one transfer), but they have access to larger public spaces and green areas. Households living in the Plaza de la Hoja project are close to downtown Bogota and next to a BRT corridor (in 30 minutes they can reach main activity nodes without transfers) but with few areas for public use or recreational activities. Residents in Ciudad Verde who work in Bogota need to take at least two transfers on transit services to reach the northern part of Bogota, but residents in Plaza de la Hoja have BRT services just one block away. The city promoted inclusionary housing regulations with the requirement of the provision of 25 percent, especially in Partial Plans. However, the implementation of this policy has opened the window to fulfill this requirements with new developments at projects located far from activity nodes in response to proposals from the private sector and developers on this regard.

FIGURE 3.10 Affordable Housing Projects in Bogota

A) Affordable Housing in Bogota – Number of Housing Units



B) Affordable Housing Projects

Plaza de la Hoja Project, Downtown Bogota

Photo: Erik Vergel-Tovar.

Ciudad Verde Macroproject Soacha Municipality

Photo: Ciudad Verde.

Sources: SDHT (2021) and Infraestructura de Datos Espaciales para el Distrito Capital (IDECA) (www.ideca.gov.co/).

BOX 3.3

Large-scale Affordable Housing Projects in Latin America and the Caribbean

Large-scale affordable housing projects developed in urban expansion areas have constituted a key strategy in the portfolio of housing policies in Latin America and the Caribbean for the past two decades (Buckley et al. 2016). Mexico, Brazil, and Colombia have implemented housing policies promoting the development of large-scale affordable housing projects in planned urban expansion areas in large and intermediate cities. The outcomes of this type of housing development are mixed. Households that access affordable housing through this type of development assume additional burdens such as difficulty visiting relatives due to long travel distances, the lack in some housing units of high-quality standards, and difficulties in accessing goods and services (Libertun de Duren 2018a).

From the developer's perspective, an analysis of factors explaining affordable housing project locations at urban peripheries through the use of expansion measures suggests that economies of scale play a key role in the promotion of such projects. Economies of scale associated with large parcels allow developers to generate between 400 and 500 (or even more) affordable housing units per hectare due to a significant reduction in construction costs. In cities like Puebla, Mexico, the profit margin differs by 10 percent between peripheral versus central locations (Libertun de Duren 2018b).

However, while large-scale affordable housing projects certainly may reduce the quantitative housing deficit, the outcomes of these projects suggest that the household beneficiaries in these projects face issues such as lack of transit supply and low mixture of land use, which in turn imply less access to opportunities, long travel distances, and housing units with low quality standards (Beuf and García 2016). Thus, although beneficiaries become homeowners, this improvement in terms of wealth does not necessarily ameliorate the decline in their quality of life (Wainer and Vale 2021).

Promoting large-scale housing developments without planning to expand existing transportation systems to guarantee adequate access can be attributed to a lack of coordination between the transport and housing sectors. As mentioned in the cases below, the lack of transit services makes these large-scale affordable developments undesirable, resulting in increases in abandonment dynamics. By disconnecting households from job opportunities, main activity nodes, urban services, and relatives settled in centrally located areas, this also erodes social cohesion with the communities that live in these developments.

Mexico; Housing Programs through the Instituto del Fondo Nacional de la Vivienda para los Trabajadores (INFONAVIT) and the Comisión Nacional de Vivienda (CONAVI)

Through INFONAVIT and CONAVI, Mexico has promoted the development of large-scale affordable housing developments, given that vacant land for the scale of such projects is available only in peripheral areas of cities. However, this has had the adverse effect of increasing the level of sprawl in some cities (Herbert, Belsky, and DuBroff 2012).

Abandonment issues such as the increment of empty housing units, the high commuting times for those who still stay, the lack of access to transit services, and the disconnection from urban core areas emerged due to the location of some housing developments far from job centers and the lack of an adequate transit supply (Maycotte Pansza and Sánchez Flores 2010). The picture on the right shows a large scale affordable housing development in Ecatepec (Mexico State) with abandonment issues.

Brazil – My House My Life

Brazil started the "My House My Life" (Minha Casa Minha Vida - MCMV) housing program in 2009 with the goal of generating 1 million housing units. The country increased this goal to 3 million units in 2011. The program's outcomes suggest that new developments are isolated from the urban fabric and suffer from accessibility issues, i.e., being located far from job centers (Nadal and Linka 2018). Although the program is not associated with urban sprawl, cities implementing it have increased their urban footprint. For instance, cities were promoting more infill developments before the start of the housing program (Biderman, Hiromoto, and Ramos 2018). An accessibility analysis of housing developments in Rio de Janeiro highlights difficulties for residents in accessing job opportunities and services (Barandier Jr et al. 2017). The picture on the left shows a large-scale housing development in São Luis (ArchDaily 2019).

Colombia: Macroproyectos and Free Housing Programs

Colombia implemented two key programs to promote large-scale affordable housing projects in the past two decades. The first was the Macroproyectos program that supported the generation of serviced land in partnership with local governments and the private sector. The most emblematic project in this program is Ciudad Verde in the municipality of Soacha, with more than 40,000 housing units (picture on the right). Critics of this program argued that these large-scale projects were implemented in urban peripheries far from job opportunities that lacked access to services and were focused on low-income groups with few restrictions, rather than on the most vulnerable segments of the population (Escallón G, 2011). The second program involved the provision 100,000 free housing units during the last decade. Households face challenges in maintaining the new homes, as living in a formal housing solution requires paying unfamiliar new expenses such as property taxes and public services (Gilbert, 2014). This issue implies concerns regarding the sustainability of the program in the long term.

Housing Projects and Social Cohesion

Based on household surveys of beneficiaries of large-scale affordable housing projects in Puebla (Mexico), Goiania (Brazil), and Barranquilla (Colombia), an analysis of location, scale, and accessibility issues provides insights regarding social cohesion for new residents in these developments (Libertun de Duren 2018a). The study compares beneficiaries of these projects with households residing in affordable housing projects that are closer to activity nodes within each city. Residents of large-scale projects at urban peripheries estimated that the housing prices of their properties are 40 percent lower than the housing prices of centrally located projects. In terms of transportation costs, residents in projects at urban peripheries reported that travel times are twice as long, or even three times longer, than travel times of residents in affordable housing projects located closer to activity nodes. Regarding social cohesion, the researchers found that three-quarters of residents in projects closer to activity nodes visit their relatives more often (one or more times per month), while only one-third of residents at urban peripheries have this level of interaction.

Affordable housing in areas that are part of urban renewal measures constitutes a paradigm that is still a key focus of public policy discussions. In cities across the globe, there are three types of policy measures associated with the provision of affordable housing in urban renewal projects. The first is policies that define a minimum number of affordable housing units required in urban renewal projects; the second is those that incentivize infill development projects at opportunity areas with the potential of generating new affordable housing units; and the third is value-capture mechanisms in which land value increments associated with the new development provide revenue for local governments to fund affordable housing projects, or cross-housing subsidies where increments in land values provide funding for affordable housing (Calavita and Grimes 1998; Thaden and Wang 2017). Inclusionary housing is a regulatory tool intended to promote the generation of affordable housing based on three scenarios: (1) incorporating social housing within a land development project by mixing different housing typologies; (2) building a required percentage of affordable housing in other areas of the city; and (3) contributing (via required payment or in-kind contributions such as land) towards a public finance fund for affordable housing (Calavita and Mallach 2010).

The experience in Latin America and the Caribbean with inclusionary housing measures focuses on policies implemented in Brazil and Colombia, two pioneer cities adopting this strategy. The results of the implementation of these measures are mixed. The experience in both countries is remarkable given that inclusionary housing is intended to promote land development with a mixture of types of land use at well-located opportunity areas. However, the results suggest that the projects generate too few housing units to address the increasing quantitative housing deficit. Another challenge is that well-located parcel sizes of vacant land are usually small in already consolidated urban areas, so it is difficult to generate large-scale housing projects (Santoro 2019). An innovative approach implemented within the policy framework of the City Statute of Brazil is the promotion of new affordable housing units within informal settlements that are beneficiaries of slum upgrading measures. This policy tool is called Social Interest Special Zones, which allow the local government to implement land management measures to accommodate the provision of new affordable housing units (Rolnik and Santoro 2014). This innovation was also implemented in Medellin, Colombia within the framework of the Integral Urban Projects, where in situ resettlement measures allowed the local government to generate new affordable housing multifamily developments within informal settlements, including the provision of transport services with the implementation of a Cable Car (Torres Arzayús and García Botero 2010).

3.2.3 Mass Transit, Land Value Increase, and Value Capture

Investments in transportation infrastructure can generate significant land value gains through their effects on connectivity and accessibility. By improving connectivity and accessibility, a subway or BRT line can generate increments in land value, which, if efficiently captured by the party responsible for these improvements, has the potential to generate resources useful for re-investing in improvements to public transportation (Cervero and Murakami 2009). The degree of land value increases is affected by urban development regulations. The extent to which land value increases in response to transit investments depends on the development zoning rules and regulations. For example, the implementation of supporting regulations and incentives for higher population density, increments in floor area ratio, better quality of public spaces, and mixed uses can amplify the potential for associated land value increases. In Brazil, the situation of Curitiba situation is notable for its coordination between transport and land use, whereby the city has promoted high-rise developments along mass transit corridors, increasing the floor area ratio via density bonuses, thus facilitating the financing of infrastructure and the generation of funding for affordable housing (Cervero 1998; Rodríguez 2013). Curitiba has enjoyed an advantage of guiding its urban growth along its mass transit infrastructure. However, cities in Latin America and the Caribbean implementing mass transit projects face a challenge in expanding their transit systems in already consolidated areas. Different studies of developed cities have shown positive impacts on land value following the construction of new mass transit rail lines, especially for land holdings close to the stations. Similar findings have been identified for BRT systems. Studies of Bogota find increases of 6.8 to 9.3 percent in real estate prices due to proximity to BRT stations, as well as increases between 13 and 15 percent in the sale and rental prices of real estate located in areas served by the BRT system (Rodriguez and Mojica 2009; Rodriguez and Targa 2004).

TABLE 3.2 Description of Magnitude and Changes in Prices by Mass Transit System, Selected Studies

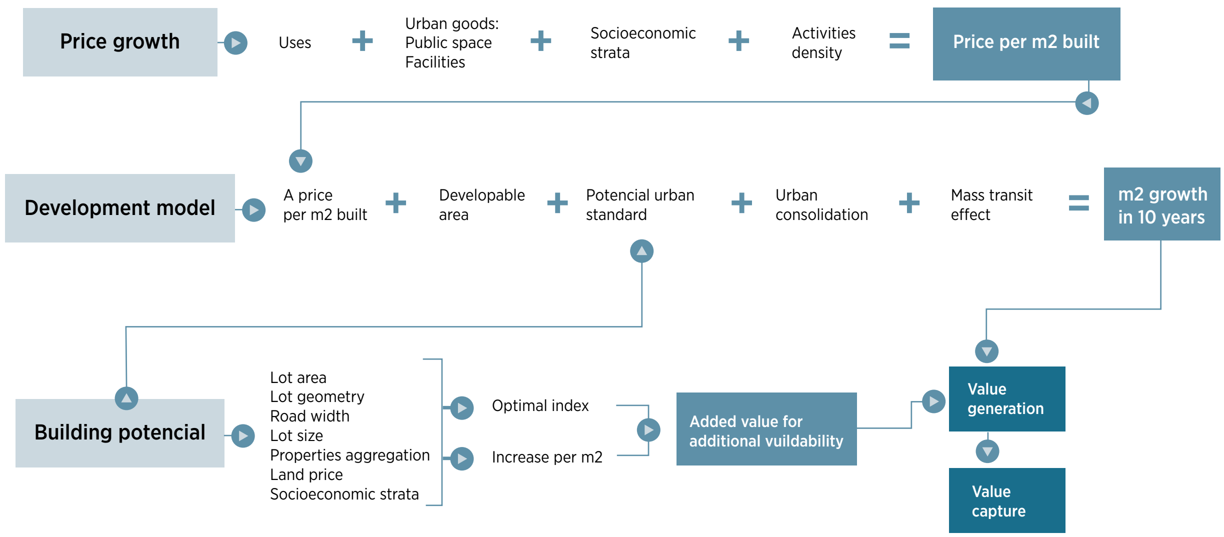
Mass Transit System	City	Findings
Subway and suburban trains	Washington, DC	The announcement of the project was positively associated with a 2.5 percent increase in rent per housing unit (Benjamin and Stacy Sirmans 1996).
	California	The real estate market analysis determined that BART increased prices by US$2.39 per meter closer to the BART system (Landis et al. 1995).
	Chicago	Increases of 17 percent in residential real estate and price increases of 1.9 percent with each mile closer to the central business districts (McDonald and Osuji 1995).
	New York City	Reduction of real estate prices by US$75 for each meter further away from the system's stations (Lewis-Workman and Brod 1997).
	Santiago de Chile	After the announcement of the new subway line, increases of 4.2 to 7.9 percent were observed in the average prices of apartments near related infrastructure. After the announcement of the final location of the stations, increases of 3.1 to 5.5 percent were observed depending on the distance to the stations (Agostini and Palmucci 2008).
	Buenos Aires	Non-linear effects on housing prices due to the subway, with increases of 3.6 percent between 200 and 600 meters away from the stations (Rosanovich and Di Giovambattista 2019).
	São Paulo	The generation of real estate projects and employment density was positively associated with investments in mass transit. Leverage of buildability through density bonuses (payments for higher buildability) in areas near Butantã subway stations (Sandroni 2021).
Light Rail Transit (LRT)	Portland	Average home values between 1980 and 1990 increased by US$2,300 for properties located within 0.06 of a kilometer of a MAX station. Single-family home sales increased in price by US$663 for every 0.03 of a kilometer of proximity to a MAX station (Dueker and Bianco 1999).
	Cuenca	Housing asking prices increased by 0.29 percent for each 1 percent of distance away from the LRT corridor. Commercial asking prices decreased by 0.20 percent for each 1 percent of distance away from the LRT corridor (Hermida et al. 2018).
	Medellín	Cadastral value premiums between 3 and 4 percent after the Tranvía de Ayacucho system began commercial operations in 2016 (Vergel Tovar, Suzuki, and Martinez 2022)

Mass Transit System	City	Findings
Bus Rapid Transit	Bogota	Increases in real estate prices between 6.8 and 9.3 percent for every 5 minutes closer to a station. (Targa, Rodriguez, 2004) Increases of 22 percent in prices of properties with access to the system. (Perdomo et al. 2007) Sales prices and rents higher by 13 and 15 percent, respectively, in areas with access to the system compared to control areas. (Rodriguez and Mojica 2009) Increases of 8.7 percent in the prices of new properties compared to those located farther away from the system. (Perdomo, Mendieta, and Baquero 2007). Higher concentration of land development in areas served by system stations (larger number of square meters and more construction licenses) (Rodriguez, Vergel-Tovar, and Camargo 2016) (Perdomo et al. 2007; Rodriguez and Mojica 2009; Rodriguez and Targa 2004; Rodriguez, Vergel-Tovar, and Camargo 2016).
	Seoul	Increases in land prices of 10 percent for residential uses within 300 meters of the stations and increases of 25 percent for commercial and other non-residential uses within 150 meters (Cervero and Kang 2011).
	Beijing	Residential real estate sales and rental prices increased from 1.31 to 1.39 percent (Deng, Ma, and Nelson 2016).
	Los Angeles	Residential properties sold for lower prices near the stations, while commercial properties sold for higher prices near the stations (Cervero and Duncan 2002).

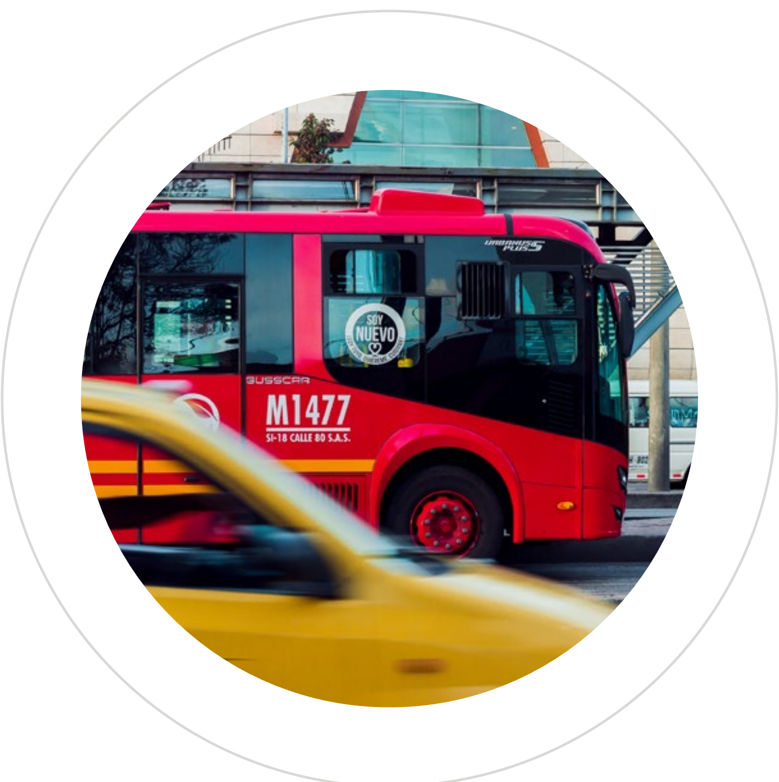
A 2015 study by the Universidad de Los Andes calculated the potential for the generation of capital gains by the first subway line in Bogota, establishing a model that is summarized in Figure 3.11 (Uniandes 2015). The figure shows how the mass transit project influences both price and the amount of buildable area. First, the model was used to estimate the potential gains in land value generated by better accessibility for the property due to the metro project. Second, it showed an increase in built area due to a change in regulations allowing greater population densities. Third, it reported possible increases due to changes in land use or socioeconomic strata.[3]

3. The Colombian government classifies households into six socioeconomic strata using a composite of factors related to household and environmental characteristics as a proxy for the ability to pay, and to establish cross-class subsidies of public utilities services. The classification has been widely used as a proxy for socioeconomic strata, where people living in stratum 1 represent the lowest-income household, and those in stratum 6 correspond to the wealthiest households.

FIGURE 3.11 Value-added Generation and Value Capture for the Bogota Subway Line



Source: Uniandes (2015).



3.2.4 Transit-oriented Development and Social Inequality

Transit-oriented development TOD is a concept that describes the coordination of land use with public transit investments (Rodriguez 2021). Specifically, it promotes the use of compact urban form, land-use mixtures, high-quality pedestrian environments, concentration of transportation demand, and local economic development initiatives to improve accessibility and the quality of life, increase transit ridership, and support active modes of transportation such as walking and cycling. This section looks at TOD in terms of density, diversity, and design. The concentration of the transportation demand with higher population densities along mass transit corridors can contribute to the sustainability of the mass transit systems in terms of higher ridership levels. A higher diversity around mass transit stations in terms of the mixture of land uses can contribute to the reduction of travel distances for local residents. Social inequality in TOD areas is related to the level of diversity of socioeconomic groups living in areas well served by transit. Although there is currently no evidence regarding gentrification dynamics due to the accessibility benefits of mass transit systems in the urban spatial structure, it is important to describe the diversity of the areas served by mass transit stations in some cities in Latin America and the Caribbean.

TOD can be understood from a planning perspective as well as from a performance perspective. The planning perspective defines transit-oriented development as development that is compact and offers a high-quality pedestrian environment and a mixture of land uses, including different densities in close distance to a transit station or mass transit corridors. It also promotes land development with more intense land use, including multiple housing typologies (Calthorpe 1993; Dittmar and Poticha 2004). The performance perspective uses indicators as well as measurements that promote understanding of the built environment and sustainable mobility, and that facilitate the comparison of transit-oriented development areas in terms of their performance according to those indicators. For example, the performance approach to transit-oriented development can be understood in terms of indicators associated with what are called the "D" categories: density, design and diversity, distance to transit, and destination (Cervero and Kockelman 1997; Cervero et al. 2004).

As a transit-oriented development performance indicator, density is a key predictor of mass transit ridership levels. The analysis of associations between population density and BRT ridership in Curitiba and Bogota find estimated elasticities of 0.26 and 0.25, respectively (Vergel Tovar 2021). Testing associations between ridership levels and population density in a log-log regression model yields an elasticity of 0.51 between mass transit ridership levels and population density, after controlling for the type of mass transit system in a sample of 87 cities in Latin America and the Caribbean (Table 3.3). The results suggest that if population density increases twice over, cities can expect an increase of 51 percent in transit ridership. However, it is important to be cautious when interpreting these results. Increments in population density would be more appropriate along mass transit corridors, but the local context and urban density suitable for the current capacity of each city must be taken into account. This finding suggests that population density at the city level plays an important role in the sustainability of mass transit systems and thus constitutes a key argument for promoting transit-oriented development in the region.

TABLE 3.3 Population density at the city level plays an important role in the sustainability of mass transit systems

Log-log Regression Results for Mass Transit Ridership and Population Density in Latin America and the Caribbean

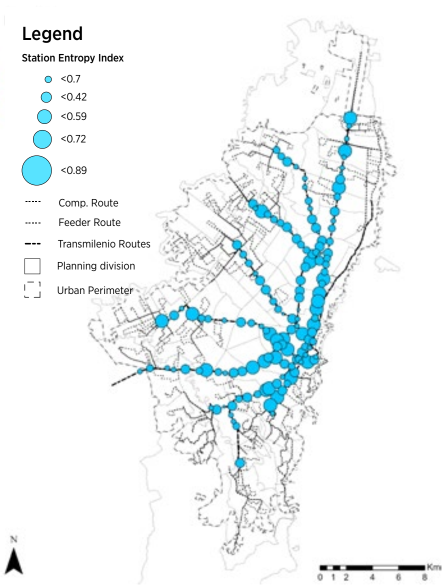
Dependent Variable: Log Ridership	Coefficient
Log population density	0.5174 *** (0.1044)
Light rail transit LRT	(reference)
Metro	2.6602 *** (0.4408)
Bus Rapid Transit BRT	2.0758 *** (0.4051)
Cable Cars	0.0288 (0.5901)
R2	0.4086

Sources: Global BRT data; Metrobits; Urban Rail; and United Nations.
Note: The model is testing the association between population density and mass transit ridership. Although the exercise has some limitations, given that ridership levels depend on multiple factors, it follows the estimation of elasticities using the procedure of Cervero and Dai (2014) for preliminary estimations purposes. BRT: Bus Rapid Transit; LRT: Light Rapid Transit.

Diversity is another transit-oriented development TOD performance indicator. The TOD literature includes the diversity domain to understand the built environment attributes by looking at variables such as the level of variation of land uses, the mixture of land uses and thus the availability of multiple options of activities given this mix of uses in the urban fabric (Cervero an Kockelman 1997). To measure the diversity of land use, the analysis conducted in this section uses the entropy measure. The estimation of the entropy level measures evenness in the distribution of commercial, industrial, institutional, residential, and other land uses (Cervero and Kockelman 1997). The estimation of the entropy indicator, usually measured between 0 and 1, suggest that when the level is closer to 1 there is more of a mixture of land uses. The exercise included the estimation of this indicator at the mass transit station level for Bogota, Quito, Mexico City, and Buenos Aires, as shown in Figure 3.12. The results suggest that the average entropy level in Bogota is 0.55, in Buenos Aires 0.62, in Quito 0.39, and in Mexico City 0.41, demonstrating higher diversity in the urban environments around mass transit stations. The mixture of land uses around these stations is not homogeneous across the urban fabric. The higher entropy levels around the stations of Bogota correspond to areas that are traditionally primary destinations. Quito, on the other hand, shows greater diversity of land use around BRT stations at the south and along the Ecovia corridor, which highlights the strong division between north and south in that city. Mexico City shows greater land-use diversity around main transfer nodes and in areas close to the historic center and main arterial roads. Buenos Aires shows a correlation between the urban spatial structure and the level of mixture of land use which in turn suggests a match between the diversity of land use with main activity nodes. An urban environment with a higher diversity of land uses provides the opportunity to reduce travel needs for local residents and generates multiple choices for areas well served by transit systems. With an urban environment that has a higher orientation towards sustainable mobility, such as TOD areas, residents have better local accessibility and thus less need for travel to further-away areas given that several local destinations are in close proximity within their residential areas.

FIGURE 3.12 Entropy Indicator at the Station Level

BOGOTA



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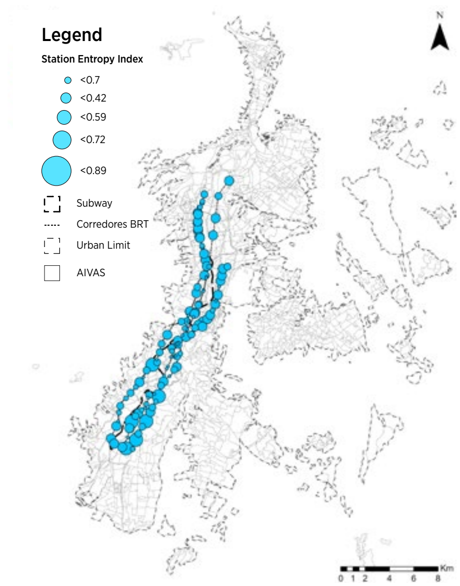
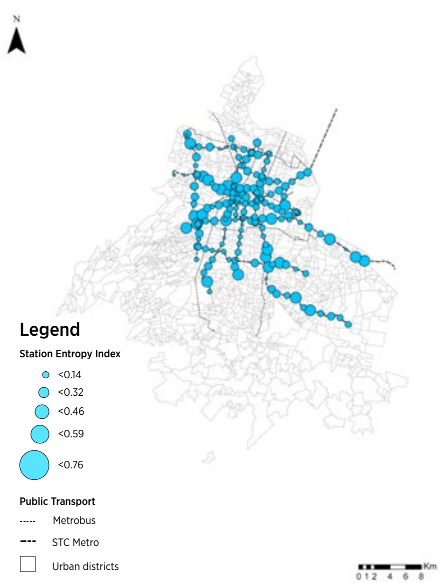
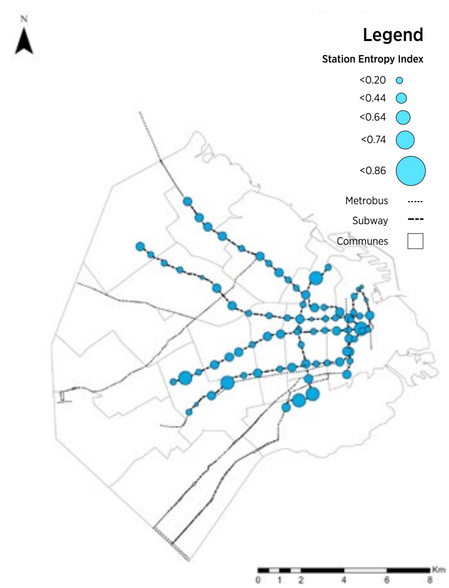


MEXICO CITY



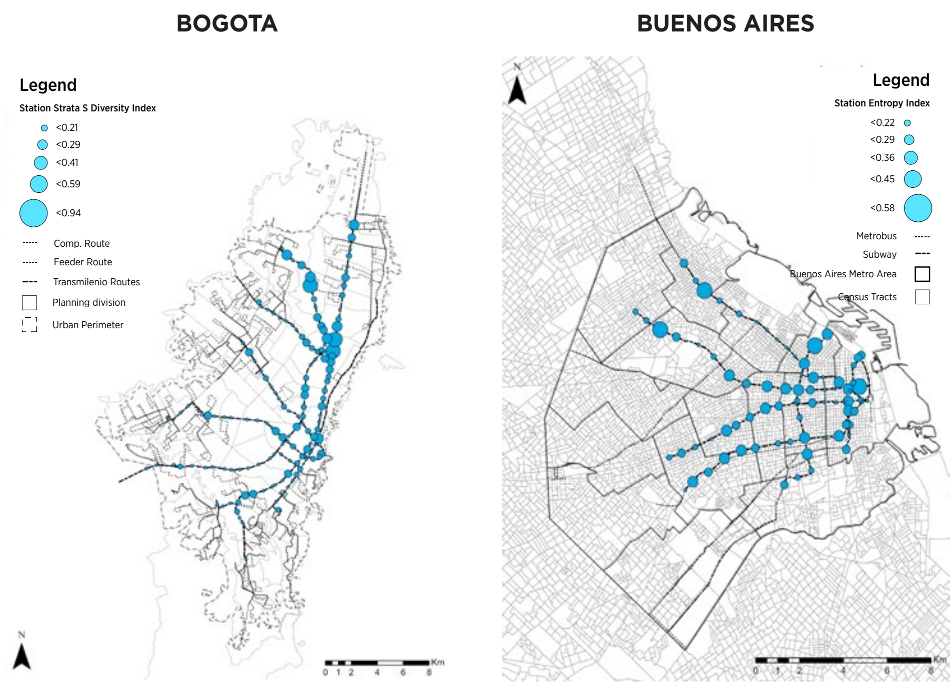
BUENOS AIRES



Sources: Datos Abiertos de la CDMX (datos.cdmx.gob.mx), IDECA (www.ideca.gov.co/), Geoportal Quito (http://geoportal.quito.gob.ec), and Buenos Aires Data (data.buenosaires.gob.ar).
Note: The entropy indicator is measured between 0 and 1, with a greater mixture of land use within the mass transit station buffer area when the level is closer to 1.

The following analysis uses the socioeconomic diversity index (Simpson, 1949) that measures the diversity in a defined area. The method measures the evenness of areas with different socioeconomic levels within each buffer. The index ranges from zero to one. The socioeconomic diversity index constitutes a useful approach to understanding the degree of mixture of different income groups within the mass transit station buffer area. Although this measurement provides a cross-sectional description, it is useful to understand the socio-spatial distribution of the population within the serviced area of mass transit stations. Figure 3.13 shows the estimates of the socioeconomic diversity index at the station level in Bogota and Buenos Aires (the analysis includes data at one point in time, which provides an understanding of the socioeconomic spatial distribution of the population around transit stations). Results indicate that in Bogota the social diversity index score averages 0.25, while in Buenos Aires it averages 0.31. In both cities, the diversity index is higher for stations located closer to main activity nodes. The level of mixture of socioeconomic levels around mass transit systems provides the base line of future studies looking at the potential risk for equity outcomes in the LAC region when implementing mass transit projects such as unintended consequences through gentrification dynamics already observed in North America (Baker and Lee 2019; Rayle 2015).

FIGURE 3.13 Social diversity indicator at the station level



Sources: Prepared by the authors based on data from Infraestructura de Datos Espaciales para el Distrito Capital (IDECA) (https://www.ideca.gov.co/); and IGN (2010) and Buenos Aires Data (data.buenosaires.gob.ar).
Note: The social diversity index is measured between 0 and 1, with a greater mixture of socioeconomic levels within the mass transit station buffer area when the level is closer to 1.

There is an emerging interest in TOD in Latin America given the rapid growth of mass transit systems in the region. Given that the region is a pioneer in the design and development of BRT systems, the interest emerged in relation to the capacity of this type of mass transit system to generate TOD. The literature suggests that rail-based systems have the capacity to generate TOD given that they are perceived as long-term investments, while recent literature is suggesting that BRT systems also have the capacity to generate TOD, especially when BRT systems are designed and implemented as long-term investments with heavy infrastructure. Moreover, the literature suggests that BRT systems with supportive land-use planning measures aiming for TOD outcomes, such as the case of Curitiba clearly show that even though BRT may be seen as a temporary investment, in the long term the consolidation of the coordination between this transportation investment and planning policies can certainly achieve TOD environments (Rodriguez 2021). At the same time, the recent development of metro systems, after several decades of having only few systems in Mexico, Brazil, Argentina, Venezuela and Chile, also generated a strong interest in the potential to promote TOD around new metro stations. Box 3.4 provides an overview of the current discussion regarding TOD in Latin America and the Caribbean.

BOX 3.4

Transit-oriented Development in Latin America and the Caribbean

Given the increase in mass transit investments in the region, including the expansion and consolidation of Bus Rapid Transit (BRT) networks, the developments of metro systems and Light Rail Transit (LRT) projects, and the rapid growth of cable cars, there is growing interest in promoting transit-oriented development pilot projects in the region. The Inter-American Development Bank (IDB) is supporting the development of studies to assess the feasibility of transit-oriented development pilot projects in different countries in the region. Recent studies in Brazil supporting the development of such pilots in Teresina, Rio de Janeiro, Brasilia, and Belo Horizonte aim to understand governance and regulatory framework issues as well as the feasibility of applying planning and management instruments, and to explore the scope and suitability of the value-capture mechanism, all of which is associated with sustainable transit projects (Hobbs et al. 2021). In Bogota, the Metro Project Agency is designing a transit-oriented development strategy to promote joint developments around some stations and define a regulatory framework that includes incentives for landowners and private developers in order to encourage more compact urban forms with higher population density around the stations (Metro, 2021). In Lima, the implementation of the Metro system and the construction of two lines is providing opportunities to promote transit-oriented development pilot projects, which are currently under study (WWF, 2021). In Panama, Ecuador, Brazil and Colombia, there is also strong public sector interest in identifying and promoting transit-oriented development pilot projects around Metro and subway system stations. The studies developed for transit-oriented development strategies in these cities are seeking out opportunities to promote inclusionary housing measures to improve social equality by addressing the difficulties faced by low-income groups in accessing land and housing in transit-oriented development areas.

The evidence suggests that BRT systems affect property values and real estate dynamics (Vergel Tovar, 2021), and there is also emerging evidence on the impact of BRT systems on changes in the urban form and land use. However, the evidence of the impact of rail systems on urban development and their capacity to promote transit-oriented development in Latin America and the Caribbean is scarce. Studies focused on the impact of metro and LRT systems in the region have primarily assessed the impact on property values and urban form (Vergel Tovar, 2021). The evidence regarding the impact of cable cars has been focused mostly on travel patterns, public health, social cohesion, and crime (Sarmiento et al., 2020). There is a need for more research examining the impact of transit-oriented development associated with metro systems, LRT, BRT, and cable cars on affordability, mobility, and accessibility for the poor in the region.

Metro: Bogota

Source: Metro de Bogota.

Light Rail Transit: Medellin

Source: Erik Vergel-Tovar.

Bus Rapid Transit: Medellin

Source: Erik Vergel-Tovar.

Cable Car: Bogota

Source: Erik Vergel-Tovar.

In summary, transit-oriented development investments have the potential to address social inequality by improving access to job opportunities for low-income groups. However, complementary policies are needed to prevent unintended consequences such as the potential displacement of lower-income populations through gentrification processes. The implementation of land-value-capture mechanisms by governments that generate revenue for local governments is one measure that could be implemented to promote the sustainability of mass transit systems and affordable housing. Therefore, promoting transit-oriented development that is inclusive entails avoiding the potential displacement of local residents, supporting active transportation, adapting and improving urban land planning tools to manage the costs associated with transit-oriented development, developing strategies that include citizen participation, and involving the private sector (Rodriguez, 2021).

3.3 Policy Actions for More Equitable and Inclusive Land Use and Transportation Integration

Transportation investments and real estate market dynamics, as well as urban and land-use regulations, largely define the way in which a city develops in terms of its opportunities, strengths, and sources of inequality. Both the private sector and the planning and regulatory authorities include transport supply in their decisions. In turn, transportation infrastructure plans are created, and legal as well as illegal transport operators respond to the travel demand generated by the location of activities.

The evidence of the strong interrelationship between land use and transportation, along with the successful results of experiments that have achieved effective and integrated planning, have generated a “best practices” approach that is gaining attention in several Latin American cities – a concept known as transit-oriented development. However, addressing inequality is not currently a priority in urban planning, transportation planning, or even transit-oriented development, so in many cases transportation for low-income populations, in particular, is not adequately developed.

First, land use and transport plans do not usually consider indicators to assess changes in the different dimensions of inequality. Even multilateral entities that use environmental impact indicators for all their projects have not yet included indicators for social equality in either the preparation or feasibility assessments of their transportation projects. In this regard, an analysis of social inequalities should be required, and indicators should be included during the planning stages of projects and investments. This chapter has examined several indicators for urban spatial structure, location and travel, affordable housing, informal settlements, and transit-oriented development features in order to illustrate social equality issues. The inclusion of robust and meaningful social equality indicators in the design and implementation of transportation projects is a critical step toward defining a more comprehensive and effective approach to promoting social inclusion.

Second, many transport projects in Latin American cities have prioritized the development of mass transit corridors, which indeed improve access conditions for hundreds of thousands of low-income citizens. However, in some cases these projects can have the unintended impact of decreased affordability of housing options located near the new system, making access to opportunities more difficult for the city’s poorest residents. The degree of displacement or gentrification associated with the introduction of mass transit corridors is unknown, given the lack of research on this topic. Studies are urgently needed on the socioeconomic and socio-spatial distribution changes that occur due to the implementation of mass transit projects.

Additionally, the public sector often does not capture the increase in property values that could help leverage the financing of mass transit projects or their expansion. The experience in the region suggests that coordination between transport and land-use planning is difficult due to a mismatch and variation in their respective implementation and development timelines, low technical capacity, and a lack of funding for transit-oriented development projects. This coordination also requires incorporating housing policies that facilitate integration between the two different areas of planning. Planning instruments are needed that support value-capture mechanisms where transport agencies may become developers within the influence area of transit stations. It is also important to promote urban management tools associated with mass transit investments that include the provision of affordable housing to guarantee the proximity between these developments and the benefits of mass transit. Transportation projects should include studies to evaluate potential changes in land use and prices and socioeconomic characteristics of the population in the area of influence of the investments in order to support the design and implementation of instruments to prevent gentrification dynamics.

Third, affordable housing initiatives need to be more diverse and innovative in order to improve the quality of these projects through a portfolio of options linked to mass transit and other infrastructure investments that increase accessibility for residents. In general, large-scale affordable housing projects tend to be developed on the urban periphery, without additional plans to expand existing transportation systems in order to provide adequate accessibility to the opportunities offered by the city. Although countries like Brazil and Colombia have implemented inclusionary housing measures, the impact of such initiatives on the quantitative housing deficit is minimal and their influence on reducing city-specific socio-spatial segregation remains to be seen. The generation of large-scale affordable housing projects located far from main activity nodes has raised some questions regarding social equality issues associated with access to job opportunities, urban services within a framework that facilitates more social cohesion. However, the experience of affordable housing projects with a better location within the urban spatial structure, which means avoiding the generation of affordable housing at urban peripheries far from main activity nodes and job opportunities, has also shown some difficulties in terms of the level of integration of the new residents with the urban social fabric. The experience has had mixed results, with some high-quality developments far from main activity nodes, and some well-located affordable housing projects not integrated into the urban fabric. As in the case of transportation infrastructure projects, it is important that such projects include accessibility indicators to evaluate the effects of these investments on the poor. Recent cable car transport initiatives that include slum upgrading measures and generate new affordable housing units with infill development measures constitute an innovation in the region. However, the integration of such initiatives with other modes of transport to broaden accessibility benefits to a wider area of informal settlements (not just those living close to the cable car stations) remains a challenge.

Fourth, it is important to understand transit-oriented development as an urban policy instead of as the sum of single isolated projects. Transit-oriented development policies at the city level represent an opportunity to address the inequalities observed in the urban spatial structure described in this chapter. Also, within a policy framework, transit-oriented development projects provide the opportunity to strengthen coordination between the transportation, land-use planning, and housing sectors. It is important that each city define a transit-oriented development policy, with pilot projects based on previous research into the dynamics of real estate and land and housing markets, and within a long-term planning process that includes citizen participation. Such pilot projects can certainly improve the integration of transportation and land-use planning. Transit-oriented development projects in the region should be employed as a strategy to promote value-capture mechanisms, including cross-housing subsidies in which the promotion of affordable housing near transit systems becomes a reality. Moreover, the promotion of such projects in Latin America and the Caribbean represents an opportunity to apply cross-subsidies within inclusionary housing measures to reduce the gap for low-income groups that usually access land and housing at urban peripheries. Further studies of the potential of transit-oriented development areas to promote gentrification dynamics should be part of the regional planning portfolio. Finally, the design and development of transit-oriented development pilot projects needs to prevent unintended consequences, such as displacement of the poor.

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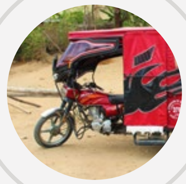
31
METRO
DE MEDELLÍN

The Transit Divide: Mapping Inequalities in the Coverage and Quality of Public Transport

4



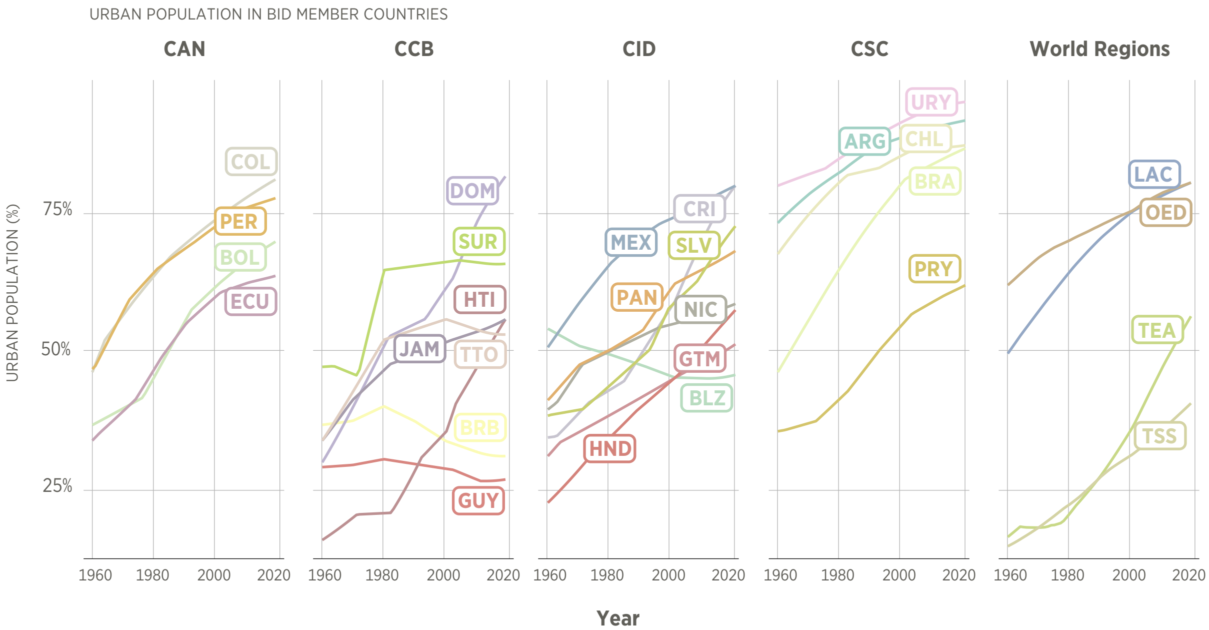
Juan Pablo Bertucci
Daniel Oviedo
Lynn Scholl
Juan David Barahona Rebolledo
Orlando Sabogal-Cardona

Adequate, reliable, and safe public transport services are a fundamental conduit to access opportunities in cities (Ascher 2003). As a necessary means of travel for those without access to private forms of transportation (Dávila 2012), public transport plays a determining role in the ability of poor and socially vulnerable populations to access employment and other key opportunities to build and accumulate social, economic, and cultural capital (Lucas 2012). In large Latin American and Caribbean cities, lower-income groups depend heavily on public transportation, while higher-income groups rely more on private vehicles. Despite the significance of public transport for low-income citizens, however, public transit services in poor neighborhoods in the region are characterized by limited coverage and quality. As mentioned in Chapter 1, these public transit features directly influence the generalized cost of transport, one of the four structural components of accessibility, and are particularly relevant for low-income populations with a limited budget and limited access to private vehicles. Poor coverage and quality of public transit do not only prevent low-income and socially vulnerable populations from reaching key opportunities through longer walking and waiting times to access public transport. They also affect the quality of life of transit users by imposing long travel times under crowded and uncomfortable conditions, often exposing passengers to air pollutants and safety risks. For example, evidence from Latin American cities has found that people in households located more than 10 minutes walking time away from the nearest transit station have a higher probability of suffering depression symptoms. This probability increases rapidly the longer the commute on public transit (Wang et al. 2019).

The importance of public transportation in enabling access to opportunities is recognized by United Nations Sustainable Development Goal (SDG) 11, which sets an overarching objective to "Make cities and human settlements inclusive, safe, resilient and sustainable," and "to provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport" by 2030. However, disparities in the distribution of public transit infrastructure and services contribute to gaps in the coverage and quality of transit services for the poor and disadvantaged groups, lower levels of accessibility, and high dependence on means of transport such as walking or informal transportation.

Planning for urban transport systems that can reach all users in Latin American and Caribbean cities is challenged by several trends, including rapid and sprawling urbanization patterns, rising motorization, and high levels of informality in transportation, housing, and employment. The urban population in Latin America and the Caribbean has risen sharply from 49.5 percent of the total population in 1960 to an estimated 81.1 percent in 2020 (World Bank 2022). As seen in Figure 4.1, urbanization rates since 1960 have been markedly rising for all countries, making Latin America and the Caribbean today one of the most urbanized regions in the world. Although the region's urbanization rates are similar or higher to developed economies, however, its investments in infrastructure, affordable housing, and other services have not kept pace with the rapid growth in demand for these services in urban areas.

FIGURE 4.1 Rapid Urbanization Rates for Four Subregions in Latin America and the Caribbean, and by World Regions



Source: World Bank staff estimates based on the United Nations Population Division's World Urbanization Prospects: 2018 Revision.
Note: Countries are grouped into four country groupings used by the Inter-American Development Bank, from left to right: CAN: Andean Group, CCB: Caribbean Group, CID: Central America and Mexico, Panama, and the Dominican Republic, and CSC: Southern Cone. The right panel for world regions shows LAC: Latin America and the Caribbean, OED: members of the Organization for Economic Co-operation and Development, TEA: East Asia and the Pacific, and TSS: Sub-Saharan Africa.

Greater demand for housing associated with rapid unplanned urbanization has increasingly pushed lower-income groups to seek affordable housing in peripheral and peri-urban areas largely disconnected from consolidated transportation networks (see also Chapter 3). Moreover, urban sprawl and informal neighborhood development in Latin American cities have outpaced the ability of the public sector to provide adequate transport and connectivity to infrastructure networks such as roads, piped water and sanitation, energy, and communications in urban peripheries where pockets of poverty are concentrated. By contrast, private and market-led forms of suburban development such as gated communities for wealthier segments of the population seeking larger housing units are almost always well-connected to these infrastructure networks. However, connectivity in these gated communities is often underpinned by a focus on private automobiles, leading to a poor supply of public transit that negatively affects those suffering from social and transport disadvantage. The inability to meet the transport needs of informal and low-income settlements, and the lack of demand for public transit in wealthier suburban areas, coalesce to lead to long walk times to reach transit, long travel times on public transit, higher travel costs, higher rates of immobility, and reduced accessibility to opportunities necessary to climb out of poverty (e.g., employment, recreation, and urban services) (Graham and Marvin 2001). These self-reinforcing patterns of accumulated vulnerability and disconnection contribute to and magnify existing social, spatial, and economic inequalities in Latin American and Caribbean cities (Gutierrez 2009; Ferrarazzo and Arauz 2000; Kaltheier 2002; Salon and Gulyani 2010; Vasconcellos 2016).

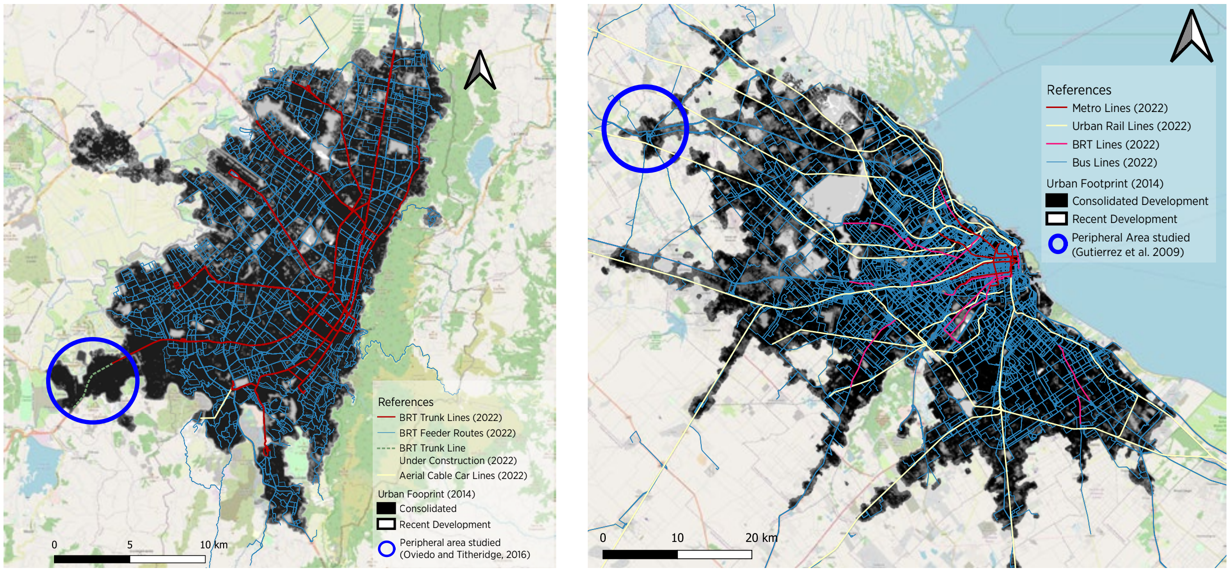
The increase in private vehicle ownership associated with rising incomes in the region further compounds the challenges associated with providing sufficient quality and coverage of public transit across the urban population in Latin America and the Caribbean. The average numbers of private motorized vehicles per 1,000 population for 10 Latin American and Caribbean countries have increased 43.6 percent regionally between 2005 and 2015 (UN-Habitat 2018), growing from 0.09 in 1990 to 0.20 by 2008 (Yañez-Pagans et al. 2019). Both cars and motorcycle ownership are expected to continue increasing in the region, with an average annual growth rate of car ownership of around 5.53 percent until 2030 (including Argentina, Mexico, Brazil Chile, Dominican Republic, and Ecuador) (Roque and Masoumi 2016), as well as increasing motorcycle ownership in leading cities (Roque and Masoumi 2016; Hagen, Pardo, and Valente 2016). In fact, the growth of motorcycle ownership has surpassed that of cars in many cities, accounting for from 10 to 49 percent of the vehicle fleet in several cities. Given current income and economic growth trends, motorization rates are expected to more than double by 2030 (relative to 2002) (Yañez-Pagans et al. 2019).

Rapid motorization has also exerted significant pressure on infrastructure provision. As a result, major transport networks frequently serve higher-density central areas where the time savings of interventions are more noticeable in the short term (Vasconcellos 2015). For example, transit line densities in 2014 in Bogota and Buenos Aires show higher concentrations of public transit lines in the urban core, exhibiting high density variations between the city center and its periphery (in meters of bus lines per square meter). In the case of Bogota, this density drops from an average of 0.071 to 0.047 m/m^2, and in the case of Buenos Aires the average density drops from 0.079 to 0.019 m/m^2 (Figure 4.2).

FIGURE 4.2 The Current Urban Footprint of the Buenos Aires and Bogota Metropolitan Areas with Their Public Transit Network Overlayed

BOGOTA

BUENOS AIRES



Sources: Urban footprint: Atlas of Urban Expansion, Buenos Aires transit network (https://datos.transporte.gob.ar/dataset?groups=movilidad); and Bogota transit network (https://datosabiertos.bogota.gov.co/dataset?groups=transporte).
Note: Areas within the blue circles are selected peripheral areas suffering from transport disadvantage discussed in Gutiérrez (2009) and Oviedo Hernandez and Titheridge (2016).

Figure 4.2 illustrates the predominant patterns of transport infrastructure and service provision that lead to fragmentation of connectivity across the cities under a logic of prioritization of areas of preexisting social advantage while bypassing less powerful groups (Graham and Marvin 2001). In the case of transportation, such imbalances go beyond density of infrastructure and public transit routes, leading as well to poor frequency and quality of service. High-capacity public transit services, such as Bus Rapid Transit (BRT), have often been implemented first in corridors connecting employment centers with high-demand areas of largely middle-income populations before being extended to lower-income, informal, and peripheral neighborhoods – a process that can take many years, as in the case of Bogota. Over time, this has led to better coverage of public transit in more dense and privileged locations of the city, but to neighborhoods on the urban fringe remaining largely unintegrated with the rest of the city (Oviedo 2021). Infrastructure in peripheral areas also tends to have lower availability of public transit facilities such as formal bus stops that offer signage, adequate shelter from adverse weather, information on bus arrival times, public lighting, and other features (Gutiérrez 2009).

As a consequence of the limited supply of adequate transport infrastructure and services, public transport services operating in lower-income areas of cities in the region are often characterized by high levels of informality. Often relying on older and under-maintained and polluting vehicles, informal transit services are characterized by overcrowding and insecurity (Tun et al. 2020; Hidalgo and Carrigan 2010, Guzmán et al. 2019; Vasconcellos 2018). Additionally, as discussed in Chapter 2, these services are frequently inaccessible for people with disabilities, for parents traveling with strollers, or for passengers needing to travel with large packages (such as informal workers carrying goods or tools) (Jara and Carrasco 2010; Pucci et al. 2019), and they tend to be less comfortable for passengers. Moreover, as drivers compete aggressively with other transit operators for passengers, they tend to be associated with high rates of accidents and significant road safety risks. The challenges related to public transport provision and resulting lower levels of mobility and access for the poor living in peripheral areas contributes to the cycle of transport disadvantage and exclusion discussed in Chapter 1.

In this context, addressing the gaps in public transport infrastructure and services coverage and quality is critical to achieving improved access to opportunities for lower-income and vulnerable groups. Reducing gaps in access to good-quality public transport can contribute to achieving a range of development outcomes, such as improved educational attainment rates, employment, and income for the poor. Understanding the implications and considering the needs of the most vulnerable groups during all phases of a transportation intervention is key to creating a positive cycle of inclusion. To this end, it is paramount to analyze coverage and perceptions of quality and safety of public transportation holistically in terms of access.

This chapter focuses on how public transportation coverage has the potential to either help or exacerbate social exclusion among low-income and disadvantaged populations. It examines the role that public transport services have played in enabling accessibility of low-income populations, the barriers that those populations face in the region in terms of access to safe and adequate transit systems, and potential policy solutions to reduce disparities in the coverage and quality of systems. Recognizing the heterogeneity of contexts in the region, the chapter reviews experiences from selected medium-size and large cities that over the last 25 year have invested in BRT systems and aerial cable cars. Drawing on policy experience and empirical evidence to inform what has worked and lessons learned, the chapter highlights current challenges when it comes to fostering social inclusion of low-income populations through public transport infrastructure.

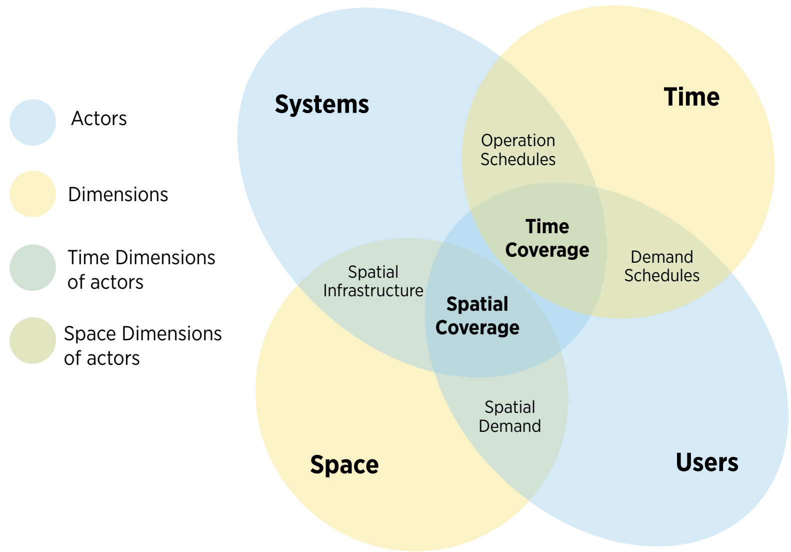
The next section presents a short diagnosis of disparities in public transport service quality and coverage among low-income populations in Latin America and the Caribbean. Along with this, a historical perspective of transit reforms (mainly documented for Colombia) is presented. The chapter then examines several case studies of BRT, metro, or cable car implementation, including their main benefits and disadvantages, and highlights the impact on low-income populations. The chapter closes by reflecting on what has been learned and the challenges ahead. Finally, policy recommendations to foster socially inclusive public transit systems in the region's cities are put forth.

4.1 Diagnosing the Disparities in Public Transit Coverage and Quality in Latin American and Caribbean Cities

Despite regional efforts to develop robust mass transit systems during the last 25 years, low-income groups continue to experience problems of quality and coverage in public transit and often do not benefit as much as other social groups. Disparities in coverage and quality in public transit across Latin America and the Caribbean are reflected by a myriad of indicators suggesting that, overall, those in conditions of social disadvantage find themselves enduring the worst conditions for commuting and accessing opportunities, often deciding not to travel and experiencing social exclusion (Avellaneda and Lazo Corvalán 2011; Gutiérrez 2010; Oviedo Hernandez and Titheridge 2016).

Public transit coverage broadly refers to the physical availability of service within an area in a given time frame. There are, however, many determinants of whether the service can be effectively used by different population groups beyond the spatial distribution of stations. These include integration with other transit modes, the frequency at different times of day, convenience, and safety to access stations, among other factors. Coverage can therefore be considered effective when connecting individuals efficiently to their destinations accounting for all their travel needs.

FIGURE 4.3 Framing Effective Coverage as Services and Infrastructure that Provide Access



Source: Prepared by the authors based on the components of accessibility from Geurs and van Wee (2004).
Note: Accessibility is determined by effective coverage. Provision of service in space and time is adequate or not depending on the users' needs and schedules at both trip origin and destination.

The degree of access afforded by public transit services to different social groups is linked to how well spatial and temporal coverage, as well as availability, match their needs (Figure 4.3). An example is the role of public transit in connecting residential areas with critical services such as healthcare, education, and skill-appropriate job opportunities. Similarly, other service quality characteristics – such as reliability, speed, number of transfers, costs, comfort, frequency, customer service, security, and safety – may also impact the ability or willingness of individuals to move and access goods and services within and outside of their neighborhoods. These quality aspects can be defined as the ability of a system to satisfy the (stated or implied) needs of the user (TRB 2013). Quality of service, in addition to coverage, reflects all the attributes a potential passenger considers, consciously or not, when deciding whether to use transit.

Measuring the degree of public transit coverage and quality that affects access to opportunities in the city calls for a holistic view of urban transportation. Table 4.1 shows some metrics and possible applications. As can be seen, measures of the population served are preferred over system performance. Analyzing the distribution of these coverage and quality metrics for transit in Latin America and the Caribbean reveals patterns of disparity that, in combination with other social disadvantages, contribute to transport-related social exclusion (Lucas 2012).

TABLE 4.1 Sample Metrics for the Analysis of Coverage and Quality Equity and Access

Focal Variable	Dimension	Metric	Equity Disaggregation	Reference
Coverage and quality	Time	Time of service and frequency	Zone, disaggregating for low-income zones	Polzin, Pendyala, and Navari (2002)
Coverage and quality	Time	Travel time	By occupation	Montoya-Robledo and Escovar-Álvarez (2020)
Coverage and quality	Time	Composite indicator with number of transfers, waiting time, in-vehicle time, and deviation from scheduled times	By zone, disaggregating for low-income zones	Kaplan et al. (2014)
Coverage and quality	Time, space, comfort	Composite indicator with bus travel time, bus fare, ticket type, frequency, timeliness of arrival, time walking to stop, seat availability, information at stop, ease of access to bus, facilities at stops, temperature on bus, driver attitude, general cleanliness	By employment status, age, and gender	Hensher, Stopher, and Bullock (2003)
Coverage	Space and time	Composite indicator of service coverage, frequency, and duration; availability of and walking distance to nearest stop	By zone, disaggregating for low-income zones	Ryus et al. (2000)
Coverage	Space	Percent of population within threshold distance to a station	By region and vulnerability of population	Hernández (2017)
Coverage	Space and time	Composite indicator of public transport provision comprised of the number of stops in the region, capacity of vehicles, and average frequency. Contrasted with a synthetic index of transportation disadvantage/need	By region	Jaramillo, Lizárraga, and Grindlay (2012); Fransen et al. (2015)
Coverage and quality	Space and time	Composite index analyzing walking time to station, frequency, reliability,	By zone By social housing By gender By ethnicity By disability	Shirahige and Correa (2015)
Coverage and quality	Space and time	Composite indicator with walking times to stations, frequency, and experienced occupancy levels	By gender By city By ethnicity By disability	Cont et al. (2021)
Coverage and quality	Time, space	Composite indicator of percent of trips with a competitive transit alternative to private vehicles. Considers whether transit is a competitive alternative factoring in travel time, frequency, number of transfers, first/last mile distances	By ethnicity By gender By income group By zone By disability	Gartsman et al. (2020)

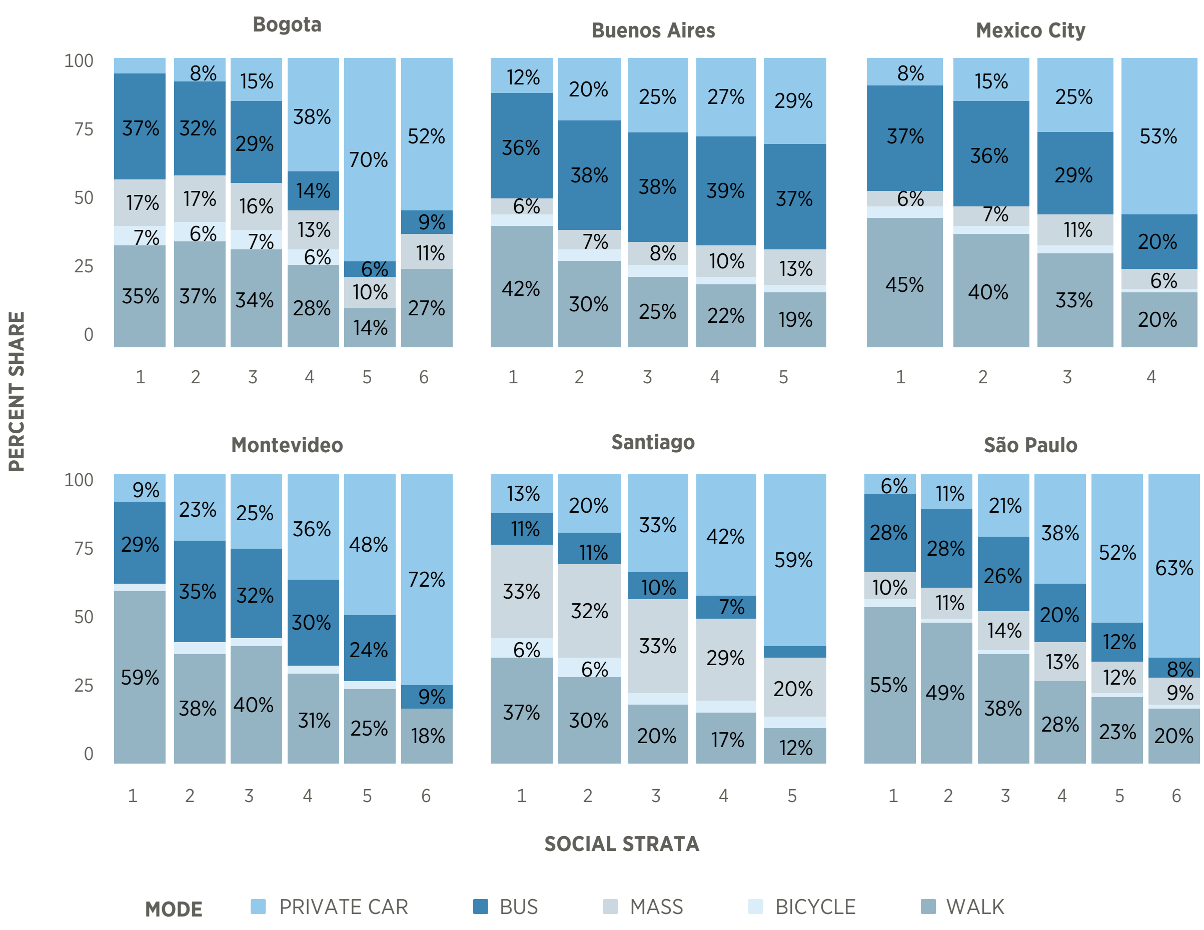
Source: Prepared by the authors based on Lucas et al. (2019).

4.1.1 Gaps in Coverage and Quality of Public Transportation for Low-income Groups

While public transit services in the region take on a range of forms including metros, minivans, BRTs, and ferries, among others, buses have historically been the most ubiquitous transportation system, carrying over 50 percent of all transit trips in the region (Vasconcellos and Mendonca 2016). Public transit dependency among low-income citizens can be observed in modal shares and car ownership rates by income. Figures 4.4 and 4.5 show that, in the context of large capital cities in Latin America and the Caribbean, public transit is the predominant mobility solution for low-income populations, while car use is concentrated among high-income groups. In Bogota, only 5 percent of people in the lowest socioeconomic stratum (SES) use a car for their daily mobility.[1] This increases to 8 percent for the next SES. This contrasts with higher SES groups, where the percentage of car use rises to between 52 and 70 percent. Other examples of this disparity are Montevideo (where lower SES have a share of car trips of 9 percent and higher SES a share of 73 percent), and São Paulo (6 percent in the low SES and 64 percent in the higher). From all the capital cities presented in Figure 4.4, Buenos Aires is the one with the lowest share of private vehicle usage among the higher-income groups (30 percent), yet this is still more than twice the percentage of car users in the lower-income segment (12 percent), suggesting that inequalities remain even in contexts of relatively low car use.

1. SES is a good proxy for income across the region. In Colombia it operates within a range from 1 to 6, where lower strata refer to lower-income residents and higher strata to wealthier residents.

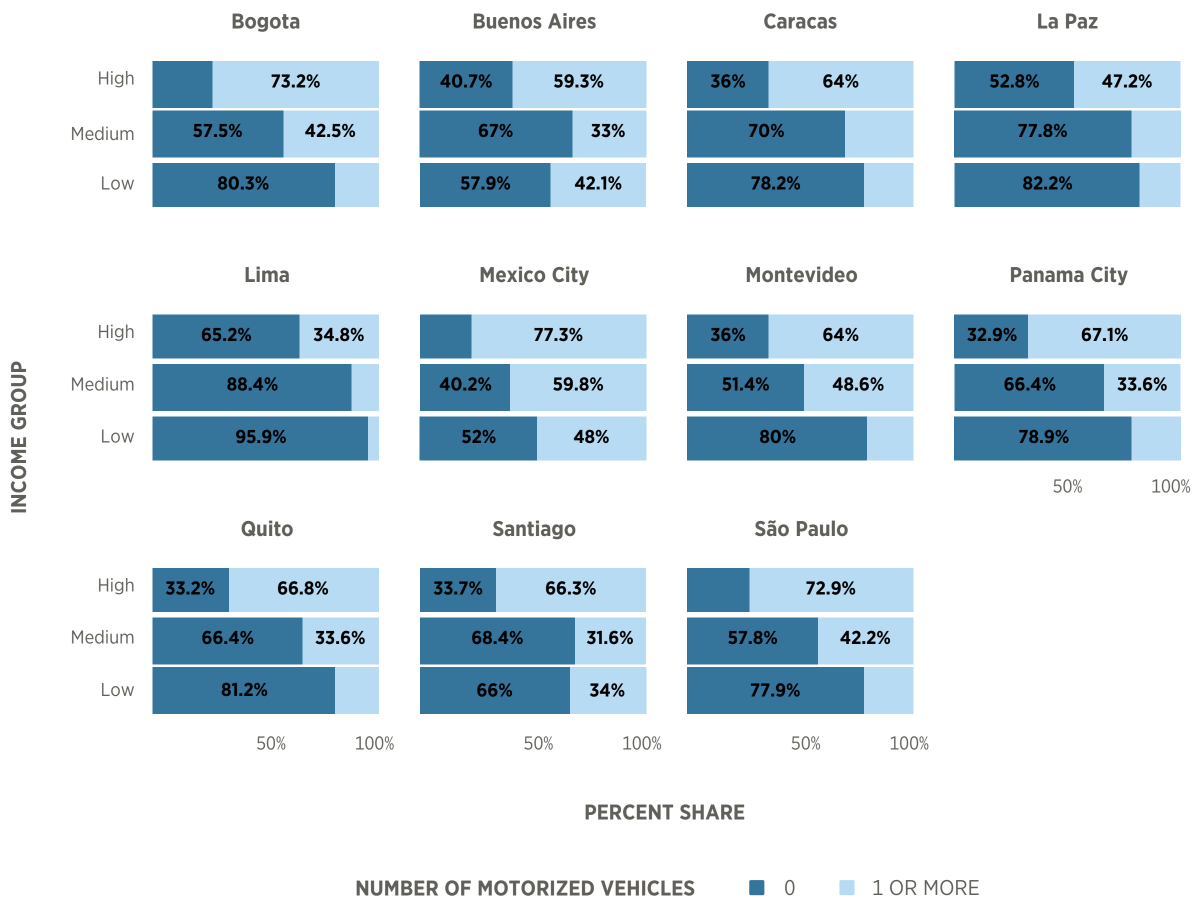
FIGURE 4.4 Comparison of Modal Shares for Six Latin American Cities (percent)



Source: Prepared by the authors based on local household travel surveys (Bogota 2015, Buenos Aires 2010, Mexico 2017, Montevideo 2016, São Paulo 2017, and Santiago 2012)
Note: Social strata groups as reported by each respective city. Social strata 1 makes reference to the lower category (less income) and 6 (or 5, depending on the country) to the higher category (those with the most income). Mexico City, Santiago, and Buenos Aires report strata levels 4,5, and 5, respectively.

Figure 4.5 shows that most low-income residents in large cities do not own a private vehicle. In Bogota, 80.3 percent of low-income residents do not own a motorized vehicle, which contrasts with 26.8 percent in the high-income group, marking a clear gap in access to private modes of transportation. In cities like Caracas, Lima, and Montevideo the numbers are similar, with 78.2 percent, 95.9 percent, and 90 percent, respectively, of the low-income population not owning a motorized vehicle.

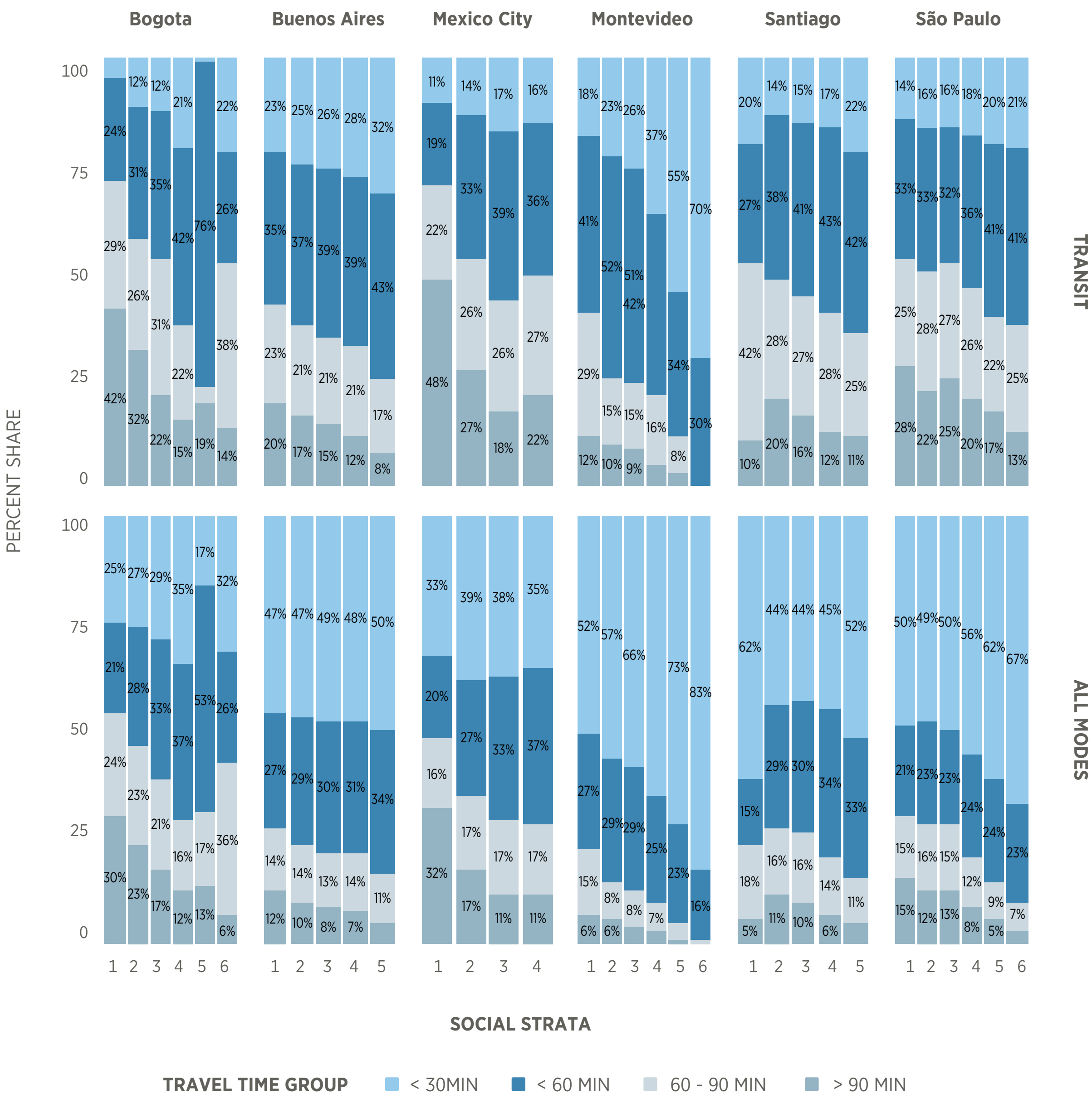
FIGURE 4.5 Declared Number of Vehicles in a Household by Income Strata for 11 Latin American Cities (percent)



Source: Prepared by the authors based on data from CAF (2017)
Note: Income groups are defined by partitioning the 15 income groups as provided by (CAF 2017).

Aggregate statistics for the region show that public transit has longer travel times than other modes, particularly cars. Such longer travel times are a determinant of transport disadvantage and tend to affect lower-income sectors more (Figure 4.6). Low-income groups endure a higher share of the most time-consuming trips across all transportation modes, even more so on public transit. In Mexico, almost a third of the population in the lowest SES reported commuting trips of over 1.5 hours, a share that rises to nearly 50 percent of commuters when focusing only on public transit users. In Buenos Aires and Montevideo, the differences are comparably less marked, but low-income populations still also experience longer travel times.

FIGURE 4.6 Travel Times for Work Purposes by Social Strata: Public Transit (top panel) and All Travel Modes (bottom panel) (percent)



Source: Prepared by the authors based on local household travel surveys (Bogota 2015, Buenos Aires 2010, Mexico City 2017, Montevideo 2016, São Paulo 2017, and Santiago 2012).

Note: Social strata groups as reported by each city. Social strata 1 makes reference to the lower category (less income) and 6 (or 5, depending on the country) to the higher category (those with the most income). Mexico City, Santiago, and Buenos Aires report strata levels 4, and 5, respectively.

Differences in travel times are also found when comparing the mean travel time by public transit for six capital cities in the region (Table 4.2). In Bogota, for example, the lowest stratum has an average travel time of 86.2 minutes while the highest stratum has an average of 67.9 minutes. The most dramatic difference is for Montevideo, where public transit trips for the lowest SES last on average around 1 hour and decrease to 27 minutes for the highest stratum. Table 4.2 also shows the mean travel time for other modes, showing that public transit is, by comparison, slower.

TABLE 4.2 Average One-Way Commutes by Public Transportation versus All Modes by Socioeconomic Strata (minutes)

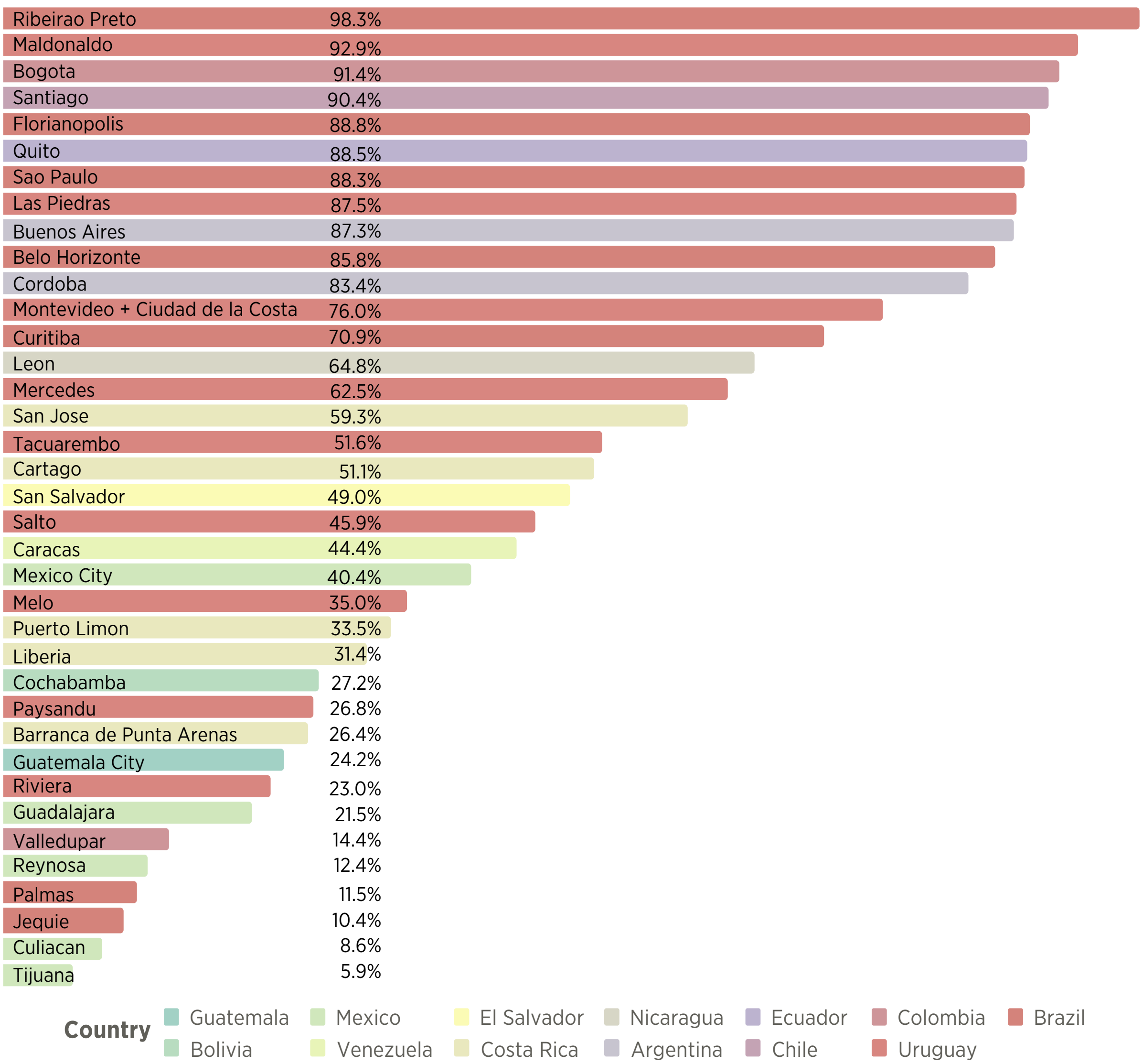
Socioeconomic Strata	Travel Mode	Bogota	Buenos Aires	Mexico City	Montevideo	São Paulo	Santiago	Average
1	Transit	86.2	68.5	91.5	66.2	76.7	67.0	77.3
2	Transit	80.9	64.8	72.8	60.5	70.1	70.3	73.2
3	Transit	75.6	62.4	65.2	60.0	69.8	67.4	67.1
4	Transit	68.1	60.6	68.4	54.1	63.1	64.3	64.5
5	Transit	69.6	55.1	n.a.	45.8	57.2	59.6	56.5
6	Transit	67.9	n.a.	n.a.	26.9	52.9	n.a.	52.9
1	All Modes	66.7	50.3	69.2	41.6	44.8	45.4	56.1
2	All Modes	58.2	48.0	54.5	40.3	44.1	52.6	54.2
3	All Modes	57.1	45.8	51.0	39.6	42.5	52.8	50.6
4	All Modes	53.1	45.9	52.8	34.3	36.6	49.4	45.5
5	All Modes	56.7	42.8	n.a.	29.2	31.2	43.0	38.0
6	All Modes	50.5	n.a.	n.a.	23.6	27.7	n.a.	28.3

Source: Prepared by the authors based on local household travel surveys (Bogota 2015, Buenos Aires 2010, Mexico 2017, Montevideo 2016, São Paulo 2017, and Santiago 2012).
Note: Social strata groups as reported by each city. Social strata 1 makes reference to the lower category (less income) and 6 (or 5, depending on the country) to the higher category (those with the most income). Mexico City, Santiago, and Buenos Aires report strata levels 4,5, and 5, respectively.

A standard metric of transit coverage is the number of people who can reach the system within 500 meters (~10 minutes) walking distance of a bus stop or a low-capacity transport system, or within 1,000 meters of a mass transit system such as a railway, BRT, or ferry terminal. Despite its relevance, lack of coverage is found in several countries and varies widely within countries (Figure 4.7). Within Brazil, for example, Palmas shows 11.5 percent of its urban population with accessible transit while Belo Horizonte and São Paulo boast 85.8 percent and 88.3 percent, respectively. In Mexico City, 40.4 percent of the population is covered, while in Guadalajara this percentage is 21.5 percent and in Tijuana only 5.9 percent (UN-Habitat 2018). These differences arise from distinct factors discussed in the previous section such as urban growth, population densities, and idiosyncrasies, but especially due to different policy approaches regarding mass transportation provision.

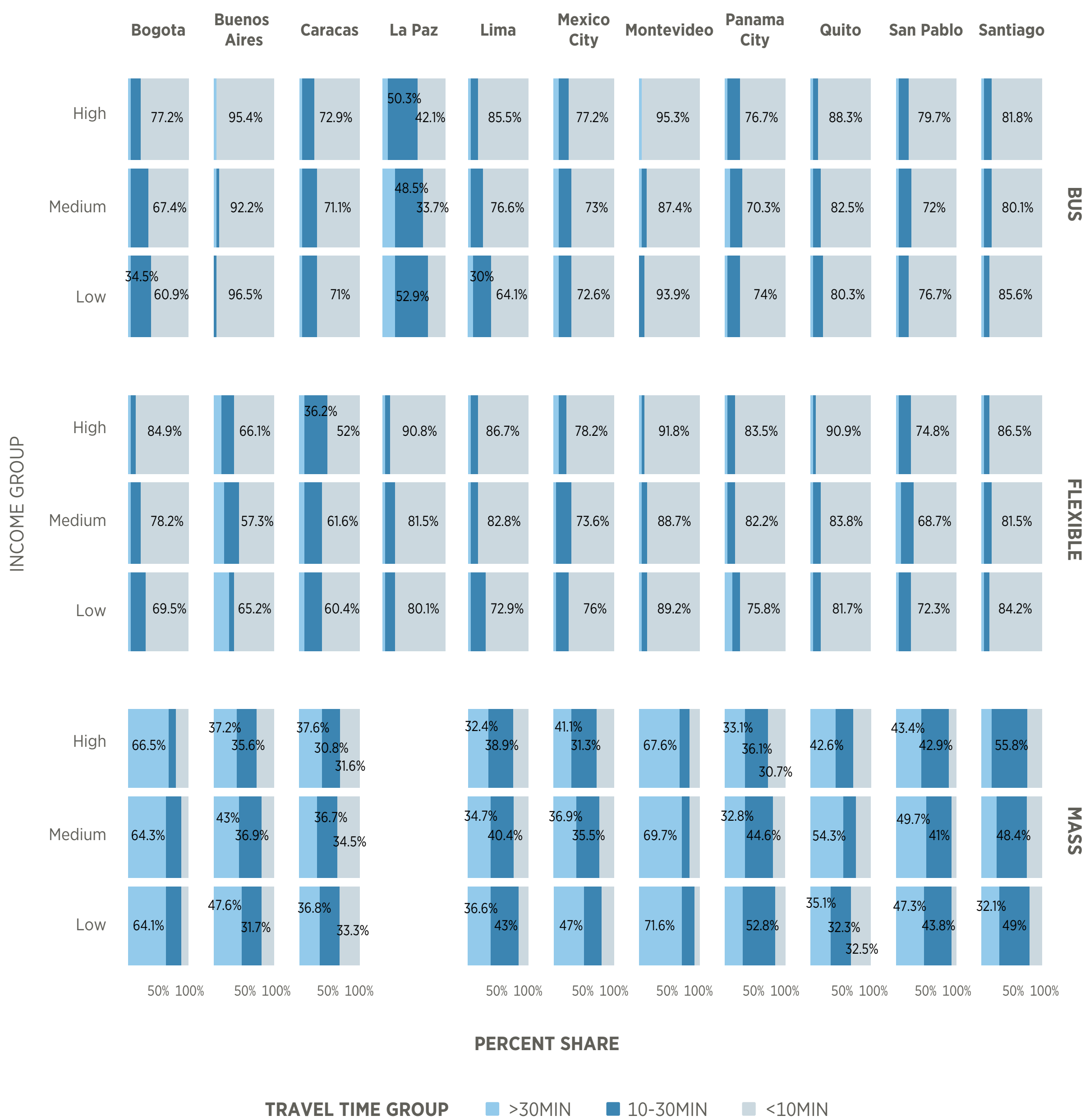
Vulnerable groups are most often affected by gaps in adequate public transportation service quality and coverage, as shown by disparities in walk and travel times by public transit (Figure 4.8). Lower-income groups walk more to access the nearest public transit station. For example, in Bogota 60.9 percent of people in the low-income group are within a 10-minute walk to a bus station. While this is not necessarily a reflection of poor coverage, it lacks in comparison with the 77.2 percent for the high-income group.

FIGURE 4.7 Percentage Access to Formal Public Transport for 45 Latin American Cities (percent)



Source: UN-Habitat (2018).

FIGURE 4.8 Declared Walking Times to Mass Transit, Bus, and Flexible Transit Stations for 10 Latin American Cities (percent shares)



Source: Prepared by the authors based on data from CAF (2017).
Note: Income groups are defined by partitioning the 15 income groups provided in CAF (2017). Modes under "Flexible" are Taxi, Informal Minibus, and Mototaxi. Modes under "Mass" are Metro and Rail.

Data collected by the IDB Transport Division in 2021 in Bogota, Medellin, and Mexico City sheds further light on inequalities in public transit coverage and quality by SES. As shown in Figure 4.9, lower SES groups are more likely to experience longer walking times to reach the nearest transit stop. In Bogota, 53.7 percent of low-SES versus 32.6 percent of users in other SES do not have a station within a 20-minute walking distance. In Mexico City, the disparities are less marked. However, 49.5 percent of low-SES and 44.2 percent of other transit users spend more than 20 minutes walking to the nearest station. By contrast, 62 percent of low SES users in Medellin spend less than 20 minutes walking to reach their nearest transit system. For those living within 20 minutes walking to transit, there are also notable differences. In Bogota and Medellin, middle and high SES respondents were more likely than low-income residents to live within 10 minutes walking to a transit stop.

Various factors can influence walking times to access public transit in each city. In Bogota, BRT stations concentrate on consolidated urban areas with higher land prices (see Chapter 3). In Medellin, inequalities in walking times persist despite a wide range of public transportation alternatives (including Metro, aerial cable cars, light rail) that are integrated in terms of fares and operation. Compared with Bogota and Mexico, a significantly higher percentage of low-income populations in Medellin are able access public transit within a 20-minute walk (24.73 percent within a 10-minute walk and 37.31 percent within a 10–20-minute walk distance).

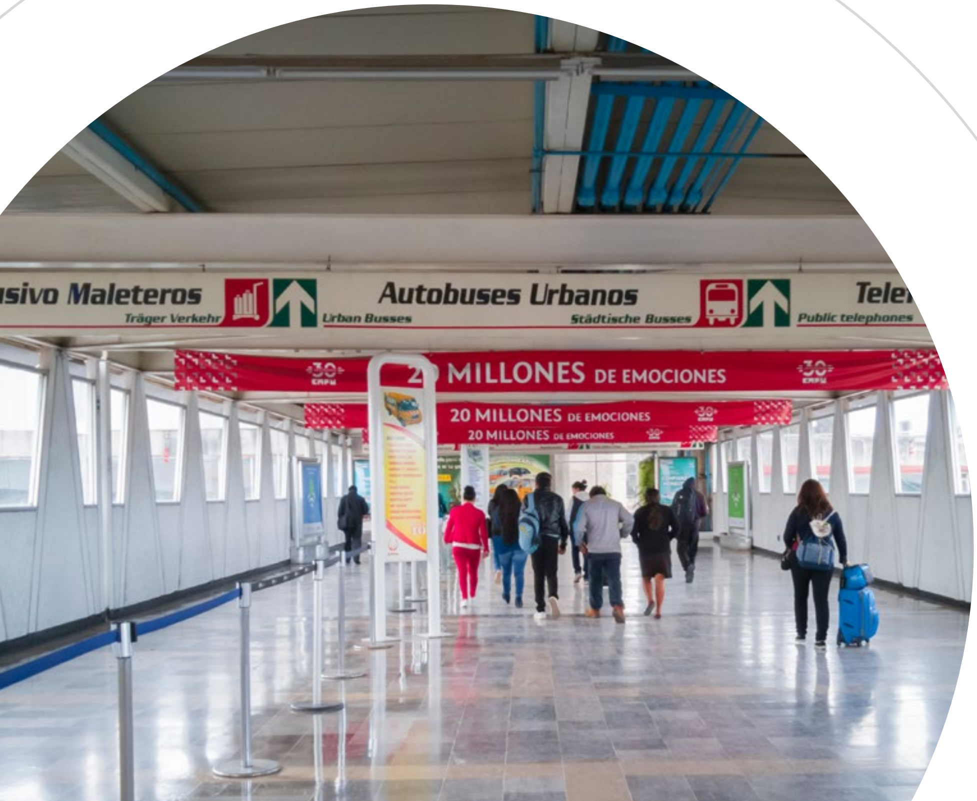
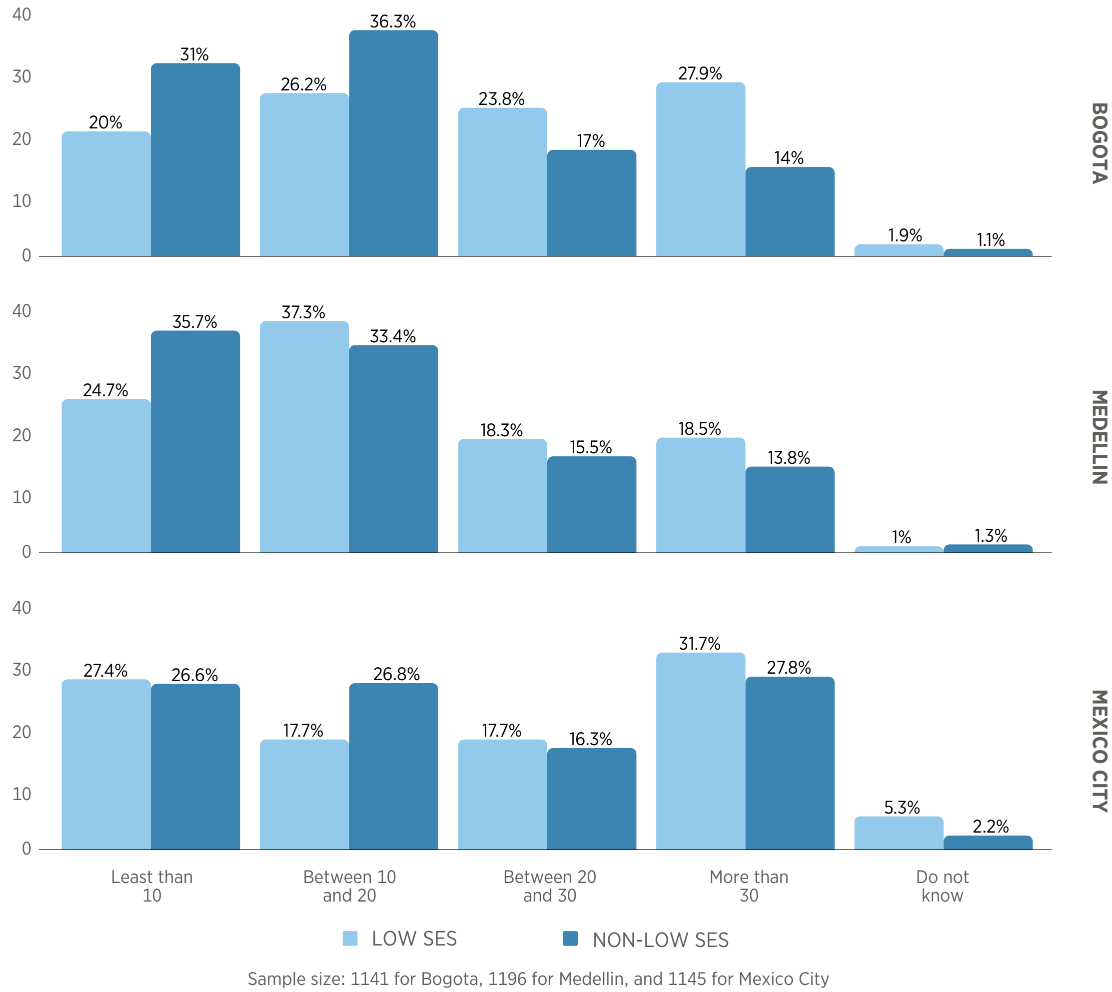


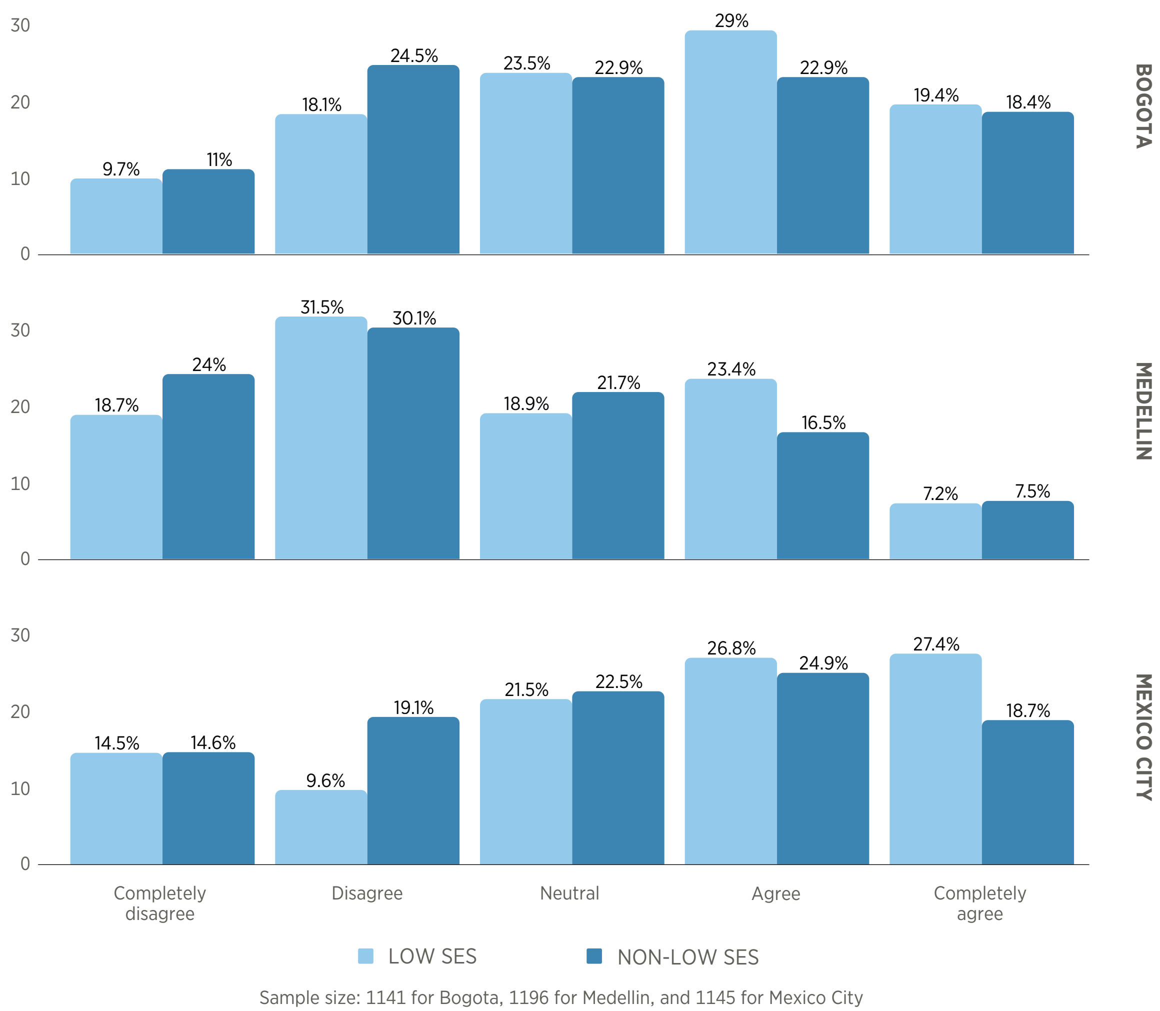
FIGURE 4.9 **Walking Distance (in Minutes) to the Nearest Transit Station, by Socioeconomic Status (percent of respondents)**



Source: Prepared by the authors based on IDB and Steer (2020).
Note: SES: socioeconomic strata.

Public transit coverage is further impaired by inadequate walking infrastructure and social concerns such as crime. The latter tends to affect low-income groups disproportionately. Figure 4.10 shows that while a substantial share of both SES groups in Bogota, Medellin, and Mexico City expressed a fear of being robbed while walking to the nearest transit station, lower SES have higher perceptions of insecurity (Chi-squared test is significant for the three cities). Perceptions of crime and insecurity can discourage public transit users from traveling to certain areas or using collective transport, thereby contributing to fear-based social exclusion (Romero 2014; Sánchez and Palau 2006; Torres Aranguren 2011). Differences in vulnerability to crime and violence on public transport are mediated by gender, ethnicity, and religious backgrounds (ITF 2018; Martinez et al. 2020). As such, when these identities intersect with poverty, poor transit coverage, and vulnerability to crime, vulnerable groups find their pathway to social exclusion exacerbated by the way transport provision is planned and delivered.

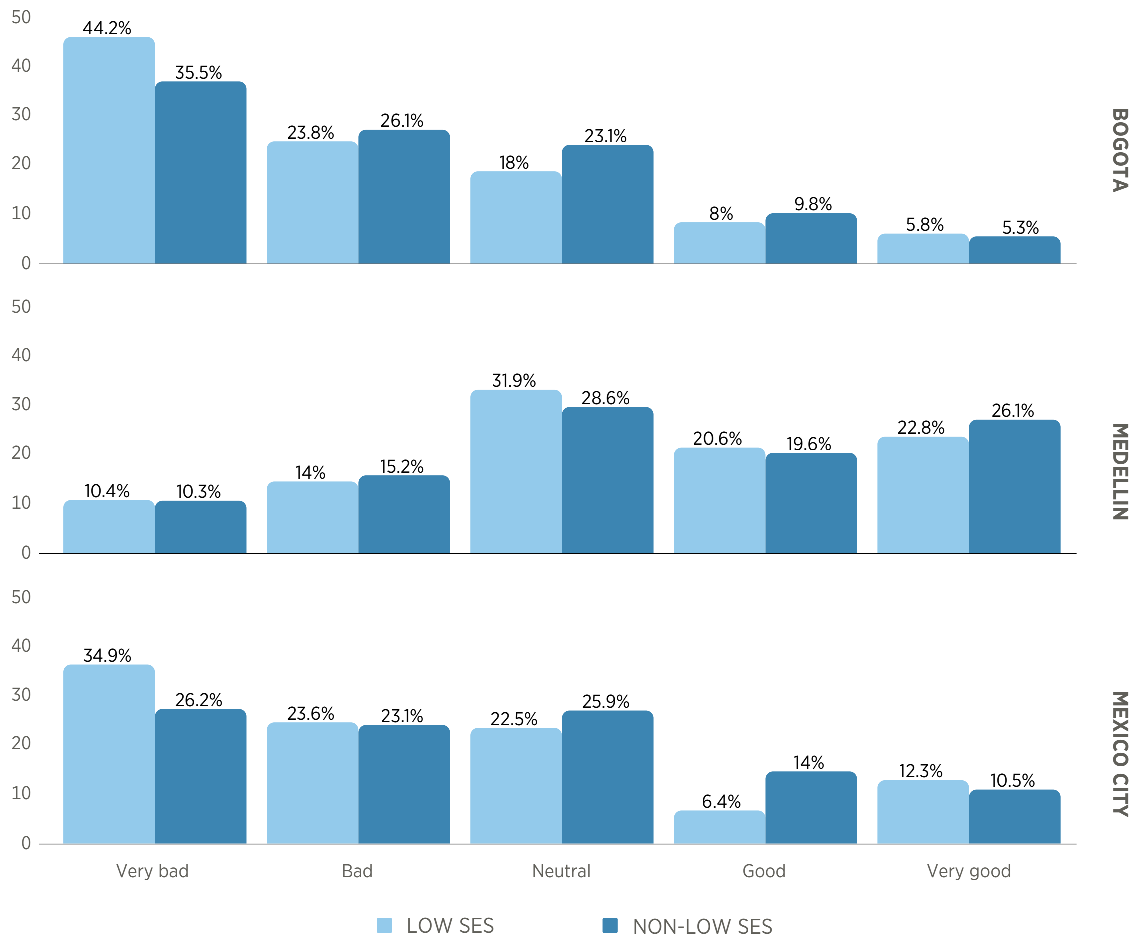
FIGURE 4.10 Fear of Being Robbed, by Socioeconomic Status (percent of respondents, by SES)



Source: Prepared by the authors based on IDB and Steer (2020).
Note: SES: socioeconomic strata.

A proxy for quality of service in public transit is presented in Figure 4.11. Perception of comfort for transit users is shown for Bogota, Medellin, and Mexico City on a scale ranging from "very bad" to "very good." Comfort on public transit can be linked with key service features such as overcrowding, service reliability, the temperature in vehicles and stations, appearance (cleanliness and clarity), and ride smoothness. Low-SES transit users were more likely than non-low SES transit users to rate service comfort as very bad in Bogota and Mexico City.

FIGURE 4.11 Perception of Comfort on Public Transit, by Socioeconomic Status (percent of respondents, by SES)



Sample size: 1141 for Bogota, 1196 for Medellin, and 1145 for Mexico City

Source: Prepared by the authors based on IDB and Steer (2020).
Note: SES: socioeconomic strata.

Most low-SES transit users in Bogota (68 percent) have negative perceptions of public transit comfort, considering it either very bad (44.23 percent) or bad (35.56 percent). This negative perception is also observed for other users, resulting in an aggregated 61 percent for the very bad and bad categories. A similar pattern is found in Mexico City, where nearly 35 percent of low-SES users rate transit comfort as very bad compared to just over 26 percent of non-low SES users. Medellin, again, shows contrasting results: although there is no association between SES and perceptions of comfort, perceptions in Medellin are significantly better than those expressed in Bogota and Mexico City.

Public transit systems in Bogota and Mexico City are known for having high levels of overcrowding at peak hours (Bocarejo and Oviedo 2012; Dunckel-Graglia 2013, 2016; Guzman and Bocarejo 2017; Oviedo Hernandez and Titheridge 2016), which may explain the very negative perception of comfort for the lower-SES group (Dunckel Graglia 2016; Flores-Dewey 2019; Milan and Creutzig 2017). Other factors are the disparities in transit coverage in Bogota and the limited operational integration that the systems offer in Mexico City. In Medellin, operational integration and a unified means of payment contribute to a more comfortable alternative for users (Bocarejo et al. 2014; Garcia Ferrari et al. 2018). Additionally, high levels of appropriation of transport systems in Medellin have contributed to users caring for transport services' cleanliness and quality in a way that strengthens efforts by public transport providers to provide good service quality across the board.

4.1.2 Public Transport (De)regulation and Informality in the Region as Drivers of and Responses to Unequal Transit Coverage and Quality

City-level disparities covered in the previous section are not the symptom of a recent crisis. Instead, such inequalities are partly the consequence of long-term processes of deregulation and privatization of the transport sector and the emergence and consolidation of informal public transit operators in cities throughout the region. The second half of the 20th century was marked by a system dominated by a chaotic set of public and private agents with different interests in the business of public transport (Tun et al. 2020). The liberalization of the transportation industry in many countries in Latin America and the Caribbean, particularly in the 1980s and 1990s, led to a disorganized institutional map with lack of clarity regarding the distribution of responsibilities, resources, and control in the provision of public transport (Tun et al. 2020). As a result, rapidly growing mid-size and large cities in the region experienced an oversupply of small private operators functioning informally in aging and highly polluting vehicles, contributing to unsafe conditions and compounding levels of congestion and bad air quality in urban areas. Uncontrolled competition in the public transport sector was also ripe with perverse incentives that led to a continuous detriment in service quality and intense competition among low-scale providers in what has been termed the *guerra del centavo* (penny war) (Ardila 2007).

As a result, these collective transport systems with various degrees of deregulation have promoted labor informality, low-quality services for users, increases in air pollution, congestion, and road accidents (Behrens, Chalermpong, and Oviedo Hernandez 2020). Although some countries have migrated towards more formal and modern transport schemes through cycles of regulation and privatization of public transit systems (Gomez-Ibanez and Meyer 1993), high levels of transport informality continue to pose a significant challenge in the region.

Generally defined as operating without official endorsement (Cervero and Golub 2007) and outside of the officially sanctioned public transit sector (Cervero 2000), informal public transit systems in the region lie on a spectrum. While informal transit is unregulated or unlicensed (UN-Habitat 2012), semi-formal services are legally authorized but operate under informal rules (Tun et al. 2020), Currently, more than half of public transport trips in Latin America and the Caribbean are made in semi-informal or informal public transport modes. In many contexts, informal services may provide demand-responsive and flexible services that fill in gaps where formal public transit is not available. Furthermore, the many trade-offs in their costs and operations can enable them to operate at comparatively lower fares than more formal competitors, making them more affordable for lower-income groups for a single trip in certain contexts. However, due to their profit-maximizing behavior, informal transport services tend to contribute to negative externalities such as high pollution rates, increased insecurity, and traffic accidents. This behavior is marked by aggressive competition for passengers and dependency on aging and under-maintained vehicles (Tun et al. 2020).

As a response to the mounting problems associated with such transport services, cities such as Bogota, Cali, Lima, Santiago, and La Paz undertook transport investments that were often centered around BRT systems and substantial reforms to the sector. Prior to the reforms, the transportation systems in all five cities experienced many of the challenges and externalities described above. In Bogota during the 1980s and 1990s bus speeds were estimated at 10 km/hour on average, and 70 percent of particulate matter emissions from all mobile sources in the city were attributed to the bus system alone (Estache and Gómez-Lobo 2004). Cali had a comparable situation, with a public transport sector characterized by high levels of congestion, accidents, and emissions. The transportation sector in Colombia also suffered from high levels of institutional fragmentation and weak institutional and regulatory frameworks that supported many of the self-reinforcing cycles of oversupply and declining quality described in this section, with dire consequences for users in terms of travel times, safety, comfort, and reliability.

The situation in Santiago was similar to that of Bogota and Cali. In 1979, the sector was completely liberalized, allowing free entry to new competitors, and by 1983, operators were given route choice and the right to set service fares. The capacity and geographical coverage of supply increased dramatically following liberalization, leading to a proliferation of smaller, more maneuverable vehicles, which tended to be operated by the owners (Estache and Gomez-Lobo 2004), bringing several benefits including reduced waiting times, reduced average distance to stops, and decreased load factors. However, massive oversupply combined with intense on-road, head-to-head competition, led to severe congestion and a significant increase in traffic accidents. Fares also increased by 100 percent in real terms between 1979 and 1990, despite declining gasoline prices over the same period.[2] In an attempt to minimize costs, bus companies tended to keep aging vehicles, rely on diesel engines, and have lower technical standards, resulting in significant increases in air pollution (Gwilliam 2003). The number of route variants also multiplied dramatically, providing more flexibility of service but disorganizing traffic patterns. In addition, drivers competed on the street, skipping unprofitable stops, and denying service to reduced-fare schoolchildren (Muñoz and Gschwender 2008).

In La Paz, the conditions of decentralization, poor regulation, and inefficient privately operated public transport modes continued for a longer period of time (Bürger 2018). By 2014, La Paz also

2. From 1979–1983, the number of buses increased from 5,185 to 7,278, or 40 percent (Estache and Gomez-Lobo 2004). In response, bus capacity was restricted during 1984 to 1988. However illegal entry persisted, and by 1988 the number of buses reached nearly 11,000. Just before the transition to democracy in 1988, the industry was again completely liberalized, and the bus fleet reached its peak of 13,698 in 1990

suffered from a chaotic public transit system supported mainly by individual operators under informal schemes. Flaws in transportation planning policies, institutions, and regulations allowed the proliferation of aging minibuses and trufibuses (i.e., low-capacity vehicles) in a disorderly environment that resulted in poor quality service in what was known as the miniaturization of public transit. Users experienced rides in old and undermaintained vehicles, overcrowding, long travel times, and exposure to externalities derived from the governance and operational scheme such as pollution, traffic congestion, and high accident rates.

The following section examines some of these experiences, describing certain achievements and challenges experienced during the initial development of these reforms to dignify the travel conditions of public transport users and informal workers in the transport sector. To start, Box 4.1 shows the current reality of a largely informal system in a context of high social disadvantage in Port-Au-Prince, Haiti.

BOX 4.1

Glimpse of a Fully Informal System and Its impact on Accessibility in Port-au- Prince, Haiti[1]

The population in Haiti is rapidly urbanizing. In 1990, 29 percent of the population lived in urban areas, but by 2014 that figure had risen to 57 percent, and it is projected to reach 76 percent by 2050. This is one of the highest rates of change in the world. Most of the public transportation in the nation's capital of Port-au-Prince could be considered informal. Both private vans known as *tap-taps* and motorcycle cabs provide most of the inhabitants' daily trips. These vehicles are on average 27 years old, and there is no official data on their daily routes, the numbers of passengers transported, or the number of vehicles in operation.

Tap-taps typically are pick-up trucks, minibuses, or canters that have been modified and adapted for the transportation of 14 to 16 passengers. Moto taxi service allows users to board a motorcycle at will along transportation corridors, sometimes two or three at a time. Although very flexible and relatively quick, moto-taxis are more expensive then tap-taps and are an extremely hazardous mean of transportation.

Tap-taps are often very colorful and ornate, contributing to the emblematic and romantic view of this Haitian mode of transportation. Ownership patterns of tap-taps are diversified. Some operators own their tap-tap, others rent their vehicles, some individual owners possess fleets of tap-taps, and some fleets are co-owned by various individuals. The permit to operate tap-tap routes is extended by Haiti's Ministry of Social Affairs and Labor (Ministère des Affaires Sociales et du Travail d'Haïti).

Flexible, tap taps and moto-taxis are a hazardous means of transportation.

Other types of public transportation services exist at different scales and for niche markets, but little information is available on their characteristics and structure. Taxi service exists but is very limited. It mostly focuses on servicing certain sites such as the international airport and hotels. In downtown Port-au-Prince, collective taxis with a capacity of 4 to 5 passengers per vehicle provide very local transportation services in the form of short circuits adapted to passengers' needs and itineraries.

The absence of public transportation planning and structuring within the metropolitan area of Port-au-Prince has made way for private and very partially regulated service providers to fill in the gaps and respond to the mobility needs of the citizens. The weakness of the state and the fragmentation of the organization of public transportation also act as catalysts for informality both in the structure of the offer and the provision and operation of the services. Services provided are driven solely by profitability for the operators with little or no regard for the users in terms of transportation options, accessibility, affordability, reliability, efficiency, comfort, or security.

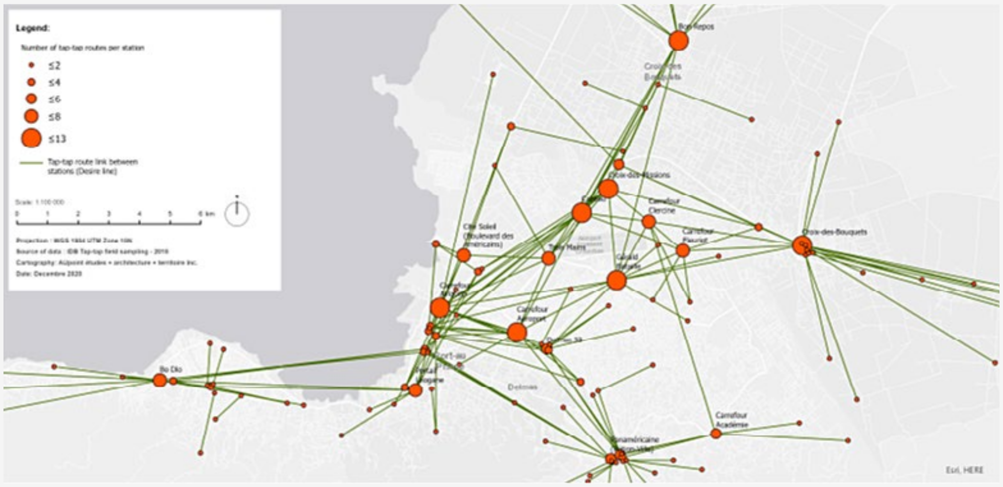
Crowded streets and slow, yet colorful, traffic, is the daily scene on the streets at Port Au Prince.

The challenges Haiti faces in terms of connectivity, planning, and financing have negatively affected its degree of urban development (World Bank 2017). Data related to population distribution and home-to-work commuting patterns in cities are scarce (Prud'homme and Kopp 2011), which has rendered mapping of spatial patterns of commuting to understand the link between access and economic opportunities a challenging task. Rapid unplanned urbanization has created several urban mobility challenges, including job market fragmentation and decreased quality of life. Such socio-spatial and functional configuration of the urban area puts many Port-au-Prince residents at risk of experiencing dimensions of transport-related social exclusion.

A field survey of tap-tap routes conducted by the IDB during May and June of 2018 allowed for identifying and mapping 155 different tap-tap routes covering 736 km of transportation corridors. The network covers 12 municipalities (*communes*) that are all located within the same department (Ouest). Some tap-tap routes function as "collector itineraries" moving the users towards more important routes operated along main transportation corridors that act as backbones of the metropolitan transportation network. But there is no differentiation in the typology of vehicles or any hierarchy within the organization of the tap-tap routes.

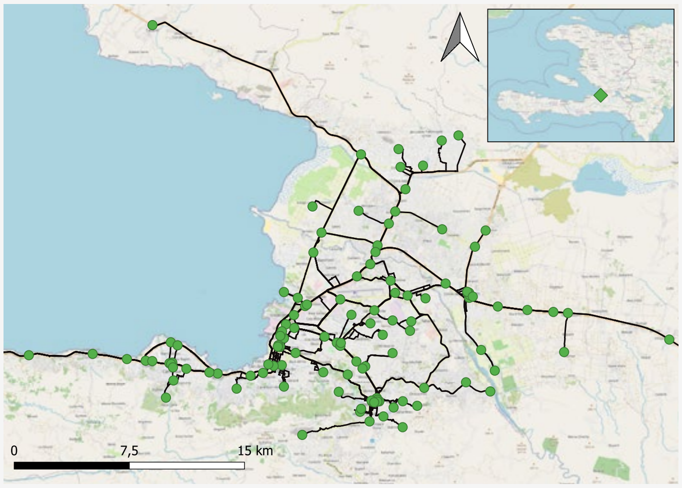
Each tap-tap route has a defined point of departure and arrival that are referred to as "tap-tap stations" and are usually using the same itineraries. A total of 123 stations have been inventoried, many of them servicing more than one route. The roads constituting the tap-tap transportation corridors are often used by a multitude of overlapping and uncoordinated tap-tap routes, and those same corridors do not have formal tap-tap stations, giving way for the users to board and disembark vehicles at will along these corridors.

FIGURE 4.1.1 Links between Tap-Tap Departure and Destination Points



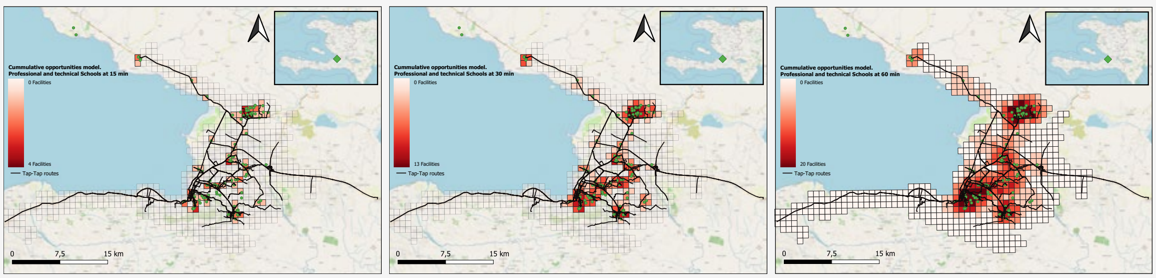
More than 50 percent of tap-tap routes are shorter than 4 km and the average duration of a full tap-tap route itinerary is around 23 minutes. In Port-au-Prince, the average speed of a tap-tap is usually very slow and is influenced by a great many factors such as traffic conditions, the state of road signalization, roadblocks, the number of passengers boarding and alighting and their effectiveness in boarding, road conditions, and the mechanical condition of the vehicle. Overall, 26.5 percent of tap-tap routes have an average speed between 4 and 10 km/hour and 49 percent between 10 and 15 km/hour.

FIGURE 4.1.2 Defined Tap-Tap Stations by Most Frequent Pick-up and Drop-off Areas (There Are No Formal Stations in the System)



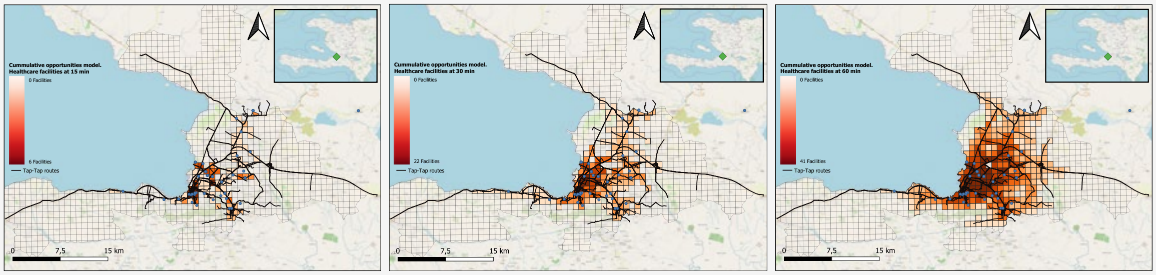
To illustrate the links between public transport services provided by the tap-tap network and land use in Port-au-Prince, an accessibility analysis was developed across the metropolitan region using cumulative opportunities indices for different types of facilities. The analysis of technical and professional schools in Port-au-Prince gives an indication of the travel demands for people in one of the user groups with more representativeness in the sample of tap-tap riders

FIGURE 4.1.3 Cumulative Opportunities Accessibility Index – Professional and Technical Schools at 15, 30, and 60 Minutes from the Trip Origin



Local access to such opportunities is very limited across the Port-au-Prince metropolitan region. Furthermore, as shown in the right panel of Figure 4.1.3, although accessibility increases within the 60-minute threshold, most peripheral areas do not reach these opportunities even with one- hour travel time.

FIGURE 4.1.4 Cumulative Opportunities Accessibility Index – Hospitals at 15, 30, and 60 Minutes from the Trip Origin



Analysis of opportunities for access to colleges and technical schools shows a similar spatial concentration pattern to that of other main travel attractors. Figure 4.1.4 shows that at 15 minutes, a minority of areas in very close proximity to the tap-tap network has access to at least one professional and/or technical school. Local access to such opportunities is very limited across the Port-au-Prince metropolitan region. Furthermore, as shown in the left panel of Figure 4.1.4, although accessibility increases within the 60-minute threshold, a majority of peripheral areas still do not reach these opportunities even with a one-hour travel time.

Paratransit in Port-au-Prince allows for coverage and affordability for a large share of the population. However, informal practices and inefficiencies can limit these benefits for those in more vulnerable situations such as low-wage earners and peripheral residents. The configuration of accessibility in the Port-au-Prince metropolitan area is more likely to penalize vulnerable groups living in the peripheries, given the high concentration of opportunities in the center of the city. The analysis by age and gender of origin-destinations in areas with different levels of accessibility suggests that among those with lower accessibility there tends to be a marginally higher percentage of women and the elderly.

In the Haitian context where resources are scarce and where transport occurs in an informal environment, manual data collection processes can be costly and inefficient. However, facilitating factors for recent data-gathering efforts include the development of new technologies such as smart phones and tablets, increasing accessibility to the Internet and mobile telecommunication, constantly improving integration of geolocation technology within communication devices, and the emergence of open-data platform.

1. This box was prepared by Raul Rodriguez, Pablo Guerrero, Raphael Dewez, Michael De LandSheer, Daniel Oviedo, Yisseth Scorcia, and Louis François Rodrigue.

4.2 Transit Reforms and Investments and Their Impact on the Poor

Since the late 1990s, Latin America and the Caribbean has witnessed major transit reforms aiming to transition from semi-informal and low-quality services towards large, robust, and integrated transit systems. These reforms represented the main response to the need to shake off accumulated inefficiency in transport practices, institutional weaknesses, and the consolidated power of privately managed public transport with very weak regulation. However, the distributional effects of these reforms, and their benefits and implications for low-income and socially vulnerable populations, are not often discussed. This section examines various cities across the region, focusing on different forms of public transport such as buses, metro, BRT, and cable cars, some of which are at the center of transit reforms. The cases include Bogota, Lima, Cali, Medellin, Santiago, and La Paz.

Public transit investments in the region have often been accompanied by significant institutional and regulatory reform. ECLAC (2016) estimated a total investment of approximately US$124 billion between 2016 and 2022 for urban mobility projects in Latin America and the Caribbean, with a significant emphasis on large-scale infrastructure. Between 2010 and 2020, 799.5 km of BRT infrastructure was built (BRT+ Centre of Excellence and EMBARQ 2021), which at an average of US$11,504,575 per km (in 2013 U.S. dollars) (ITDP 2019) means that approximately US$9.2 billion (in 2013 U.S. dollars) was devoted to this type of infrastructure. In the same time frame, 113.1 km of urban aerial cable cars were built in Bolivia, Colombia, Venezuela, Ecuador, the Dominican Republic, Brazil, and Mexico (World Bank 2020), amounting to about US$2.02 billion (in 2020 U.S. dollars). In 2021, 39 active projects worth a total of US$5.26 billion were expected in the region for the period between 2019 and 2025 (Hannon et al. 2020). In the case of light rail and metro systems, for the period between 2010 and 2020 over 308.2 km of new metro systems or extensions were built, which under a conservative assumption of US$150 million per km (in 2002 U.S. dollars) (Flyvbjerg, Bruzelius, and van Wee 2008), represents a combined investment of US$46.2 billion across Latin America and the Caribbean. Another US$50 billion in investments in metro and light rail are expected in the region for the period between 2019 and 2025 (Hannon et al. 2020).

4.2.1 Bus Rapid Transit and Integrated Transit Reforms

BRT systems have become a frequent reference of best practice in contemporary urban transport planning and represent an innovation in the region in terms public transit provision. Characterized by dedicated bus lanes, high-capacity articulated vehicles, and operational features that improve efficiency, such as off-board fare collection, level-platform boarding, and traffic signal prioritization, BRT systems are widely considered a cost-effective means of providing more efficient transit and reducing traveling times. Formalization schemes centered around bus and BRT investments have been carried out at different scales in several cities across the region. Bogota, Cali, Lima, and Santiago implemented a BRT technology with medium- and high-capacity buses. In contrast, La Paz, without using BRT technology, based its formalization process on the implementation of a medium-capacity bus system. Adopting hybrid-managed bus systems with a more active role of authorities in determining the structure of the transport network and levels of service and frequency forced a separation between revenue collection and operating activities that returned autonomy and control to the public sector to steer the development of the city's transport network (Wright,2011). Table 4.3 summarizes the initiatives in the five cities.

TABLE 4.3 Comparison of Implementation Approaches for Five Formal Bus-based Transportation Systems

City	Transport System	Year of implementation	Technology-based	Gradual Implementation	Scale of Implementation	Scope of First Phase
Bogota, Colombia	TransMilenio	2000–2003 Phase 1 2011 SITP	BRT scheme supported by high-capacity buses + medium capacity buses for a feeder system + integrated transit system	Yes	Corridor-level	30 km of segregated busways (trunk lines) implemented
Cali, Colombia	MIO	2009	BRT scheme supported by high-capacity buses + medium-capacity buses on non-trunks + feeder services + MIO Cable	Yes	Zone- level	Four trunk lines totaling 31.05 km
Lima, Peru	El Metropolitano	2010	BRT corridor – first of several planned mass transit lines in the city	Yes	Corridor-level	28.6 km of segregated trunk line + feeder routes, each extending up to 14 km in low-income areas
La Paz, Bolivia	Pumakatari	2013	Medium capacity buses	Yes	Corridor-level	Three service routes on mixed traffic lanes
Santiago, Chile	Transantiago	2007	BRT scheme supported by high-capacity buses + medium-capacity buses for feeder system.	No	City-level	n.a.

Source: Prepared by the authors based upon Tun et al. (2020), Scholl et al. (2016) (for the cases of Lima and Cali); on La Paz Bus (2022) and Bürger Jens (2018) for La Paz; on Red Metropolitana de Movilidad 2022) for Santiago; and on Teunissen et al. (2015) and (TransMilenio 2022) for Bogota.
Note: BRT: Bus Rapid Transit.

One of the main examples of these reforms that ultimately influenced other reforms across the region occurred in Bogota. In 2000, the city initiated a plan for a comprehensive new BRT system of exclusive bus lanes and feeder routes through the busiest corridors of the city. Bogota opted for a scheme based on the progressive implementation of trunk lines of its BRT-type system (named TransMilenio) through the provision of integrated trunk and feeder services. This approach sought, among other things, to generate a progressive withdrawal of informal operators, who were strongly opposed to it at the time. Buses along exclusive lanes were designed to operate somewhat like a rail, including enclosed bus stations accessed by pedestrian bridges, off-board payment systems, and level platform boarding. Not only did TransMilenio represent an unprecedented change in urban transport policy in terms of technology, infrastructure, and operation; it also entailed a restructuring of longstanding weaknesses in local and regional transport management institutions and the organization of private actors in the provision of public transport services.

Bogota created a public agency, TransMilenio S.A, which manages and plans the system, competitively tendering out routes to private operators. Schedules and routes are controlled and monitored by a traffic control agency using an electronic satellite positioning system. Bus firms are compensated by the number of kilometers driven and the quality of service, de-linking passenger revenues from operations and the incentive for aggressive driving behavior. In addition, an electronic pre-paid card system allows for fare integration.

The required regulation and policy changes for implementation of TransMilenio greatly influenced urban policies in Colombia. This opened the door to a new regulatory framework originated in the national urban development policy. The National Policy to Improve Public Urban Passenger Transport Services launched in 2002, two years after TransMilenio started operating, provided policy guidelines aimed at improving urban public transport services through the application of innovative financial techniques and management tools. Following Bogota's experience, Colombia's national government aimed to strengthen the decentralization and increasing productivity of large and medium-sized cities using public transport as an instrument of urban management and development (CONPES 2002). The objectives of the National Urban Transport Policy encompassed physical, economic, and institutional interventions to achieve sustainable and inclusive mobility. The ambitious policy framework set by the government aimed to institutionally strengthen cities in the planning, management, regulation, and control processes of traffic and transport. It encouraged the implementation of public transport systems that could respond to the travel needs of the population under criteria of operational, economic, and environmental efficiency. One of the central issues of TransMilenio-influenced urban policy was an explicit aim to break the inertia motivating local governments to continue expanding road infrastructure. This encouraged the implementation of BRT systems in five large metropolitan areas in the country, and the conceptual development of thoroughly integrated transport systems that would eliminate most atomized operation of traditional public transport.

Cali's first integrated mass transit system, the MIO, constituted a comprehensive response to the city's transport challenges. Inaugurated in 2009, the system took a holistic approach to address Cali's mobility and environmental issues. The city increased the scale of intervention by planning the Western Integrated Mass Transit System with a vision of comprehensive coverage of the metropolitan area. The goal was for high-capacity services to circulate on segregated trunk lines and be integrated operationally and fare-wise with medium-capacity bus services operating along preferential lanes. Implementation of the MIO, which started in 2009, was carried out in different progressive phases.

Moving to Peru, the Metropolitan Area of Lima-Callao has been slowly and continually transforming its transport system. Developed between 1996 and 2000, the Metropolitan Area Urban Transport Project aimed to increase mobility and reduce the social and environmental costs of transport by connecting the most populous areas of the city to important employment centers. The first part of this project was the BRT line, the Metropolitano, inaugurated in 2010, followed by implementation of its first metro line, Line 1, a few years later. The two systems were instrumental in helping to connect two of the fastest-growing areas of the city and lower-income neighborhoods in the northern and southern cones of the city with the financial district, major universities, and the historic downtown. The systems were built gradually but were fully operational by 2014. By 2019, ridership reached more 700,000 validations daily on the Metropolitano, and more than 550,000 passengers per day for Line 1. However, while these two projects represented significant improvements to the city's transport system, they accounted for a relatively small share of the total transport demand, and much of the transport system remains informal (Darido et al. 2015). Lima's BRT serves one of the highest-demand corridors. The system includes 28.6 km of segregated busway, with 35 stations, two terminals, and a central transfer and feeder routes that extend from the two terminals up to 14 km into the north and south cones of the city, reaching into low-income neighborhoods. It offers passing lanes and a mix of regular and express services (Martinez et al. 2018). It also offers higher-quality service: it is safer and more reliable, provides universal access, has dedicated stations and terminals, operates more hours than the traditional service, and complies with strict vehicle emission standards.

One of the most prominent examples in the region of a system that planned for better quality, efficiency, and complete regulation of informality was Transantiago in Santiago de Chile. The Santiago case contrasts with the gradual implementation of systems in Bogota and Cali. A new planning body, Tran Santiago, was created to conduct all urban transport planning for the city. The sweeping intervention inaugurated in 2007 sought to reform the entire system and formalize a hitherto informal and atomized bus system into a modern, more sustainable, and metro-integrated trunk-feeder system. The agency developed a comprehensive plan modeled after similar systems in Curitiba, Brazil and Bogota, Colombia that involved the creation of a network of privately financed exclusive busways along a trunk and feeder network. Transantiago adopted a strategy, which has been coined as "Big Bang" (Muñoz et al. 2014; Tun et al. 2020), in which its BRT system came into operation simultaneously throughout the entire metropolitan area, which represented a significant challenge at the time.

In La Paz, in a context of high levels of informality, a turning point came in 2013 with the creation of a new transportation agency (*Servicio de Transporte Municipal* - SETRAM) to oversee the design and implementation of a formal mass transit system. The Pumakatari buses represented the first action to consolidate an integrated transportation system, called La Paz Bus. La Paz followed Bogota's model of gradual implementation at the corridor level, and in its initial phase, SETRAM implemented three Pumakatari lines operated by 61 medium-capacity buses (60 passengers per bus). In its second phase, 80 additional buses were incorporated to serve three new lines and cover a total length of 66 kilometers (Bürger 2018). The original plan of the transport agency was to include a full BRT system, but to date the buses are operating along semi-dedicated lanes.

Public Transit Investments and Policy Reforms in the Region and Their impacts on Vulnerable Groups: What Do We Know?

BRT systems and transit reforms have reduced travel times and increased connectivity to major employment and activity centers. In addition, as these systems are often equipped with lighting, security personnel, and cameras at stations and onboard trains, they bring substantial improvements in terms of the safety and quality of public transit. In-vehicle travel time savings have been particularly large for systems such as BRTs and Metros that operate along dedicated lanes separated from mixed traffic corridors in areas with high levels of traffic congestion. Given that they tend to be placed in areas with high demand that connect to key activity or economic centers, the systems also can increase accessibility for those who are able (physically and financially).

Within a year of operation, TransMilenio (Bogota) was able to increase bus speeds that had been ranging between 12 and 18 km/hour to 26.7 km/hour (on average) and to decrease travel times by approximately 32 percent (Estache and Gómez-Lobo 2004). Similar trends were observed in Lima and Cali. In Lima, before implementation of the system the average trip time from one end of the trunk line to the other took 55 minutes, compared to 35 minutes on average once the system opened (Scholl et al. 2015). Low-income populations living near the system had a highly positive perception of its overall speed. Moreover, inhabitants of the urban fringe saw travel time reductions of up to one hour. The BRT in Cali extended beyond the city center to the city outskirts, delivering travel time savings of more than 11 minutes to 80 to 90 percent of lower-income groups.

Quality of service

The modernization of public transport systems has also generated several key benefits in terms of quality of service and personal security. First, as part of their reforms most cities included upgrades to vehicles, which generated better accessibility (see Chapter 2) as well as environmental and safety improvements.

In Lima, Cali, and Bogota, the BRTs (and the metro line in Lima) included several features to enhance quality, public safety, and security. For example, level boarding, universally accessible stations and vehicles, and fare integration improved service for users of varying abilities. Moreover, stations and vehicles were equipped with lighting, security personnel, and security cameras, which represent substantial improvements relative to the safety of the rest of the city's public transit system. An IDB study by Galiano and Jaitman (2016) found that while Lima's public transit system overall is still one of the least secure in the region, the Metro Line 1 was ranked by women to be the safest, followed by the BRT, buses, and finally microbuses.

The Pumakatari scheme in La Paz began operations with a limited fleet of buses, but despite its initial limitations this new bus system offered considerably better-quality standards for users. The improvements included medium-capacity buses, new bus stations, and a new configuration of route itineraries, which improved passenger loading and schedule reliability, and reduced travel time for users. Pumakatari also has a more affordable system in terms of fare regulation, benefiting public-transit-captive users more than the previous transport scheme.

The photo on the left shows the fleet of microbuses servicing one bus stop in La Paz.
The photo on the right shows a Pumakatari bus stop.

Photos: Shutterstock & La Paz BUS.

Other improvements from the Pumakatari system include allowing for multimodal integration (bike-bus), the use of smart cards, and the progressive coverage of more geographical zones of La Paz. These improvements also impact quality and coverage, principally better proximity, environmental sustainability, and user comfort. According to a 2016 satisfaction survey of the Pumakatari system, transit users in La Paz prefer it over the conventional (informal) public transport service. In the survey, the main reasons for choosing Pumakatari were safety, comfort, fare, reliability, and customer service, with 88 percent of those interviewed saying that they could have made their trip on a minibus, trufi, or micro.

Safety and public health

Road safety and health have also been significantly improved by several of the reforms. For example, in Bogota. Hidalgo et al. (2013) estimated that in 2013 the first two phases of TransMilenio (from 1998 to 2013) resulted in gains of US$167 million (in 2008 U.S. dollars) due to reductions in injuries and deaths from road accidents. During the same time frame, there was an estimated US$144 million (in 2008 U.S. dollars) gain in health given improvements in air quality (Hidalgo et al. 2013). Perhaps one of the most salient improvements brought about by BRT reform has been environmental benefits resulting from the reduction in the oversupply of old polluting buses, introduction of lower-emissions buses, and implementation of bus scrapping programs. In the case of Cali, these measures are estimated to have reduced emissions of $PM_{2.5}$ by 66 percent from 2008 to 2015, which led to significant public health benefits (Scholl et al. 2015) Lima's system resulted in substantial corridor-level reductions of $PM_{2.5}$ of 17 percent in 2012 and 19 percent in 2013 (Scholl. et al, 2015). In the case of Bogota, pollution levels fell dramatically: sulfur dioxide concentration levels fell by 43 percent, NO_2 fell by 13 to 41 percent (depending on the season), and particulate matter (< 10 microns) fell by 17 to 31 percent (depending on the season). In terms of accident safety and air quality, BRT systems may be particularly benefiting lower-income groups, given that they tend to be disproportionately affected by transport-related emissions and road injuries (Bocarejo and Urrego 2022).

Positive impacts on time use, accessibility to employment, and other opportunities

Travel time savings and improvements in quality of service and security as a result of investments in urban transport have led to positive labor market impacts for populations living near the system. Martinez et al. (2018) analyze the case of Lima, focusing on the impact on women. The share of women using public transport increased 8 percentage points, indicating that the opening of the BRT and Line 1 strongly pulled women into using the system. Employment for women increased after the new line was implemented, and earnings per hour increased for women close to the project (Box 4.2).

BOX 4.2

The Employment Impacts of Public Transport Systems: Lessons from Lima, Peru[1]

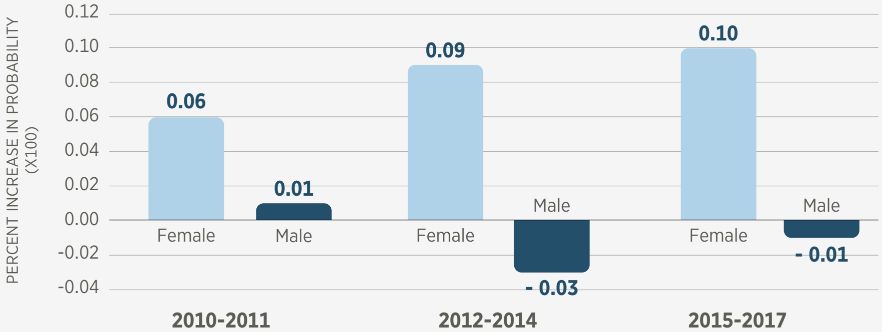
The role of urban transport in access to employment opportunities is undeniable. The urban poor either forgo trips or endure long and costly travel times to get to their jobs or carry out other tasks, a circumstance that aggravates social inequalities. In addition, women, particularly those from lower-income segments, often face barriers in their daily mobility and accessibility due to personal safety concerns and high rates of harassment in crowded transit systems (Osmond and Woodcock 2015; Simicevic, Milosavljevic, and Djoric 2016).

Two evaluations conducted by IDB and IDB Invest teams explore the impact of urban transport systems on employment by looking at the opening of two urban transportation modes in the metropolitan region of Lima: Bus Rapid Transit System (BRT), better known as the Metropolitano, and an elevated light rail, better known as Metro Line 1.

To quantify the causal impacts of the two transport systems, the studies estimate propensity score matched difference-in-differences models, combining annual data from the Peruvian National Household Survey from 2007 to 2018. The methodology compares changes in employment indicators for men and women living in areas that are closer to these transport systems versus those living in comparable areas that are farther away and with limited access to these services. It also compares areas with higher and lower socioeconomic status at different distances from the systems. To characterize small areas or neighborhoods prior to the entry into operation of the BRT and Line 1, the teams used the 2008 economic census, the 2007 population census, and a 2004 origin-destination survey.

The results from the analysis showed large increases in employment and earnings per hour among women, but not men, associated with these transport investments. As shown in Figure 4.2.1, effects on women's employment increased over time on the order of 6 percentage points from 2010 to 2011, 9 percentage points from 2012 to 2014, and 10 percentage points from 2015 to 2017. These effects suggest increases of between 9.5 and 16 percent with respect to the pre-treatment employment rate among women living in the treatment area. Moreover, the analysis showed an increase in hourly earnings among women on the order of 17 to 27 percent, mostly driven by women who were not previously participating in the labor market. Most of the gains arise from more women being employed, however, their employment does not appear to be of higher quality in terms of wages than that for comparison groups. The study also found evidence of an increase in the use of public transport, with women reporting an increase of 46 percent in their public transport expenditures, which supports the hypothesis that improved access to transport led to improved access to employment.

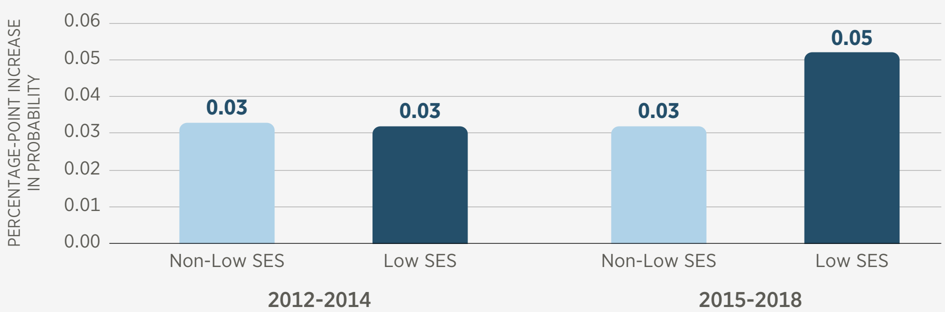
FIGURE 4.2.1 Impact of the Bus Rapid Transit and Metro Line 1 Investments on Women's Employment Rates in Lima: Changes in the Probability of Employment for Women versus Men (percent)



Source: Prepared by the authors based on Martinez et al. (2020).
Note: Numbers in gold denote statistically significant at 1 percent significance level.

For the analysis across socioeconomic status, the findings suggest that populations living in poorer areas also saw significant improvements in their employment conditions compared to those living in relatively richer areas. Specifically, the probability of being employed increased by 6 percentage points for this lower-SES areas, while no statistically significant impact was observed for non-low SES groups (Figure 4.2.2). Moreover, results show that these workers were increasingly getting jobs as employees and domestic workers, as opposed to being occupied in self-employed and homemaker categories. All of the effects observed appeared in the full operation period (2015–2017).

FIGURE 4.2.2 Changes in the Probability of Employment in Low versus Non-low Socioeconomic Strata Areas



Source: Prepared by the authors
Note: Numbers in gold denote statistically significant at 1 percent significance level. SES: socioeconomic strata.

Overall, these findings suggest that infrastructure investments that increase safety and improve travel times for women using public transport can generate important labor market impacts for women who reside in the area of influence of these projects. The quality of the jobs they hold once their accessibility opportunities increase is still an area that needs to be further examined and may require additional structural interventions beyond the reach of the transport sector. Regardless, the power of transport investments in facilitating access to opportunities and encouraging changes in time allocation decisions for women appears to be quite remarkable. Results also highlight the important role of these investments in promoting the inclusion of lower-income populations and facilitating their access to job markets. Given this, and to maximize the impact of such investments, it is important to carefully consider during project design how these systems can help connect lower-income populations to strategic areas of economic activity and their affordability.

1. This box was prepared by Daniel Martínez, Oscar A. Mitnik, Edgar Salgado, Lynn Scholl, and Patricia Yañez-Pagans.

Challenges to Providing Socially Inclusive Public Transit Systems

While transit reforms have improved the quality of buses and standards of service, several challenges have been observed in implementation that have undermined the social inclusion objectives and led to barriers for low-income groups related to affordability, coverage, and service quality. Additionally, the goals for improved service quality, mobility, and access for users were often challenged by lower-than-forecast ridership and financial difficulties experienced by bus operators. Moreover, route optimization and a focus on efficiency from the point of view of the vehicle have led to untended consequences such as an increase of generalized travel costs due to an increase in wait times and transfers.

Disparities in coverage and accessibility

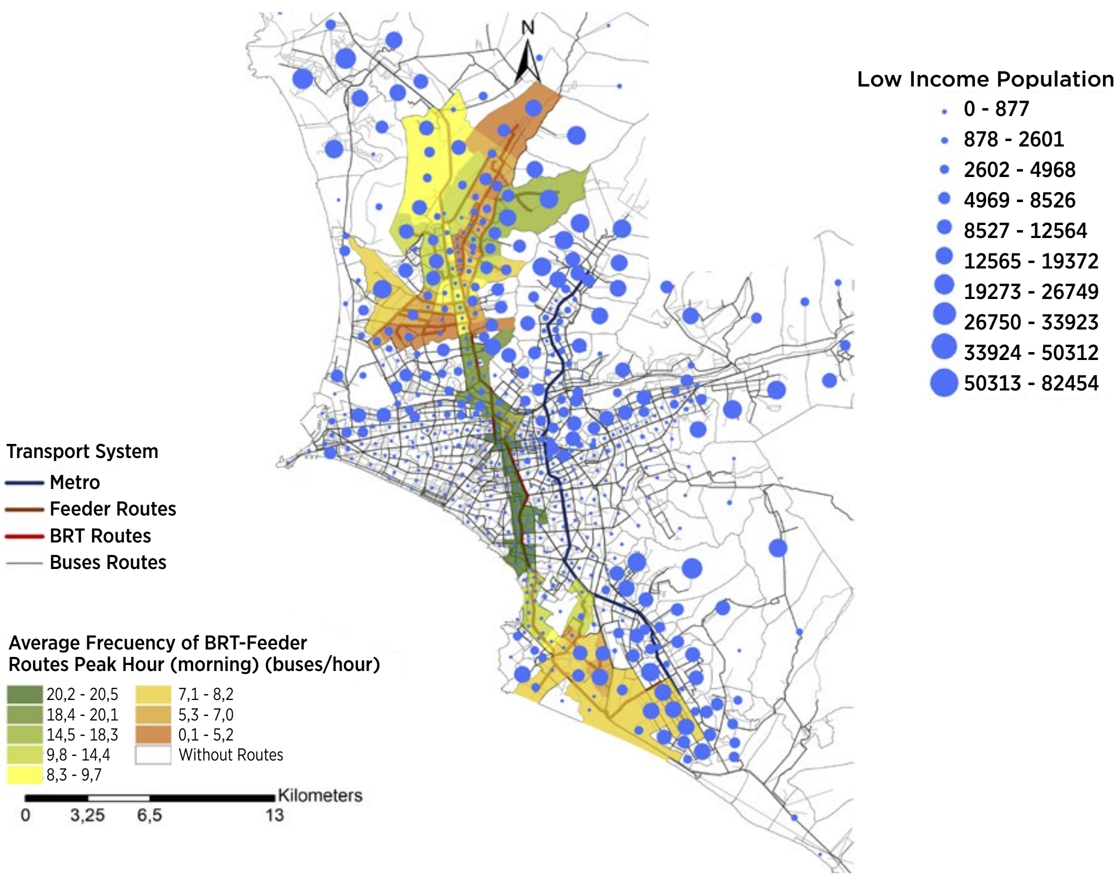
Despite the benefits of the BRT systems, many did not reach lower-income neighborhoods, particularly in the case of single-corridor interventions. In Lima, while the extensive feeder system increases the reach of the BRT system into lower-income areas, overall, the BRT system provides service to middle- and low-SES areas.[3]. This is in part due to the hilly and difficult terrain in these

3. In Lima, Peru, SES C and D are correlated with middle- and low-income households, respectively.

often-informal neighborhoods as well as a lack of infrastructure needed to support bus services in extremely poor neighborhoods where roads are often narrow, unpaved, steep, and winding. As a result, these neighborhoods are served by informal mototaxis. Just 3 percent of extremely poor areas enjoy feeder services, while 31 percent of the areas served are middle-SES areas (Scholl et al. 2016). Moreover, the trunk line that provides most of the travel time savings system covers primarily middle-income zones.

The share of ridership on the system among poor and very poor people living near the system (43 percent) is lower than that same share for the middle class (57 percent). A survey of transit riders living within walking distance of the system found that a majority of the respondents who said they rode the system more than once a week were low-to-middle-income strata, compared to 19 percent of regular riders who were classified as poor or extremely poor.

FIGURE 4.12 Coverage of the Bus Rapid Transit and Metro Lines and Low-income populations



Source: Scholl et al. (2016)

In general terms, in Bogota, TransMilenio provided better coverage to low-income groups compared to other systems. More than 48 percent of lower-income people were estimated to live within a five-minute walking distance from a TransMilenio station (Teunissen et al. 2015). The percentage was lower for the middle-income population (34.7 percent) and high-income population (4.4 percent). Percentages for groups within a 15-minute walking distance to a TransMilenio station were 74.4 percent for low-income, 72 percent for middle-income, and 33.2 percent for high-income (Teunissen et al. 2015). Despite the better coverage, however, low-income groups still experience fewer benefits. For example, high-income group have more access to opportunities and facilities and perform more than twice the number of trips than low-income groups (Guzman and Bocarejo 2017). The notion of inequalities in accessibility despite no coverage inequalities is reinforced by other studies. For example, Guzman et al. (2017), using potential public transportation accessibility models (considering work and study opportunities) estimated accessibility per capita of 3.05 (work or study opportunities available) for low-income groups, 3.35 for medium-income groups, and 3.63 for high-income groups. Interestingly, this study also shows that these values are higher than accessibility per capita by car (1.91 for low-income, 2.38 for medium-income, and 2.5 for high-income) but lower than accessibility per capita by bus (5.2 for low-income, 6.87 for medium-income, and 8.07 for high-income). Bocarejo and Oviedo (2012) highlight that a fare policy aimed at reducing the cost of transportation (so more people can afford it) might have a more equitable impact than improving and expanding coverage of transit stations (Guzman and Bocarejo 2017).

In Cali, while the MIO system was designed to serve almost all demand in the city by using the main corridors, marginalized neighborhoods in the periphery and industrial sectors that provide employment to many lower-income groups remained relatively uncovered. The eastern section of the MIO system was planned to be served by a trunk service, yet given terrain and fiscal difficulties, it was transformed into a pre-trunk service (Scholl et al. 2016). This area is more densely populated than other parts of the city and has a higher share of lower-income groups, yet the final design depended more on prevailing routes than on an assessment of the needs of populations living in this area. Although the public transit agency had a goal for the MIO to achieve 100 percent spatial coverage in the city, financial and technical evaluations of the requirements to achieve that goal made the government decide to forego geographic expansion of the system. This decision was primarily due to the difficulties of maintaining services within minimum parameters (mainly in terms of providing the required frequency of service), especially in peripheral areas (Scholl et al. 2016). Nevertheless, the system managed to achieve a high level of geographical coverage of Cali. For example, 92 percent of the very poor are at most 15 minutes walking distance from the system feeders, and in most zones, coverage exceeds 90 percent, except in stratum 1, where MIO reaches 87 percent of the zones on average (the number of routes per zone is similar for most strata, between 12 and 13) demonstrating a high focus on system equity.

Affordability and accessibility barriers

Lack of coverage combined with affordability barriers has resulted in lower relative accessibility to the benefits of transport among disadvantaged groups. Disparities in accessibility benefits are linked to the affordability of the systems, which may preclude use by disadvantaged populations despite physical coverage (Bocarejo and Oviedo 2012; Teunissen et al. (2015). In Lima, 35 percent of the very poor find the fare inaccessible. Nevertheless, the integrated fare that allows a free transfer between the BRT and feeders is generally perceived as affordable and as a positive feature of the system (Scholl et al., 2016). In Lima, people in extreme poverty allocate 16 percent of their income to travel, a similar value to non-users of the system (17 percent) (Scholl et al. 2016). In Cali, MIO users living in poverty invest 18 percent of their income, while non-users invest 20 percent (Scholl et al. 2016).

Financial sustainability and service quality issues

Transit operators have also faced financial sustainability issues that have affected service quality and social inclusion. For example, in Cali, the MIO experienced challenges in implementation related to negotiations with the incumbent operators, higher-than-expected operational costs, and lower-than-expected ridership. This caused a financial crisis that led two of the four operators to face bankruptcy before a financial stabilization plan was implemented in subsequent years (2013–2016), However, although this reportedly helped the financially sustainability of the transportation system and increased the number of buses in operation, it also led to fare increases for users (Tun et al. 2020).

Results of focus groups of transit users in Lima suggest that people living within the area of influence of the system found that service quality issues, along with a lack of service to their main destinations, were the main reasons to not use the system. Low-income transit users explained that more significant issues with the Metropolitano included unreliable feeder services, a lack of lines serving their key destinations, overcrowding of stations and feeder lines during peak hours (making boarding near impossible), and long lines both to charge cards and to get onto the buses (Scholl et al. 2016).

In Santiago, the transit reforms initially faced several challenges, including rationalization of buses leading to overcrowded and unreliable service, and to service changes that passengers had to suddenly familiarize themselves with (Muñoz and Gschwender 2008). The result of the new layout, which entailed an integrated system built upon trunk and feeder configurations and consolidation of numerous vehicles into a fewer number of larger buses, meant more transfers (the mean number of transfers per trip increased five times), less coverage (370 routes were reduced to 132 feeder routes), and less connectivity in the periphery (Morande and Doña 2007).

Although the TranSantiago system represented an improvement for users in terms of vehicle fleet quality, fare integration, and service modernization, system coverage to date faces equity challenges, especially when considering accessibility from social-housing districts. Martinez et al. (2018) developed connectivity equity indicators for the area served by Transantiago and found that areas comprised mostly of social housing require more time to reach various activities compared to city averages, with healthcare and employment facilities presenting the most significant differences. The analysis shows two types of territorial disadvantages, geographic and transport. Given the concentration of facilities in the city, they location of social housing is also key to guaranteeing adequate equity of opportunities (see Chapter 3).

The initial phase of TransSantiago remains a testament to how initiatives to promote better quality, sustainability, and modernization, while laudable in their purpose, can have room for improvement when it comes to effectively serving the most vulnerable. The formalization of services, the modernization of the fleet, and the operational efficiency criteria that prioritize the system's financial sustainability may not necessarily represent better service in terms of coverage than the former semi-formal atomized system (Munoz et al. 2016). Incremental approaches that integrate existing parties have proven to be more effective in the long run (Gómez-Lobo 2020). However, smaller-scale interventions do not guarantee positive outcomes for transport-disadvantaged communities either.

In La Paz, the optimization of routes and stops provided by the Pumakatari may be detrimental to the direct connectivity that informal services provide by allowing multiple connections without requiring transfers. The route/length ratio reveals how efficient a transport route can be within a network. Low values correspond to inefficiencies such as a high number of transfers and overlaps, and low values are associated with more formal systems with better route planning. Bürger (2008) analyzed the route-to-line-length ratio of Pumakatari and informal services and found values of 0.9 for Pumakatari services in contrast to an average of 0.01 for informal services.[4] This implies that the more direct and perhaps faster services require more transfers for longer trips, which may affect the most vulnerable population when systems do not offer operational and fare integration. Achieving a positive change in users' perception of their public transport systems necessarily implies comprehensively improving the coverage conditions and quality of the transit systems. This process, like that of customer loyalty, involves a culture of continuous improvement. For this reason,

4. Route length refers to the unique distance covered by each mode type (for example, a street segment served by multiple routes is only counted once toward the total route length). In contrast, line length is the total of all lines independent of overlapping route segments using the same roads.

Pumakatari is working on its operational integration with the Cable de la Paz system and with the city's future BRT system.

Challenges faced in the transit reform in these cities echo that of the general experience of medium-size and large cities in Colombia. A focus on system efficiency has led to decreased fleet sizes (through the consolidation of mini-buses into larger less coordinated buses), more crowding in vehicles, and a long-term reduction in passengers using the system (Gómez-Lobo 2020). Gomez-Lobo (2020) argues that this reduced fleet, and the additional transfers increased the generalized cost of transport in the system. In the absence of operating subsidies or other relevant alternative sources, transport systems rely exclusively on the collection of user fares as their primary source of revenue for financial sustainability, which limits the positive benefits of actions to address the needs of the most vulnerable.

In the case of the Integrated Public Transit System of Bogota (SITP), an operating subsidy has been implemented with overall positive results (see Chapter 5). Also, in the first phases of TransMilenio, the government made the feeder routes free for the lower SES and for areas located far away from transit stations.[5] The requirement for financial stability of operations based on fare revenues may lead to a lack of service coverage in areas with lower demand. For disadvantaged groups, this can mean more walking, longer waiting times, and more transfers. The transit reforms were expensive, and the costs were covered primarily by excessive fleet rationalization and could possibly lead to increased fares in the long run. These negative effects led to reduced ridership, which in turn resulted in cuts in service frequency, reliability, and coverage by operators and ultimately increased motorization (Gómez-Lobo 2020).

Continued informality

These challenges related to financial sustainability and to inadequate diagnosis of the specific needs of the poor in terms of service gaps and barriers to transport accessibility in lower-income areas, combined with political difficulties in reforming the informal transit sector, have led to informal transit services continuing to operate in parallel, oftentimes filling in gaps in service left by the new system. Additionally, in some cases, informal transit services provide more affordable options for shorter trips that are not easily served by a BRT or metro.

5. Information from the Transmilenio S. A. website, available at https://www.transmilenio.gov.co/preguntas-frecuentes/95/serviciosalimentadores/#:~:text=The%20feeder%20system%20is%C3%A1%20proposed%20for%20the%20needs%20of%20the%20users.

In cases where informality in public transit services persists, such as in Soacha (Colombia) and Quito (Ecuador), these services and operators are closely embedded in the communities they serve, often providing an added degree of flexibility and adaptability to the local needs of commuters in otherwise disconnected neighborhoods (Gamble and Dávalos 2019; Oviedo Hernandez and Titheridge 2016). Users of these services often acknowledge that they do so at the expense of higher risks and costs, and with lower quality and less efficiency than their more formal alternatives. However, due to users lacking a better alternative, informal operators tend to strengthen their presence in disadvantaged neighborhoods.

4.2.2 Negotiating Exclusionary Landscapes with Cable Cars

Reaching impoverished areas with public transit systems is often challenged by a lack of infrastructure, high levels of congestion, and difficult hilly terrain. One innovation in the region has been the installation of cable cars. These systems have generally been successful in reaching the poor in the context of and represent a key innovation for inclusive mobility. Cases in Colombia, Argentina, and Haiti (Gutiérrez 2009; Oviedo et al. 2022; Oviedo Hernandez and Titheridge 2016)) show that lack of proper streets make efforts to provide transport services with large vehicles too cumbersome, and result in higher rates of vehicle breakdowns.

Cable cars are a cable-guided system of individual gondolas or vehicles propelled by a continuously moving haul rope/cable that connects two terminal stations, typically at different elevations. Increasingly adopted in urban areas of the region, since the world-renowned case of Medellin in 2004, seven other cities in Latin America and the Caribbean have followed suit (Vergel-Tovar 2022). These systems are especially well suited to connect points at different altitudes and to reach points difficult to access by land. In that sense, gondolas naturally promote the integration of dislocated/hard-to-reach areas in the margins of developed road (and other) infrastructure (World Bank 2020). Furthermore, the capital investments for this kind of system are low compared to other alternatives in terms of both cost and time, with low land space requirements (Dávila, Julio 2012)

However, the throughput of the cable car systems tends to be lower than other mass transportation systems, with passenger flow rates, ranging between 1,000 and 4,500 passengers per hour and direction (compared to over 19,000 for light rail and over 25,000 for BRT). Also, as the use of cable cars is a relatively recent development in urban transportation, the literature on the impact of cable car systems on users is scarce. Most of the literature is anecdotal, with few impact evaluations (Garsous, Suárez-Aleman, and Serebrisky 2019). Nevertheless, positive results in terms of time savings (Martínez, Sánchez, and Yañez-Pagans 2018) accidents and personal safety (Bea 2016; Garnica Quiroga 2020; Heinrichs and Bernet 2014), access to opportunities (Bocarejo et al. 2014), and employment outcomes (Martínez, Sánchez, and Yañez-Pagans 2018; Matsuyuki et al. 2020) show the very valuable role cable cars can have in integrating communities that are difficult to reach with traditional urban transport systems.

Generally, these types of projects are implemented along with other urbanistic reforms and social programs (Brand and Dávila 2011). Although these clearly enhance the success of cable-car interventions (Bocarejo et al. 2014) it becomes difficult to disentangle the effects of the transportation reforms from the more general environmental and social improvements (Brand and Dávila 2011). This section discusses the findings for three distinct cases in the region: MetroCable in Medellin, Mi Teleferico in La Paz, and TransMiCable of Bogota.

The case of Medellin is one of the best documented urban transformations linked to aerial cables. The first K line started operating in 2004 and cost about US$24million (in 2012 U.S. dollars) (Dávila, Julio 2012). Although its initial objective was to act as a feeder for an underutilized metro system (Dávila, Julio 2012) the local government then expanded its implementation to an integral urban project with physical, social, and institutional citywide interventions (Bocarejo et al. 2014; Dávila, Julio 2012)

The cable car line connects to lower-income neighborhoods of El Alto to La Paz in Bolivia, reducing travel times and freeing up time for productive and recreational activities.

Mi Teleferico serves the metropolitan region of La Paz and El Alto in Bolivia. It addresses a major challenge for urban transportation in the city. With populations of roughly 1.1 million in the El Alto region and 900,000 in La Paz (INE 2021), a trip between the Irpavi station in La Paz, at 3,267 meters be sea level, and the 16th of July station in El Alto, at 4,095 meters, means a climb of over 828 meters, covering areas of highly informal settlements on hilly settlements. Since its inception in 2014, the Mi Teleferico aerial cable has expanded to 10 lines currently spanning over 32.7 km, with 35 stations. To date, this has represented an investment over US$831 million (in 2020 U.S. dollars) (World Bank 2020)

In Bogota, TransMiCable is located in the Ciudad Bolivar neighborhood, a peripheral region with high rates of poverty and inequality in the south part of the city. It began operations in December 2018 with the goal of improving access to informal and impoverished villages on the outskirts of Bogota's southern hillside. The system has one line with four terminals and a total length of 3.43 kilometers (Guzman et al. 2022), and cost US$73.7 million (in 2020 U.S. dollars) (World Bank 2020)

Travel Time Savings

Clear gains have materialized in terms of travel time savings as a result of the installation of cable car systems in the region. Medellin's K line shortened to 15 minutes previous 2.1 km trips (with a 400 meter climb) that took an hour by bus (Brand and Dávila 2011; Heinrichs and Bernet 2014). Similarly, a 10-minute ride on the Mi Teleférico from the outskirts of El Alto to downtown La Paz (Martinez, Sanchez and Yañez-Pagans 2018) replaced a 40-minute commute (during peak commuting hours) via small zig-zagging streets or a tolled motorway (Suárez-Aemán and Serebrisky 2017). In Bogota, one-stage trips on average last 43 minutes when using TransMiCable compared to 67 minutes when the cable system is not used (Unión Temporal Econometría – Sistemas Especializados de Información 2020). Other sources report an overall time savings of about 15 minutes with slight differences between outgoing and return trips (Muñoz Socha 2020) and 22 minutes savings with a higher percentage decrease in waiting times than in-vehicle travel times (Guevara et al. 2020).

Service Quality

The improvements in transit service quality brought about by cable cars is substantial for daily commuters and surrounding neighborhoods; prior to the building of the cable car system, the only public transportation alternatives between La Paz and El Alto were taxis, buses, and minibuses, all of which were extremely congested during peak hours. (Martínez, Sánchez, and Yañez-Pagans 2018). In Medellin, the MetroCable K line began offering more reliable service relative to the scarce conventional bus system and also provided modern stations for the residents of peripheral areas (Dávila and Daste 2011). The heavily populated hillside districts of Medellin were previously serviced solely by buses and sporadic cab service (Dávila 2012). The traditional bus system had no set schedule and was frequently impacted by street congestion, resulting in frequent bus bunching, long waiting times, and unreliable service (Heinrichs and Bernet 2014). In contrast, the MetroCable system bypasses street-level congestion and, as it is a continuous conveyor, cabins appear and go continually. This reportedly has had a positive subjective effect on users who experience less actual "waiting" (Heinrichs and Bernet 2014).

Especially relevant were quality upgrades for disadvantaged groups that now enjoy new ramps and elevators that make stations and facilities such as restrooms easily accessible for all (Libertun de Duren 2021; CAF 2018). In all cases, the principles of universal accessibility were considered and actively put into practice. In terms of environmental pollution, cable car systems have replaced emission-intensive transport modes, with low-consumption motors run with electricity and almost no acoustic pollution thanks to a noiseless mechanical system (Libertun de Duren 2021).

Safety

A distinctive feature of cable cars is the increased safety and perception of personal security of the passengers. The dedicated airway line replaces a much more twisting and unsafe commute, especially during peak, congested hours in the case of La Paz-El Alto (Martínez, Sánchez, and Yañez-Pagans 2018). In Medellin, MetroCable provides a safer alternative to informal buses, which offer no guarantees of vehicle safety or driver training, concerns often identified by women in focus groups (Heinrichs and Bernet 2014). The system's individual vehicles, with their maximum passenger allowances and seating arrangements, also help instill a sense of personal safety. MetroCable has cabins that hold up to 10 passengers, with two rows of four seated passengers facing each other and two passengers standing. This contributes to an uncrowded setting where groping or touching becomes very difficult without passengers immediately noticing. (Heinrichs and Bernet 2014). In Bogota, there are positive perceptions of safety on the TransMiCable thanks to the incorporated surveillance system around stations (Unión Temporal Econometría – Sistemas Especializados de Información 2020), dedicated policing around stations, and apps that allow for reporting criminal activities (Guevara et al. 2020).

Other Benefits

These gains in travel times have translated into benefits in other realms of daily life for populations living in the area of influence of the systems. An impact evaluation of La Paz's cable car has shown a decrease in private transportation expenditures and a rise in public transit spending, reflecting a mode shift driven by the cable car system, particularly for residents of El Alto living near the system, which has had significant population growth owing primarily to lower-income, rural migration and is now better connected to La Paz, the administrative capital and home to most of the metropolitan area's employment hubs. These shifts are more clear among residents who do not own a private vehicle (Martínez, Sánchez, and Yañez-Pagans 2018). Furthermore, as a consequence of commute time savings, time devoted to educational and leisure activities have increased by 32 minutes and 120 minutes per day, respectively. Educational travel expenditures have also risen significantly. This might be related to Mi Teleférico's improved access to a wider range of educational facilities (Martínez, Sánchez, and Yañez-Pagans 2018). Although no significant improvements were found in terms of unemployment rates, significant changes were found in self-employment and income (Martinez and Sanchez 2018, 15). Substantial gains of almost 50 percent in the rates of self-employed workers were also found, with accompanying large improvements in the income of household heads of about US$434 per month (from independent labor). These findings show that improving access to labor markets, through cable-car-based transit systems that improve public transit travel times and service quality may help individuals find new job opportunities and raise their income. These aggregated results are very promising for self-development of the users of the Mi Teleférico system in El Alto. They point towards a relevance of the system in lower-income sectors for improving mobility and reducing inequality.

In the case of Medellin, implementation of the cable car system offered an integrated tariff with the Metro and bus systems, making long-distance journeys with transfers more attractive via the integrated mass transit system. For example, it represented a 33 percent discount compared to an equivalent trip using two buses (Brand and Dávila 2011). Expenditure on transportation appears to have increased in many of the households using the system (Bocarejo et al. 2014), suggesting that those living in areas neighboring the K line became more mobile and enjoyed greater accessibility (Bocarejo et al. 2014). In two of the four communes around the MetroCable, unemployment has decreased. Male heads of household in the four communes did not reach the legal minimum wage in 2004 but surpassed it in 2009. A before-after study of the system found that female head of household salaries showed similar improvements in only two of the four communes (Coupé and Cardona 2012).

In Bogota, travel time savings on TransMiCable allowed users to devote more time to activities that contribute to well-being, such as spending more time on leisure and exercise. For example, users of the system were found to be more engaged in working, study, and leisure activities when compared to non-users (Dominguez Gamez 2022). However, no significant increase in transportation expenditures and personal incomes or reduction in poverty has been found for the impacted areas to date (Unión Temporal Econometría – Sistemas Especializados de Información 2020; Muñoz Socha 2019). Nevertheless, given the relatively recent implementation of the project, such results may be identified in future research.

Spillover Benefits in the Urban Environment

Perhaps the most significant result of the cable car systems has been the spillover of positive effects to the surrounding urban environment. The case of Medellin is especially well known for the significant reduction in violence in the urban areas neighboring the project; for example, between 2003 and 2008 homicide rates and violent events reported for the locations with the intervention were 66 percent and 74 percent lower than in areas without interventions (Cerdá et al. 2012).

In the case of Mi Teleférico, in La Paz/El Alto, the system had a multi-fold influence on urban accessibility, reducing travel times and ensuring physical and fare integration with other modes of transportation such as the Pumakatari and Waina buses, and with bicycles. Even more, it transformed the areas surrounding the stations into healthcare, business, education and recreation opportunity hubs (Libertun de Duren 2021).

Urban renewal interventions associated with the TransMiCable in Bogota.

An equally transformative effect has taken place in the surroundings of the TransMiCable in Bogota, including less noise pollution and improvements in street lighting, roads, and sidewalks. Although these effects did not occur homogeneously, the qualitative response of residents suggests an appreciation of the land prices close to the project stations (Unión Temporal Econometría – Sistemas Especializados de Información 2020). Critical urban interventions such as the provision of parks generated a positive and significant effect on the indicators of sports, recreation, and health activities, with a reported 24 percent increase in such activities (Unión Temporal Econometría – Sistemas Especializados de Información 2020). In addition, 41 percent of Ciudad Bolivar participants were more satisfied with their neighborhood and 19 percent recognized new parks after the TransMiCable intervention. Pre-existing parks (Illimani and Manitas) were also renovated to provide more room for socializing and physical activities, resulting in a rise in moderate and vigorous physical activity among those living within the intervention area (Guevara et al. 2020). The perception of the benefited population regarding their urban environment was more positive after implementation of the TransMiCable, which can be an important catalyst to continue reinforcing their well-being and sense of belonging and pride in their neighborhood, which is fundamental to greater social cohesion (Unión Temporal Econometría – Sistemas Especializados de Información 2020).

Challenges to Reaching All with Cable Cars

The areas where cable car systems are installed are disconnected from major infrastructure networks, in part due to their topographic conditions, and are home to a combination of lower-income populations and informality. Thus, affordability of the services is a key determinant to adoption and success of the system.

Affordability barriers

Surveys of MetroCable users in Medellin found that they chose to use the system primarily because of its reduced overall fare when conducting multimodal trips, followed by time savings. MetroCable's security and safety were not judged to be as important as the other aspects (Matsuyuki et al. 2020). Although poor groups, women, and unskilled employees were found to use the system is rarely used by the lowest-earning classes and those with the least education. This could also be linked to their profession being at home or nearby (Matsuyuki et al. 2020). Also, in the case of Medellin, the travel time savings do not consider waiting times, which at peak demand hours can last between 10 and 60 minutes (Dávila and Daste 2011). Added to the relative high cost of the ticket compared to average incomes, this could contribute to an overall low modal share of cable usage (Dávila and Daste 2011), especially among disadvantaged populations that, by 2011, accounted for less than 10 percent of the trips in the neighborhood of the station actually involved (Brand and Dávila 2011).

In La Paz, affordability is also a significant challenge. Time savings may not be enticing enough for the poorest sectors, as their marginal value of money may still not justify shifting from a longer microbus commute to the cable car system. This is reflected in the relatively low participation of the lower-income sectors close to the Mi Teleférico according to some surveys (Garsous, Suárez-Alemán, and Serebrisky 2019). A one-way ticket on the system cost 3 bolivianos in 2017 (about US$0.44), twice as much as the same trip on an informal minibus (Garsous, Suárez-Alemán, and Serebrisky 2019). This suggests why those in the lowest earning groups might still prefer a traditional minibus trip.

Similar setbacks have occurred in Bogota, where time limits for multimodal fare integration constitute affordability barriers for users; 15.6 percent of travelers do not use the TransMiCable system on return trips. Such behavior is derived from the possibility that a user has to change systems and pay an extra transfer cost if not within a time threshold (Garnica Quiroga 2020). Having to pay the transportation fare again to access the cable station if the initial trip takes too long, or similarly, when those who do not have a personalized transportation card must pay another fare, explains why some prefer to take the feeder routes, even if it means longer travel times (Muñoz Socha 2019). All of these constraints lessen the project's impact, which is why some residents opt to continue using their existing modes of transportation in order to avoid the increased expenditures. Although the operating company, TransMilenio, touted that the cable system would directly benefit 80,000 people daily, the truth is that it only reaches a quarter of that ridership (Muñoz Socha 2019).

Waiting times, crowding at peak hours, and difficult access to stations also constitute deterrents to system use. For example, as mentioned earlier the travel time savings of about 15 minutes in the case of Medellin do not consider waiting times, which at peak demand hours can last between 10 and 60 minutes (Dávila and Daste 2011). MetroCable also reports a loss of 3.6 minutes due to restrictions on transfers to the cable station (Muñoz Socha 2019). Capacity constraints in peak hours are also a recurring problem in many cable car systems. Although in-vehicle crowding is not a challenge for cable cars due to the restrictions on passengers who can board and the seating arrangements, this translates into longer wait times to board during peak hours (Guevara et al. 2020). Also, during holiday seasons (Capillé and Reiss 2019) and during maintenance operations (Guevara et al. 2020), the service becomes cumbersome or completely halted, resulting in unexpected delays. These various conditions can coalesce to make the cable system less attractive than it could be.

Time to access stations has also remained an issue due to the complicated orography of Medellin (Heinrichs and Bernet 2014), Bogota (Unión Temporal Econometría – Sistemas Especializados de Información 2020), and La Paz (Martinez and Sanchez 2018). The case of La Paz also shows the challenge of accessing the systems' stations, with a decrease of 7 percent in the probability of using the system for those more than 1 km away from a station (Martinez and Sanchez 2018). In Bogota, the likelihood of using the cable car system diminishes by up to 84 percent for every 100 meters a user is away from a station (Muñoz Socha 2019). Given that access to stations may involve extensive walking over steep climbs, this restricts access for those with less physical endurance (Dávila and Daste 2011). Nevertheless, studies have shown that many users are willing to experience long waiting times and walking distances to reduce total expenditure (Dávila and Daste 2011).

Continued informality

While some people profited from the location of the aerial cable stations because it reduced the number of transfers and removed costs associated with utilizing informal transit, others still must rely on informal transportation to get to the cable stations (Muñoz Socha 2019). This has highlighted the role of informal transportation modes in these communities. In Medellin, only a few bus lines are connected with the rest of the system, leaving smaller, frequently unofficial cooperative routes outside. Informal transportation is not criminalized and is widely used. These services continue to complement formal transport lines because of their capacity to permeate at a smaller scale and reach better door-to-door from house to destination in a direct manner. In Medellin, the MetroCable has strengthened existing local systems rather than eliminating them (Capillé and Reiss 2019). The most favored groups in the use of MetroCable are formal workers with long north-south trips who save on their total fare, rather than in significant time savings. Informal workers with shorter trips, women with multi-objective trips, and other groups such as the elderly and children do not use the system as much and may still find conventional informal bus systems more convenient (Dávila and Daste 2011).

Other restrictions of formal systems have also led to the inadvertent exclusion of informal groups. For example, the prohibition of oversized items on the metro system of Medellin limits the capacity of some informal workers to access the system (Brand and Dávila 2011). In Bogota, 48 percent of the feeder trips to the system are made via informal services. Thus, in Ciudad Bolívar, informal transport still represents a convenient alternative for the population despite its poor quality of service and lack of integration of rates and transfers (Unión Temporal Econometría – Sistemas Especializados de Información 2020).

Although often associated with host of negative externalities and often competition with formal systems, the prevalence of informal transit services frequently arises from gaps in coverage and a lack of affordability for lower income groups. Given its relevance for urban mobility, therefore, care must be exercised before giving way to hardline policy stances seeking to eradicate informal transport rather than improving it (Tun et al. 2020). Recent experience shows that the development of formal services should not plan for the complete removal of informal services. Villar-Uribe (2019) shows that the deployment of TransMiCable in Ciudad Bolivar in Bogota has had little effect on replacing the use of informal transit systems. To the contrary, new informal lines have sprung up to connect TransMiCable stations to the more rural areas of Ciudad Bolivar (Villar-Uribe 2019). There are similar findings with regard to informal transit in Medellin (Capillé and Reiss 2019). Such evidence points to the vital role informal systems play in covering areas that are not reached adequately by formal systems, and how they could benefit from proper integration and support for service quality and safety improvements (see also Chapter 8) that include pro-poor mobility developments.

Financing and key institutional points

Key to long-term sustainability is political support for the project from local communities, which in turn leads to partial financial sustainability. Connecting the service to mass transit, ensuring brief downtime for maintenance, providing local jobs during construction and operation, holding frequent public consultations, and linking systems to community spaces can make systems a source of pride and daily mobility for the local population and not just an attraction for "slum tourists," as is sometimes the case for aerial cable projects (Dávila 2021).

These systems should be supported by expenditures in peripheral social amenities in order to boost resource access and reduce exclusion. Parallel investments to enhance the size and quality of public areas, offer safer and higher-quality housing, contribute to economic development, and provide services such as libraries, reliable Internet, and professional training for people of all ages are key to integrate aerial cables into the community (Dávila 2021).

4.2.3 Summary of General Considerations for Improving Social inclusion in Metro, BRT, Bus, and Cable Systems in the Planning and Operational Phases

Table 4.3 summarizes the main challenges and opportunities from a perspective of social inclusion for different public transit systems analyzed in this chapter. From mass transit such as Bus Rapid Transit, integrated bus systems and metros, to targeted interventions, such as cable cars, for improving access in areas with difficult physical access in poorer areas historically overlooked in the provision of transport infrastructure and services, the table provides a synthesis of the main opportunities and constraints that metro, BRTs, buses, and cable-cars face for reaching vulnerable populations from a perspective of coverage and quality and the opportunities they present regarding improvements in social inclusion.

TABLE 4.4 Challenges and Opportunities for Social Inclusion of Different Transit Systems in Latin America and the Caribbean

Type of system	CHALLENGES	OPPORTUNITIES TO IMPROVE SOCIAL INCLUSION
METRO	The location of the most vulnerable persons in peripheral areas not usually reached by the subway, combined with gentrification phenomena that drive lower-income persons out of the city, make it difficult for the subway to be a main transportation alternative for the most vulnerable in terms of coverage. The high capital costs of the metro result in the need for subsidized fares, which can be higher than those of other modes of transport. Even in developed countries, low-income workers use the metro less.	From the planning stage itself, build a hierarchical transport network that efficiently feeds the metro network. This process of building a hierarchy should take into account the infrastructure at local, district, and metropolitan scales, and provide transport solutions suitably adapted to the constraints that these infrastructures may present. The hierarchical network must be operationally integrated and ensure the provision of continuous services (not necessarily using the metro network) that are adapted to the origin - Destination patterns, schedules, and other specific travel characteristics of vulnerable groups. Ideally, transfers should not be penalized in terms of extra fares in the case of the most vulnerable population when using metro services. The recurrent demand-side subsidy on subway fares should be adequately differentiated to generate a lower burden on the expenditure basket of vulnerable groups in order to ensure their use of the system.
BUS RAPID TRANSIT (BRT)	In the absence of operationally and tariff-integrated feeder systems, pure trunk systems may exclude the most vulnerable population in terms of coverage. The affordability of the system will depend to a large extent on its financial structuring.	Depending on whether it is a main or intermediate system, the system should be planned to be operationally integrated with other modes of a lower hierarchy, and/or to connect with higher-capacity systems. When defining the criteria for operational and fare integration, a clear and transparent policy should be established for the definition of feeder routes that gives priority to the most vulnerable through indicators such as maximum allowable geographic proximity to a station or socioeconomic stratum. This policy must be properly articulated in financial and contractual terms to ensure that these services will provide the necessary coverage, as settlement parameters vary, and will not be interrupted due to external factors that may affect the conditions for provision of these services, such as higher prices for operating inputs or fluctuations in passenger demand. The financial structuring of these systems should incorporate new sources of financing that go beyond high dependence on fare collection, which currently encourages operation under high levels of passenger saturation, which in turn has a negative impact on user comfort.

Type of system	CHALLENGES	OPPORTUNITIES TO IMPROVE SOCIAL INCLUSION
BUS	The flexibility of implementation and low operational costs make bus systems suitable for providing high coverage at low rates compared to other modes of transport. However, these same advantages work against bus systems, as they encourage an atomization of operating companies when there is a low regulatory environment. When bus services operate with obsolete fleets and low technology, the perceived benefits decrease considerably.	In the case of bus services that serve as main transportation systems, the following steps need to be taken: · Generate comprehensive policies for the formalization of bus transportation services that dignify both the user's travel conditions (modern, safe, universally accessible, and comfortable buses) and the drivers' working conditions (fixed working hours and fixed salary with social benefits). · Establish effective regulatory frameworks that promote the provision of transportation services under safe and reliable conditions in terms of services and itineraries, without oversupply conditions or route suspensions. · Provide bus routes that provide coverage to peripheral areas and unconventional schedules that adapt to the living conditions of the most vulnerable, for example, in areas where shift work is common and exceeds the conventional 9 to 5 hours. · Reinforce the institutional framework through the creation of robust public agencies in charge of managing the system and complying with quality indicators for infrastructure, bus fleet and services.
CABLE CARS	The capital and operating costs of the cable system allow it to be a feeder mode to major transportation systems such as BRT or Metro and therefore can have a favorable impact on household transportation expenditures, in addition to considerably shortening travel times for this excluded population. However, accessing cables can be a challenging task for residents in their area of influence and this can limit their benefits, as can be seen in the case of TransMiCable in Bogota.	Strengthen the presence of feeder routes in the vicinity of the cable systems to facilitate both the supply to the system as well as the mobilization of important loads in weight and size that are restricted to be transported on the cable systems.

Source: Prepared by the authors.

4.3 Conclusions and Policy Recommendations

The public transport sector in cities in the region has become a space for innovation in terms of infrastructure, service arrangements, and institutional and regulatory reforms that have resulted in substantial positive transformations of the urban transport landscape in relatively short periods of time. As a result of these initiatives, the region today boasts public transport systems that are hailed as international best practices in the sector, such as BRTs and aerial cable cars, particularly given their positive effects on the poor and disadvantaged. Both policy reforms and infrastructure investments have had positive impacts on the poor and disadvantaged in terms of a range of benefits associated with the coverage and quality of public transit services. Investments in BRT and cable cars have translated into significant travel time savings for populations historically challenged by both social and transport disadvantage. Such interventions have not only extended the coverage of public transport networks in cities of all sizes but have also provided higher-quality and modern services in areas where transport development had struggled in previous years. This modernization of public transit services has brought about a substantial improvement in commuting conditions for a large share of the urban population.

However, limited resources and the criteria for prioritization of public investment constrain the scale at which new services and infrastructure can be provided, creating a division between those that benefit from reforms and those bypassed by them who become captive users of informal or semi-formal alternatives. In addition, the current configuration of public transit services in Latin America and the Caribbean is largely the consequence of a long trajectory of privatization, deregulation, and informality, along with demographic and urban development patterns marked by social segregation and spatial inequality. In addition, significant public investments in transit infrastructure have been governed by decision-making and prioritization criteria that are aggregated at the city level and do not recognize the diversity of travel needs and preferences of the larger population, particularly lower-income, transit-dependent groups. The emphasis of conventional transport planning on efficiency, speed, and aggregated maximization of demand (i.e., serving as many people as possible) leads to continued focus on high-demand areas.

This development pattern of transport, coupled with an expectation that the system's operation be self-sustainable, often leads to lack of revenue to sustain high-quality transit service and gaps in coverage in peripheral and often disadvantaged neighborhoods. This calls for a redefinition of the financing of public transport and a consideration of differentiated fares and other forms of subsidies (see Chapter 5) that enable the poor to benefit from high-quality public transit without compromising their ability to afford other essential needs. Underinvestment in infrastructure in low-income and informal neighborhoods contributes to their progressive disconnection from the rest of the urban fabric. Furthermore, lack of political representation and participation in planning processes by low-income populations at distinct stages of project implementation leads to their needs and preferences going unaddressed (Kash and Hidalgo 2014).

The experiences of various Latin American and Caribbean cities with different forms of formal and informal public transit, illustrate a need for a more disaggregated approach to planning and decision-making in the transport sector. Moreover, it calls for an accessibility-based approach to public transport planning that increases the coverage, quality, and integration of public transit systems, targeting areas where disadvantaged populations lack access. Cable cars and other spatially targeted investments in infrastructure for low-income neighborhoods have shown that it is possible to integrate those historically bypassed areas of the city with transit systems that bring significant benefits for mobility, accessibility, and well-being. However, this requires a nuanced and deeper understanding of the socioeconomic composition of the population and its needs, preferences, and abilities.

Specific recommendations to strengthen the diagnosis, monitoring, and evaluation mechanisms of urban public transit require the use of disaggregated metrics for accessibility, coverage, and quality by relevant socioeconomic strata that enable comparisons of the levels of service quality and both spatial and temporal coverage that low-income and other disadvantaged populations receive compared to wealthier areas of the city. Accessibility metrics such as the cumulative opportunities index, which require relatively low amounts of data and are easily comparable across jurisdictions, can help with this objective (see Chapter 1). It is also recommended to set benchmarks and targets for service standards and minimal levels of access to public transit that help inform decisions geared towards reducing inequalities across income groups. Furthermore, monitoring tools – such as satisfaction surveys designed to enable comparative analysis of perceptions of a diversity of groups, including vulnerable and low-income populations, during the preparation and operation phases of public transit systems – are needed to help provide and adjust infrastructure and services that respond to the needs prioritized by communities.

Spaces for active participation in planning processes, such as participatory budgeting, proactive consultations, and representation of local communities in project appraisal and evaluation processes, are critical to fostering socially inclusive mobility. This also requires the recognition of the functional configuration of cities beyond municipal jurisdictions. Approaches to metropolitan planning can contribute not only to a more equitable allocation of resources and distribution of routes and frequencies of public transit services but can also allow for agreements and coordination of operations in areas with high demand that are not adequately serviced by networks restricted by municipal boundaries. Having metropolitan coordination is necessary to guarantee that jurisdictional issues will not compromise the continuity and coverage of transportation services.

Participation and representation should also be extended to the informal and small-scale operators currently meeting the needs of under-served communities. Despite their lower quality and externalities compared to high-capacity and modern public transit infrastructure and services, these services are flexible and adaptable to local needs. They are also embedded in communities and have networks that can facilitate the processes of formalization and modernization of public transport supply to low-income neighborhoods.

Operational and fare integration with other current systems and with alternative modes of transport are also critical to foster socially inclusive systems. The use of real-time data from Transportation Information Systems can be used both as a useful mechanism to support decision-making and to improve the quality and reliability of services, and to informs users about delays, detours, road works, or closures, giving users a tool to plan ahead and to increase system reliability, particularly in low-income areas. These initiatives can be complemented by efforts to improve service quality – for example, developing strategies for personnel training directed to customer service and implementing quality indices that allow for benchmarking customer satisfaction, identifying the performance of several independent quality attributes, and establishing a global measure of quality that can be disaggregated by income level, socioeconomic characteristics, and neighborhood and planning zones. Finally, cities should work to increase allocation of road space for public transit (e.g., dedicated bus lanes) and the integration of systems across public transit and other modes, including walking, cycling, and micromobility (e-scooters and e-bikes) (See Table 4.4, and Chapters 6 and 8) to improve first and last mile access to public transit in low-income areas.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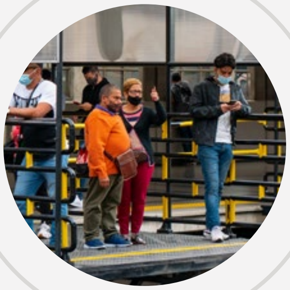
Out-of-Pocket: Transport Affordability and Social Inclusion

5



Daniel Oviedo[1]

The cost of transport can be a source of economic stress and vulnerability for those spending a disproportionate share of their income accessing mobility and the opportunities it makes available (Mattioli, Nicolas, and Gertz 2018). Transport affordability is the capacity of all socioeconomic groups to afford access to the urban services, opportunities, interactions, and activities they need or desire through transport given their disposable income after covering other basic expenses (El-Geneidy et al. 2016; Falavigna and Hernandez 2016; Kenyon, Lyons, and Rafferty 2002; Litman 2013; Lucas 2011, 2012). In other words, it is the ability to make necessary journeys to various income-generating and non-income-generating opportunities (i.e., work, school, health and other social services), as well as make visits to family members or make other urgent journeys without having to sacrifice other essential activities (Carruthers, Dick, and Saurkar 2005).

In simpler terms, affordability is the ratio between individual transport expenditure associated with making necessary/desired journeys and an individual's disposable income. Households' financial capacity to cover housing and transport costs is a product of their location and access to opportunities (land-use), income and consumption (individual), and time availability (time) (Tiznado-Aitken 2020). These in turn are underpinned by the configuration of infrastructure and services networks for urban mobility, transit pricing, operational costs, and funding sources (transport). Each of these determinants is influenced by different factors interacting at the national, city, and individual levels, leading to diverse individual experiences of transport affordability and wide social implications. This chapter will unpack such determinants of affordability and their interrelationships, provide evidence on their distribution between different socioeconomic groups, and discuss their links with accessibility and social exclusion in cities of Latin America and the Caribbean.

Transport expenditure is a function of individual needs and preferences, distance to opportunities, land-use configuration, and availability of transport. Affordability depends on the alternatives (e.g., the feasibility or practicality of walking or cycling as an alternative to using public transport) and other costs of living, including housing and the city's basic food basket, among other essential items in the household economy (Fay et al. 2017). Disposable income is a function of income distribution, which in turn is determined by macro determinants such as the legal minimum wage, employment rates, tax policies, and levels of informality. Therefore, although the experience of transport affordability is highly individualized, its determinants are influenced by issues of a national and city scale as much as household individual conditions that lead to a myriad of needs and abilities to pay for and access transport.

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A regional analysis of household transport expenditure across 12 countries in Latin America and the Caribbean found that private transport accounts for 76 percent and public transport accounts for the remaining 24 percent (Gandelman, Serebrisky, and Suárez-Alemán 2019). Despite comparatively lower total expenditure on public than private transport, public transport is often a necessity for poor and middle-income households, while higher-income citizens in the region perceive it as an inferior good (Gandelman, Serebrisky, and Suárez-Alemán 2019). When compared to the region's average purchasing power, transport expenditures as a percentage of income in Latin America and the Caribbean (17 percent) were among the highest compared to other world regions in 2010 (9 percent in sub-Saharan Africa, 11 percent in Eastern Europe and Central Asia, and 5 percent in South Asia).[2] This suggests that urban mobility in Latin America and the Caribbean is on average more expensive. Those with lower incomes tend to bear the highest economic burdens of accessibility. For example, in Port-Au-Prince, Haiti, domestic workers earning the minimum wage can spend between 10 and 24 percent of their income (depending on the number of transfers required) using the semi-formal public transport service known as tap-taps.

Approximately 68 percent of passenger travel in Latin American and Caribbean cities is through public and shared systems (Estupiñan et al. 2018). Recent assessments at the city level suggest that dependency on public transport can range from 28 percent in cities such as Santiago (Chile) to 72 percent in La Paz (Bolivia) (Tirachini 2019). Such figures add scale to the affordability problem in public transport systems at the city level.

The income share distribution of transport expenditure among socioeconomic groups can be a powerful indicator of the vast inequalities between rich and poor households regarding income, access, mobility needs, choices and preferences, and availability of services and infrastructure (Valenzuela-Levi 2021). Such inequalities can be amplified by intersecting differences in social identities of class, age, gender, ethnicity, and disability and their associated social and spatial positions, making transport expenditure a complex social issue that can prevent people from accessing relevant opportunities for social, economic, and cultural development (Levy 2013; Schwanen et al. 2015).

Furthermore, the consequences of unaffordable transport are diverse and have implications in the short, medium, and long terms. For instance, the inability to pay for transport can lead those with lower disposable income and other restrictions to individual urban mobility (e.g., disability) to forgo trips to relevant economic, social, or cultural opportunities (Motte-Baumvol and Nassi 2012; Porter 2007). Individuals priced out of transport can also become captive walkers who are bound to local

2. These figures might hide forgone trips and suffer from data issues, such as the extent to which transport expenditure is accurately measured across world regions, and the lack of available data for low-income groups. See https://datatopics.worldbank.org/consumption/sector/Transport.

mobility and access, experiencing different degrees of social exclusion (Bostock and Hons 2001; Iglesias et al. 2019; Marquet and Miralles-Guasch 2015).

Global agendas such as the United Nations Sustainable Development Goals (SDGs) highlight the significance of transport expenditure and its associated inequalities, as well as the role of public transport for sustainable and inclusive urban and transport development. There is an SDG for the reduction of inequalities within and among countries by 2030 (SDG 10), and affordable transport has also been adopted as a desirable development policy objective, as stated in target SDG 11.2 that urges the provision of "... access to safe, affordable, accessible and sustainable transport systems for all" with an emphasis on public and non-motorized transport.

Recent years have seen visible progress in policy and political discourse accompanied by increased public investment in public transport infrastructure and services, as well as greater recognition of the relevance of affordable public transport to redress inequalities related to mobility and accessibility. Despite this positive progress in policy and practice, however, diverse challenges still pose barriers to the achievement of affordable urban transport systems for all (Dewita, Yen,and Burke 2018; Gómez-Lobo 2020; Hidalgo and Huizenga 2013). These challenges include structural issues at the city level such as increasing private motorization and car-oriented development, which reduce the viability of cost-effective public transit provision. Furthermore, rapid growth of low-income peripheral settlements with inadequate access to formal public transport increases costs for the poor and leads to stark trade-offs between housing and transport costs that have a stronger negative effect on lower-income households. In addition, approaches to pricing of public transport remain limited in their ability to improve the affordability of mobility for the poor because they tend to homogenize social vulnerability, leading to poor targeting mechanisms. Lack of integration of public transport service fares and persistent agendas advocating for financial self-sustainability of public transport operations in several cities across Latin America and the Caribbean keep prices high for those who need these services the most.

Moreover, mainstream transport policy and practice are yet to reach a consensus about definitions, metrics, and thresholds of transport affordability, and about the best ways to alleviate transport costs, particularly for the poor and socially vulnerable. Despite rapidly evolving research on the topic of transport affordability and a growing emphasis on subsidies as a potential mechanism to improve accessibility and mobility for low-income and disadvantaged groups, there is still much debate surrounding the delivery, targeting, and funding mechanisms that could maximize the effectiveness of such subsidies and other policy instruments. Furthermore, questions about whether free public transport, subsidy schemes for sustainable transport modes acquisition (i.e., bicycles), or pricing policies against car use could lead to more progressive public transport pricing mechanisms remain contested policy and practice arenas in Latin America and the Caribbean. This suggests the need for a comprehensive assessment of approaches to define, assess, and improve transport affordability grounded in the diversity of urban contexts in the region. Such a nuanced understanding has the potential to inform current policy and practice debates about future directions for more affordable and inclusive transport.

This chapter builds on a review of definitions and metrics of transport affordability with an emphasis on the Latin American and Caribbean context to illustrate the growing role of affordable transport in the reduction of inequalities in the Global South. Building on concepts such as accessibility and transport-related social exclusion, the chapter draws relevant links with essential concepts for transport equity, presents an overview of the landscape of transport affordability and related policies and practices in the region, and reflects on ways forward to improve affordability in transport, fund affordability improvements, and address the need for a more socially nuanced understanding of the role of transport pricing in reproducing inequalities in the region.

5.1 Understanding Transport Affordability: Structural Drivers and Links with Accessibility and Social Exclusion

The concept of "transport affordability" has undergone significant changes since the start of the new millennium. Its evolution and adoption at different scales of transport policy and decision-making illustrate a paradigm shift in the field from economic efficiency to a rising concern with promoting equity and pro-poor targets through transport (Transport Research Laboratory 2003; Venter and Behrens 2005). This section provides a brief overview of the concept of and approaches to measuring transport affordability and discusses in detail key definitions and metrics, highlighting their strengths and weaknesses.

5.1.1 A Wealth of Approaches to Affordability: Definitions and Measures in the Literature

The understanding of the social consequences of urban transport affordability has evolved slowly in Latin America and the Caribbean. This gradual progress is related to a historical emphasis more on transport's economic and environmental impact than on its social impact and its distribution (Bueno Cadena et al. 2016; Nuworsoo, Golub, and Deakin 2009). An examination of the literature between 1980 and 2020 shows that the concept of affordability has followed a similar trajectory to that of concepts related to accessibility and transport-related social exclusion. This trajectory is marked by a transition from purely macro accessibility assessments at the city level to a more holistic understanding of the social and health impact of transport at the neighborhood scale (meso level) and for individuals and communities with various degrees of social and transport (dis)advantage (micro level) (Jones and Lucas 2012; Levine 2020).[3]

To measure the inequalities and performance of urban transport systems, metrics of transport affordability have evolved from macro or city-scale indicators, which do not reflect inequalities among social groups, to a more nuanced notion that explains economic barriers for access to transport and opportunities for specific social groups and their implications. Such implications include disproportionate and unequal levels of expenditure relative to income, forgone trips, immobility, and limited access to economic, human (i.e., skills and education), cultural, and social capital (Bryceson, Mbara, and Maunder 2003; Nordbakke and Schwanen 2015; Oviedo and Sabogal 2020). In recent

3. See Chapter 1 for further detail on these concepts.

years, concerns about affordability have informed new pricing policies, fare schemes, and operational designs to maximize social welfare and improve distributional outcomes (Cools, Fabbro, and Bellemans 2016; Jin, Schmöcker, and Maadi 2019; Kębłowski 2020). Similarly, affordability research has seen a geographical shift from developed-country contexts to growing attention to cities in the Global South (Oviedo et al. 2020; Uteng and Lucas 2017).

Table 5.1 presents a summary of the main definitions used in the literature, their scale and purpose, and their strengths and weaknesses, and it signals whether each definition and metric has been applied in Latin America and the Caribbean. Definitions in the table encompass the most commonly used approaches to transport affordability and were analyzed in terms of its strengths and weaknesses based on their applicability, comparability of indicators, ease of implementation under different constraints of data availability, and potential for reflecting social inequalities and the particular challenges of the region. The latter include complex considerations like transport, housing and employment informality, potential or non-realized mobility, and differences across specific socioeconomic groups.

TABLE 5.1 Main Definitions and Measures of Transport Affordability

Definition	Key References	Scale of Study	Objective	Outcome if Applied/ Achieved	Strengths	Weaknesses	Studies in Latin America and the Caribbean?
Fixed basket: Computation of affordability based on a set number of trips per month multiplied by the public transit fare per trip divided by income. Views affordability as "the ability to make necessary journeys to work, school, health and other social services, and make visits to other family members or other urgent journeys without having to curtail other essential activities" (Carruthers, Dick, and Saurkar 2005, 2).	Carruthers, Dick, and Saurkar (2005)	Individual	To guarantee a minimum of mobility that covers basic needs requiring mobility	Increased conditional affordability for certain population groups. It does not lead to the empowerment of beneficiaries given the rigidity. Household structures and power imbalances might hinder the reach of this approach, excluding certain groups (women, children, youth, disabled, elderly).	Simplicity, replicability, comparability, accounts for potential affordability.	Artificial, as a set number of trips per month does not respond to the specific needs of each individual or household; limits activities to basic needs activities, abandoning other urban opportunities such as leisure or social life; makes it difficult to assist informal workers who do not qualify for transport subsidies; ignores possible changes in fares due to supply responses to accommodate to the fixed number of trips to be established; is a gendered measure given that trips per month are not necessarily representative of non-working/ non-studying populations.	Yes (Carruthers, Dick, and Saurkar 2005; Rivas, Serebrisky, and Suárez-Alemán 2019; United Nations 2020)
Expenditure as a percentage of disposable income: Affordability metric based on households' income allocated to transportation. Later variations measure affordability as a combination of transport expenditure as a percentage of income, together with accessibility and transport investment so as to identify transport disadvantages and priorities for policymaking. Views affordability through a social exclusion and accessibility lens, identifying the effort made by people to access mandatory activities from different areas of a city and evidencing the inequalities that result from the need to gain access to an income source. Considers elements of spatial, economic, and transport facilities, and aims to provide "an indicator of the effort required for not being excluded" (Bocarejo and Oviedo 2012, 142; Falavigna and Hernandez 2016)	Bocarejo and Oviedo (2012); Falavigna and Hernandez (2016)	Household	To guarantee a maximum of mobility from a perspective of accessibility	Transport-related inequalities within the urban environment are more clearly identified and allow for a more targeted affordability intervention. Due to lack of data or stable source of income, informal workers remain a challenge to be addressed.	Its interlinkages with accessibility constitute a more complete view of affordability-only measurements; provides benchmarks that can inform policymaking on what to plan for/ aspire to; and provides information on equity impacts related to income.	Requires more data (especially on income distribution); does not account for potential affordability measures or forgone trips; does not account for captive walkers or bikers; the percentage expenditure may not be directly proportional to welfare, as it can be misleading to conclude that all persons with a proportional transport expenditure below a certain percentage of their income (e.g., 10 percent) are better off than those above the benchmark. This aspect together with unaffordability leading to forgone trips makes an indicator based on expenditure alone unable to capture welfare considerations (Venter and Behrens 2005).	Yes (Bocarejo and Oviedo 2012)
Percentage of household expenditure: Affordability metric based on actual transportation expenditure rather than modelled expenditure. Views affordability as the ability to have the necessary resources to access important expenses (Blumenberg 2004).	(Blumenberg 2004)	Household	To guarantee a maximum of mobility that is independent from labor status	Achieves a more comprehensive understanding of the interlinkages between affordability, accessibility, and well-being, based on the fact that job accessibility is an important factor in the economic well-being of welfare recipients. Informal workers can be better targeted through this approach, given its independence from labor status and the formal systems that are usually related to this.	Accounts for instability of income; more accurately measures households' affordability, accessibility, and, ultimately, well-being.	Omits relevant data; does not account for potential affordability measures or forgone trips; does not account for captive walkers or bikers; does not account for household structures and power relations; needs to be very nuanced, depending on whether it is a low- or high-inequality context, since increases in post-tax income inequality have different effects on household expenditure on mobility; is based on income data that are difficult to gather and can be unreliable when it comes to low-income households surveys.	Yes (Diaz Olvera, Plat, and Pochet 2008; Gandelman, Serebrisky, and Suárez-Alemán 2019)

Definition	Key References	Scale of Study	Objective	Outcome if Applied/ Achieved	Strengths	Weaknesses	Studies in Latin America and the Caribbean?
Housing-transportation affordability measure (H+T Index): Sum of average housing costs plus the average transport costs for a neighborhood, dividing the outcome by average neighborhood household income. In this framework, total housing costs include current housing sales prices and rents; total transport costs include the sum of costs of private car ownership, car use, and transit. The index can be adjusted on an individual household basis to represent household income, intended paid price for a new home, and a certain neighborhood's transport costs. Views affordability as an indissociable combination of housing and transport affordability, acknowledging that the cost of transportation has become increasingly central to household budgets. Therefore, it considers "the affordability of housing in the context of the transportation costs associated with the neighborhood in which the home is located" (CNT and CTOD 2006, 14).	CNT and CTOD (2006); Dewita, Yen, and Burke (2020); Mattingly and Morrissey (2014)	Household	To illustrate the true cost of housing and inform policymaking on the benefits of transit-supportive land use	A quantification of the combined expenses of households, which accounts for differences in the distribution of costs for shelter and mobility.	Accounts for the location of activities and services; incorporates the concept of location efficiency; more accurately measures people's daily ability to fulfill basic needs in accessing various destinations.	Requires more data than other measures only focused on transport.	Yes (Yañez-Pagans et al. 2019; Tiznado-Aitken 2020).
Context-sensitive framework: Affordability measure that goes beyond income and expenditures to also consider time availability. Views affordability as the financial burden households bear in purchasing transportation services (Fan and Huang 2011).	Fan and Huang (2011)	Household	To guarantee a maximum of mobility sensitivity to context particularities (at the household, neighborhood, and city levels)		Measures time and monetary frameworks for each population group; accounts for household sociodemographic characteristics and the built environment; is correlated with welfare	More data-hungry than other metrics; harder to implement in areas with less disaggregated information.	No
Welfare-based measures: Estimate the average change in the affordability measure using the initial observed number of trips made by households as a reasonable approximation of the social welfare change generated by transport policies. Expands on measures often used in the estimation of inequalities in income distribution such as the Gini Index and Palma Ratio.	(Gomez-Lobo 2007)	Household	To estimate the distribution of affordability across socioeconomic groups	A measurable and comparable distribution of inequalities in transport expenditure, as well as a graphical representation of such distribution across income groups (Lorenz Curves).	Is the most accurate indicator for distribution of affordability and inequalities between income groups.	The definition of any welfare function is arbitrary and subject to the preferences of the analyst. Different studies may arrive at different results simply because they chose different social welfare functions.	Yes (Gomez-Lobo 2007; Guzman and Oviedo 2018)

Source: Prepared by the author.

5.2 Transport Affordability, Inequality, and Social Exclusion in Latin America and the Caribbean: What Have We Learned?

5.2.1 The Big Picture: Aggregate Transport Affordability Indices in Cities of the Region

There is visible regional inequality in terms of the ability of urban citizens to afford urban transportation services that has worsened over the last 30 years. In one of the first comparative studies focused on the affordability and availability of urban public transport services in the region, the Economic Commission on Latin America and the Caribbean, using data from 1988, analyzed 10 cities in terms of the percentage of each city's minimum wage needed to make 50 trips per month using public transport (ECLAC 1992). Despite the limitations of aggregate comparisons to reflect distributional issues and inequalities, the study showed stark differences across urban contexts in the region, with a larger number of cities with user expenditures over 20 percent of the minimum wage (33 percent in La Paz, 28 percent in Santiago de Chile, and 26 percent in Brasilia) than those below 10 percent (6 percent in Bogota, 3 percent in Havana, and 2 percent in Mexico City).

Early comparative assessments of the affordability of transit in cities across the region show disparities in public transit affordability. Rivas, Serebrisky, and Suárez-Alemán (2019) examined the differences between transport expenditure in selected urban contexts, showing levels of expenditure in both public and private transport. Expenditure is understood as the total cost paid for transport, which differs from affordability, which compares such expenditure at the individual level with that person's income. These findings were further expanded at the country scale by Gandelman, Serebrisky, and Suárez-Alemán (2019). These studies find stark differences between total transport expenditure by mode of transport, which indicates inequalities between car and motorcycle users and those who depend on public transport for their mobility and accessibility. Both at the country and city levels, as total expenditure increases so does the share of private transport. Countries with more public transport dependency are expected to have a larger total expenditure on transit than those where the modal share has shifted towards a more car-dependent configuration. However, data from the region suggests that private motorization rates are increasing rapidly, with a growing number of middle- and low-income households acquiring cars and motorcycles (Acevedo 2013; Combs and Rodríguez 2014; Gandelman, Serebrisky, and Suárez-Alemán 2019). For instance, while Bolivians spend three to four times more on public transit than on private vehicles, Brazilians, Uruguayans, and Costa Ricans spend four to five times more on private transportation than on public transit (Gandelman, Serebrisky, and Suárez-Alemán 2019). These results suggest the need to challenge current urban transport configurations that make it more attractive to spend on private transport for higher-income households.

Table 5.2 compares fixed-basket affordability indices for public transport in 12 cities (building on Rivas, Serebrisky, and Suárez-Alemán 2019). Cities in the table are ranked from high to low according to the percentage of their average income spent on a benchmark of 60 (10 km) trips on public transit. The estimate in column A is for cities where public transit is generally more expensive for most of the population, assigning a traffic light system from the least (red) to the most (green) affordable cities.[4] As shown, Montevideo, Lima, and Panama City have some of the highest percentages of average per capita income spent on public transport, with values above the 10 percent benchmark identified by previous studies as a desirable maximum threshold (Table 5.2).

TABLE 5.2 City-level Comparison of Fixed-Basket Affordability Indicators as a Percent of Average Income and Income for the Lowest Quintile (60 Public Transit Trips)

City	Country	A Average Affordability (percent of average per capita income)	B Low-income Affordability (percent of income of the lowest economic quintile)	C Affordability Inequality Ratio (B/A)
Montevideo	Uruguay	12.6	30.3	2.4
Lima	Peru	10.5	26.3	2.5
Panama City	Panama	10.5	29.1	2.8
Santiago	Chile	10.1	34.4	3.4
Mexico City	Mexico	7.8	20.9	2.7
Nassau	The Bahamas	6.8	36.6	5.4
Tegucigalpa	Honduras	6.5	38.1	5.9
Asunción	Paraguay	5.7	16.3	2.9
Brasilia	Brazil	4.9	19.2	3.9
San José	Costa Rica	3.0	11.8	3.9
La Paz	Bolivia	2.5	8.1	3.2
Managua	Nicaragua	2.0	5.8	2.9
Average		6.9	23.1	3.3

Source: Prepared by the author based on Rivas, Serebrisky, and Suárez-Alemán (2019).

4. The traffic light system introduced in Table 5.2 will be used in other tables in the chapter to signal different levels of expenditure and measures of inequalities.

By estimating transport affordability for the lowest economic quintile in each city, column B of Table 5.2 tells a very different story. Cities such as Nassau and Tegucigalpa have the highest ratios of expenditure and income for poor inhabitants compared to other cities in the sample (Rivas, Serebrisky, and Suárez-Alemán 2019), suggesting wider gaps between the income of citizens in the poorest quintile compared to the average.

The aggregate indicator in column B, however, may hide some structural inequalities across the region. While countries like The Bahamas have some of the highest per capita incomes in the region, others such as Honduras have some of the lowest. Yet, their affordability indices for public transit are very similar. In The Bahamas, despite being wealthier than most Caribbean countries, the minimum wage and income in informal employment are precarious, which is reflected by the wide gap between columns A and B. In the second case, Tegucigalpa has witnessed various price hikes of public transit fares linked with changes in the cost of fuel since the 1990s, accompanied by growing unemployment and slow increases in the legal minimum wage (Ochoa 2017), which has increased the vulnerability of the poor to becoming priced out of public transit services.

Perhaps one of the most striking findings in column B is the high number of cities where the lowest income quintile spends more than 25 percent of income on public transit (Rivas, Serebrisky, and Suárez-Alemán 2019). Such high levels of unaffordability are likely to lead the poor to forgo trips, use less public transport for non-essential displacements, and trade off the mobility and immobility of different members of the same household to guarantee access to income, among other potential negative consequences.

Comparisons between columns A and B in Table 5.2 demonstrate the contexts where public transit fares can become prohibitive for the poor, despite having a cost that accommodates a significant number of monthly trips at an affordable rate (i.e., below 10 percent) for those earning sums around and above the city's average per capita income. By the same token, cities with the green shadings in column A tend to also have more affordable rates for the lower-income segment of public transit demand. In most cities, the poor spend nearly three times the percentage of their income on public transit than those earning around the average, who spend well below 10 percent of their income (Rivas, Serebrisky, and Suárez-Alemán 2019).

The affordability inequality ratio, calculated as column B over column A and shown in column C of Table 5.2, allows for a more complete picture of the comparative levels of inequality in public transport affordability among the sample in Rivas, Serebrisky, and Suárez-Alemán (2019). These levels reinforce the observed disparities in cities such as Nassau and Tegucigalpa, showing the scale of the inequalities between those with the lowest incomes and those with average incomes (i.e., the poor have more than five times the expenditure on public transit than those earning average incomes). The inequality in column C shows large gaps between the poor and average per capita income earners in other cities in the green region of both columns A and B, such as Brasilia and San José. In Montevideo and Lima, public transport users with both average and lower income spend more relative to their income on transport compared to other cities. These cities also have the lowest inequality ratios in the sample.

In sum, Table 5.2 shows considerable heterogeneity in transport expenditure and the affordability of public transit across Latin American and Caribbean cities. Different indicators of affordability at the city level illustrate systemic inequalities in public transit affordability in different contexts (Rivas, Serebrisky, and Suárez-Alemán 2019). Moreover, countries experience higher levels of income inequality, often suffering from wider disparities in the affordability of transit services for the poor.

5.2.2 Affordability and Accessibility in Cities: Impact on the Urban Poor

In cities across Latin America and the Caribbean, transport affordability is intricately linked to accessibility and its components, including land use, transport prices, integration and connectivity, individual ability to pay, socioeconomic characteristics that affect travel demand patterns, and the amount of time available for travel given other activities and responsibilities. However, concerns about affordability have not been sufficiently present in the region's transport planning debates of the last three decades (Gandelman, Serebrisky, and Suárez-Alemán 2019). Localized lags in the introduction of affordability measures have led to the sizable inequality across cities, countries, and population groups.

Affordability and Land Use: Urban Forms and Their Effects on Public Transport Costs for the Poor

As shown previously, poorer populations spend a higher portion of their incomes on mobility, often with public transit being the only alternative to motorized transport. More detailed analyses of transport affordability in specific case studies suggest that such a commonality is mediated by the strong links between income and socio-spatial segregation in cities in the region (Borsdorf and Hidalgo 2010; Oviedo and Dávila 2016; Sansone and Caldeira 2003; Tiznado-Aitken 2020; Vignoli 2008). Land-use configurations, spatial segregation, pricing, and other structural disadvantages contribute to transport unaffordability for the poor in Latin American and Caribbean cities.

Tendencies of spatial concentration of poverty and homogenization and expansion of low-income areas in cities are well documented in the literature on the region (Bayón 2008; Sabatini 2006). High degrees of urban inequality manifest spatially, leading to socioeconomic inequalities becoming spatial inequalities (Bárcena and Byanyima 2016; Simson and Savage 2020). This is supported by previous research arguing that territorial contexts with high levels of spatial segregation exacerbate the vulnerability of socioeconomically fragile groups and can lead socio-territorial isolation (Blanco and Apaolaza 2018).

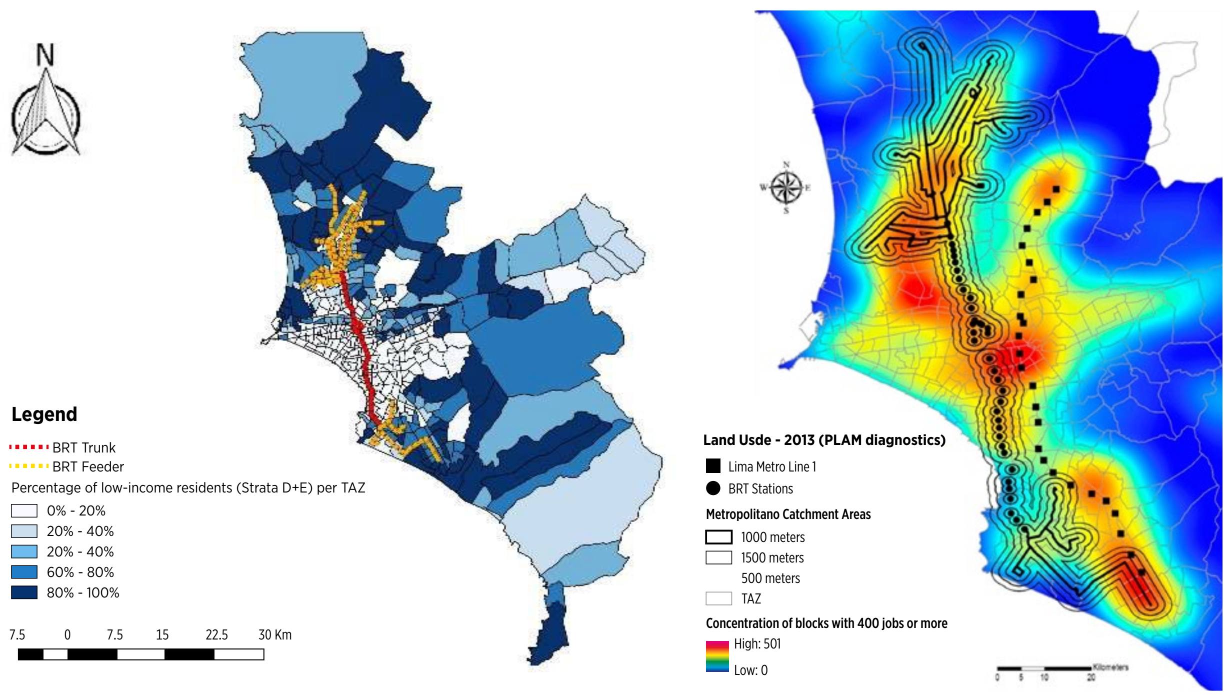
Cumulative processes of disadvantage in rapidly growing low-income neighborhoods are related to increasingly unaffordable transport and a limited ability to access local opportunities, including work (Bayón 2008). Such segregation is heightened by the development and consolidation of both formal and informal settlements of low-cost housing for the poor in areas where land is still affordable (Gilbert 1981; Thibert and Osorio 2014; McLafferty 2015; Tarazona 2015).

Inappropriate land regulations, unclear institutional arrangements, inadequate enforcement, political corruption, changes in levels of poverty and extreme poverty, and largely variable approaches to social housing by many Latin American governments between the 1970s and 2000s led to increased informal housing in the region (Gilbert 2009; Vinet and Zhedanov 2011). These settlements are often located in the outskirts of already large cities, sometimes in neighboring municipalities, generating conurbation and urban expansion processes. Segregation has led to increasingly homogeneous pockets of low-income housing marked by lack of coverage of infrastructure, local job and educational opportunities, and affordable and accessible public transport services for the poor (Caldeira 2017; UN-Habitat 2012; Watson 2009).

Informal and low-cost housing in emergent neighborhoods in growing cities has also been incentivized by a growing demand for rental housing, particularly among the poorest residents and migrants unable to locate near city centers (Dávila et al. 2006; Gilbert 2005; Guzman and Bocarejo 2017). This involves an additional trade-off with transport affordability, as renters do not have the added incentive of home ownership when locating in peripheral settlements. Renters can account for up to half of the total families in several low-income informal settlements in large cities in Latin America, and they constitute the group most susceptible to changes in costs in both transport and housing (Abramo 2012; Bocarejo et al. 2014; Yunda and Sletto 2017). Research in Lima, Cali, Bogota, and Barranquilla have found similarities in the patterns of concentration of low-income populations in the peripheries that spend between two and six times as much as high-income groups on public transport as a percentage of their respective incomes to access work (Arellana et al. 2020; Scholl et al. 2016).

Figure 5.1 illustrates socio-spatial segregation in Lima, both in terms of the concentration of poverty in the peripheries of the city and the concentration of employment in the expanded city center along main corridors of mass transit (i.e., Bus Rapid Transit and rail) (Scholl et al. 2018). Unidirectional travel patterns have direct implications on the accessibility of public transit for the poor. Public transport affordability in Lima, as in many other Latin American and Caribbean cities, is heavily influenced by longer trips and the costs associated with transfers from collective transport to mass transit that affect most residents of the peripheries outside the coverage of mass transit (Oviedo et al. 2019). Lima illustrates the negative feedback loop in which opportunities are concentrated in the affluent and financial sectors of the city, reducing the accessibility and affordability of low-income groups in the periphery. These groups are likely to become captive walkers or public transport users with an inadequate level of service, and are more likely to work in lower-paying and less-stable informal employment, reinforcing the cycle of poverty (Tiznado-Aitken 2020). The vicious circle of lack of services and opportunities in the region is exacerbated by the inability of the poor to overcome socio-spatial segregation via public transit after being priced out of affordable housing near where opportunities are located.

FIGURE 5.1 Spatial Segregation in Lima by Concentration of Poor Residents (left) and Heat Map of Employment (right)



Sources: Oviedo et al. (2019) and Scholl et al. (2018).
Note: BRT: Bus Rapid Transit.

Affordability and Transport Supply: Are the Poor Priced Out or Do They Just Lack Access to Public Transit?

While no systematic study to date has traced aggregate estimates of affordability over time for a larger sample of cities than those discussed above, analyses at the macro scale in the region in the late 1980s agreed that low-income groups, which depend the most on public transportation, face a clear affordability problem (Gandelman, Serebrisky, and Suárez-Alemán 2019). These findings are supported by a myriad of city-focused research that has also pointed to both formal and informal transport as a driver of (un)affordability in cities of Latin America and the Caribbean. Characteristics of the supply of public transport affect the degree of transport affordability for the poor in terms of availability, pricing, and integration. Research in the last decade also shows that affordability challenges not addressed by public transport pricing policies are often met by strategies deployed by low-income populations that find themselves priced out of public transport services. Analyses of low-income commuters in various contexts in both the Global North and South have found that the poor often manage to travel by resorting to behaviors such as fare evasion (with its associated risk of arrest or fines), exploiting free transfers, forgoing goods, relying on household members, coworkers, and friends, using informal public transport, walking for one or more legs of the journey, and using free fare cards provided through State welfare programs (where available) (Oviedo and Titheridge 2016; Perrotta 2017; Troncoso and de Grange 2017; Venter et al. 2018).

Availability

A lack of adequate public transit connectivity imposes high financial burdens on poor households, especially in areas where integrated transport systems are not available, by increasing transfer costs to reach jobs or other activities (Scholl et al. 2018; Suárez et al. 2016). This problem seems only to have grown in scale and complexity in recent years, despite a substantial increase in public transport investments across the region between 2002 and 2013 (Fay et al. 2017). Investment in public transport doubled in Bolivia, Mexico, and Panama from 2008 to 2015. (See Box 5.1 for more detail on the metro system in Panama City.) Colombia, Paraguay, Peru and Nicaragua follow these countries with a more moderate increase in public investment in transport. Much of these new investments have been directed at improving coverage in low-income areas and access to higher-quality public transit services, often with an integrated fare that reduces the overall costs of traveling long distances. By contrast, public investment in transport has decreased in Argentina, Honduras, and Guatemala, reducing access to public transport and motorized infrastructure and pushing poor populations to walk more and use available informal transit services that add to high commuting prices (Suárez-Alemán, Sererisk, and Pastor 2017).

Availability of public transport to improve affordability is a heightened challenge for island states in the Caribbean. Infrastructure and provision costs are high due to geographic and logistical challenges that pose a high burden on national finances. Such challenges have led many local and national governments in the Caribbean to not prioritize such investments (Fay et al. 2017). Policies and investments targeting availability of public transit for poor populations are also challenging in countries and sectors with low access rates – in other words, in contexts where the demand is too small to bear or alleviate investment costs. A good example is Haiti (Fay et al. 2017), where this situation has led to a fragmented and largely informal configuration of urban transport services relying on very limited infrastructure for its operation. In coastal cities and Caribbean islands, where most transportation systems are in low-lying areas and frequently damaged by extreme meteorological events, unavailability of public transport is compounded by the vulnerability of infrastructure. Lack of resilience planning can pose an additional indirect challenge for affordability, as environmental changes and emergencies may affect supply without notice, leading low-income persons to become temporarily disconnected from the rest of the city or giving rise to overpriced alternatives in the informal market (Fay et al. 2017).

BOX 5.1

The Formal Transportation System in the Metropolitan Area of Panama City

The Metropolitan Area of Panama City (MAP) is an example of the influence of public transit supply on transport affordability and its associated inequalities in Latin American cities. During the last two decades, Panama has stood out in Latin America as an exceptional case of economic growth. The country doubled its GDP over the 2007–2018 period, increased GDP per capita by more than 60 percent (US$7,242 to US$11,755), and maintained a rate of annual average growth of 6.3 percent.1 In the regional context, the average income of Panamanians (US$11,910 in 2019) is one of the highest, though lower than that of Chile (US$15,091) and Uruguay (US$14,597). The country's economic growth has been accompanied by a slow process of poverty reduction. Between 2007 and 2017, approximately 410,400 people (10 percent of the total population in 2017) stopped being poor, with the country moving from a poverty rate of 36.5 percent in 2007 (approximately 1.26 million people) to 20.7 percent in 2017 (approximately 850,000 people) (Austillo, Fernandez, and Garcimartín 2019).

Although there has been a considerable reduction in poverty, the socioeconomic distribution of the population across the main districts of the metropolitan area suggests a concentration of lower-income persons in many of the districts farther away from the city center of Panama City (Tocumen, San Miguelito, Panama Oeste). The two central districts (Centro Bancario and Centro Antiguo) have some of the largest concentrations of high-income population in the metropolitan area. Aside from the old central district, most of the population in the lowest income quintile in districts near the center is below 15 percent (Table 5.1.1). Most MAP residents in the lowest income quintiles are therefore forced to cover very long travel distances to access opportunities, which are concentrated in the central districts (Ortegon-Sanchez and Tyler 2016).

TABLE 5.1.1 Distribution of Population by Income Quintiles in the Metropolitan Area of Panama City (percent)

Area	Q1	Q2	Q3	Q4	Q5
Centro Antiguo (CBD)	30	18	17	19	16
Centro Bancario (CBD)	10	16	20	24	30
Betania	13	27	23	16	17
Paitilla	11	11	22	26	30
Parque Lefevre	20	13	18	16	34
Juan Diaz	12	17	14	24	32
Tocumen	20	23	22	22	13
San Miguelito	23	25	21	21	11
Reverted Areas	19	11	24	21	26
Panama Oeste	27	23	21	16	13

Source: Prepared by the author based on Hernández Carrera (2013).

The land-use configuration in the MAP is dispersed, leading to an expanded urban area with a monocentric functional structure, which has implications for public transit operating costs and the number of paid public transport trips. Such an urban structure leads to very lengthy motorized trips on average (16.5 km), with distances equal to or greater than other cities in Latin America with populations well above that of the MAP. As a consequence, public transport routes in the metropolitan area are extensive and there is a low turnover rate on the routes (little rise and fall of passengers, since most trips start in the periphery and end in the city center) (Ortegon-Sanchez and Tyler 2016).

Panama thus faces considerable challenges to enable access to urban transport and improve affordability for all. Estupiñan et al. (2018) argue that the MAP experienced a transformation in its public transit supply and management as a result of implementation of the first phase of an ambitious integrated transit system constructed around the city's Metro and Metro Bus services. The Metro system, which started operation of its first line in 2017, offered an unprecedented level of quality of public transport services. Both new challenges and opportunities have arisen as a consequence of the launch of that first line. According to Estupiñan et al. (2018), one of the most significant challenges is related to the payment of the system's operating cost, particularly as it expands and an Integrated Transportation System is formed.

On the one hand, the success of the system has led to the Metro network continuing to expand. Metro line 2 was inaugurated in 2019, while resources have already been allocated for implementation of line 3. The MAP's planned master public transit network consists of a multimodal system, with eight metro lines as the structural axis, complemented by buses, minibuses, taxis, and informal transport services that help local connectivity in a significant proportion of the city (Figure 5.1.1). On the other hand, the financing of the operation of these systems, which are planned to expand in future years, requires considerations in terms of guaranteeing access, fare affordability, and smooth integration, all of which puts a strain on public finances. The latter becomes particularly relevant since, under current rate levels, it is necessary to provide subsidies for operation of the systems (Estupiñan et al. 2018; Metro de Panamá S.A. 2017).

FIGURE 5.1.1 Master Network of the Metropolitan Area of Panama City Metro System

Source: Metro de Panamá S.A.

At present, public transit fares are differentiated by mode of transport, with no full fare integration with regular fares for Metro Bus at USD$0.25 and Metro USD$0.35 (Metro Panamá S.A. 2017). These systems meet over 58 percent of the total public transport demand. In light of the lack of a fully integrated fare, this translates into disproportionate expenditures for those traveling from the peripheries to the city center. Poorer residents depend on traditional buses (known as Diablos

Rojos) which have fares between US$0.55 and US$1.25, and on informal public transit services, which operate with (negotiable) fares between US$1 and US$3.5 (Metro Panamá S.A. 2017).

Considering the distribution of income by quintiles and the costs of public transport in the MAP, Table 5.1.2 draws on data from Hernández Carrera (2013) to estimate a fixed-basket affordability index considering 50 trips by public transit (including the most common transfers) across different districts in the metropolitan area. San Miguelito, along with Panama Oeste and Tocumen, are the three MAP districts where relative spending on transportation as a proportion of household income in the two lowest quintiles is the highest. Inequalities in public transit affordability are considerable and visible, as shown by the "traffic light" shading in the table. The populations of San Miguelito, Panama Oeste, and Tocumen distributed between income quintiles 1 and 2 incur transportation expenses between 18 and 25 percent of their total income, a high figure in comparative terms. Lack of integrated fares, long distances, unidirectional travel patterns, and dependence on informal services contribute to this situation. By contrast, more central and affluent districts show affordability indices below or close to 5 percent of the income of the wealthiest quintiles. In those districts, investment in public transit and infrastructure is likely to have a direct impact on accessibility and on the ability of lower-income residents to access mobility and, consequently, relevant opportunities in a city marked by social and spatial segregation.

TABLE 5.1.2 Affordability Indices by Income Quintile in Metropolitan Area of Panama City Districts (percent)

Area	Q1	Q2	Q3	Q4	Q5
Centro Antiguo (CBD)	14	9	5	5	2
Centro Bancario (CBD)	13	7	5	3	2
Betania	13	8	5	3	2
Paitilla	12	7	5	3	2
Parque Lefevre	13	9	5	3	2
Juan Diaz	14	9	7	4	2
Tocumen	25	10	8	5	4
San Miguelito	18	10	8	5	3
Panama Oeste	21	11	9	5	4

Source: Prepared by the author based on (Hernández Carrera 2013).

Despite large inequalities in affordability, the MAP's formalized transportation system (Metro Bus and Metro) had required operating subsidies of US$68.1 million and US$10.7 million, respectively, as of 2016 (Metro Panamá S.A. 2017). The fare scheme includes subsidies for specific population groups such as the elderly and students, who receive discounts between 25 and 50 percent of the base fare. The amount of the transfer of resources to cover the costs of the operation is likely to increase substantially as fare levels are maintained and as new Metro lines are implemented and coverage of Metro Bus is extended across the metropolitan area (Estupiñán et al. 2018).

The case of the MAP shows how different strategies and structural drivers of inequalities in terms of affordability can be addressed at least partially through an integral strategy of increased coverage and improved quality and integration. However, the case also cautions about the inequalities resulting from a prioritization system that allocates more resources to wealthier parts of an already heavily segregated city in terms of population, and a monocentric functional pattern of distribution of opportunities. The lack of additional mechanisms to improve affordability for people in disadvantaged conditions, both socioeconomically and spatially, has increased already-large gaps in terms of the share that transport costs represents for households in the metropolitan region.

1. See https://datatopics.worldbank.org/consumption/sector/Transport.

Pricing

Pricing is a second driver of transport affordability related to supply. Research on affordability and inequality has found that relying on user fees from financially constrained consumers with few transport choices to fund the operation of public transport in low-income neighborhoods can have harmful effects on transit provision to those residents (Aivinhenyo and Zuidgeest 2019). In addition, analysis of the effects of different changes in public transport operations shows that aspects not directly related to the price itself can have a harmful effect on low-income citizens. For instance, shifts in fare payment technology can affect transit affordability. Any change that removes the discretion of the bus driver, or that prevents sharing of fares, will be problematic for riders struggling with affordability (Perrotta 2017).

For instance, after Argentina's dramatic economic collapse in 2001, the poverty rate in the country went from 37 percent in 2001 to a peak of 58 percent by the end of 2002. With most public utilities having been privatized during the previous decade, transport systems in the city suffered significant changes in usage as a result of unaffordable rates geared towards economic efficiency and financial self-sustainability. Such changes included a 15 percent reduction in the number of bus passengers, a 23 percent reduction in suburban rail users, and a 10 percent reduction in metro passengers (Blanco and Apaolaza 2018).

Fare evasion is a common adaptation strategy deployed by users who cannot otherwise afford public transit services (Carruthers, Dick, and Saurkar 2005). Buenos Aires experienced a significant increase in fare evasions during the economic collapse of 2001 as a result of a growing number of people becoming priced out of public transit (Blanco and Apaolaza 2018). Pricing is the main explanatory factor for fare evasion, followed by unemployment levels and the number of fare inspections carried out each month (Troncoso and de Grange 2017). Tariff evasion in 2016 was estimated at 27.6 percent in Santiago de Chile, 15 percent in Bogota, 12 percent in Buenos Aires, and 10 percent in Lima (Troncoso and de Grange 2017). Lima and Santiago were among the least affordable cities for the poor, as shown in Table 5.3. Research in Bogota and Buenos Aires suggests that transit prices can be prohibitive for the poorest residents, leading to higher fare evasion in this population segment (Blanco and Apaolaza 2018; Guzman et al. 2021).

There is little conceptual and empirical groundwork for determining the socially optimal pricing of passenger transport services and understanding which pricing reforms yield the biggest welfare gains in cities of Latin America and the Caribbean (Parry and Timilsina 2010). Until recently, passenger travel pricing was not directly associated with affordability, but rather was governed by principles of efficiency and maximization of benefits for the average user (Jara-Díaz, Cruz, and Casanova 2016).

Since the privatization of public transit in the region in the 1980s and 1990s, followed by a trend toward restructuring chaotic and informal operators into public-private partnerships, there has been a tendency to attempt to cover operating costs with user fares. For example, the Bus Rapid Transit (BRT) systems in Quito, Bogota, and Mexico City were implemented under financial models based on such an assumption, leading to comparatively higher fares compared to traditional collective transport at the point of start of operation and a relatively rapid increase of fare costs over 10 years of operation (Flores and Díaz 2019; Hidalgo and Gutiérrez 2013). Although increases in fares are controversial and politically costly for authorities making decisions over pricing, cities across the region have experienced visible fare hikes. These increases in pricing have led not only to disincentives for the use of public transit by those with lower purchasing power, but in some cases have also prompted such discontent that citizens have taken to the streets in protest, as recently occurred in Brazil, Chile, Colombia, and Argentina (Cavallo, Powell, and Serebrisky 2020).

Table 5.3 shows the evolution of fares and additional details for four selected cities in the region over 2014–2021. The cities were selected as examples of top-down fare policies that are defined by local authorities and depend on both mass and collective public transit with a significant degree of fare integration.

Table 5.3 illustrates how different policies and changes in fares can have potentially different effects in terms of affordability for people earning the basic legal income in different Latin American capital cities. As shown, the changes in public transit fares in all cases between 2014 and 2021 ranges from a reduction of 11.8 percent for long-distance bus commuters in Santiago to increases of over 13 percent for trips combining Metro and BRT services in Rio de Janeiro. Each case presents an interesting picture in relation to the real changes in fares vis-à-vis the change between 2014 and 2021 of the legal minimum wage in each context. The most critical case is Rio de Janeiro, which during a period that saw rapid increases in inflation and a real reduction of the real value of the minimum wage, also considerably increased public transit fares. In Bogota, although the minimum wage increased, the fare of the recently implemented zonal services of the city's integrated transit system increased at a real rate that surpassed that of the base income. The most progressive case among the selected sample is Santiago de Chile, where there was as increase in the minimum wage of over 15.5 percent, yet transit fares decreased in real terms by around 10 percent. Similar to this case is the trend in transit fares in Mexico City, where only the Metro fare increased, and at a lower rate than the minimum wage.

Rio de Janeiro has the largest and most diverse set of beneficiaries for discounted fares and demand-side subsidies of the four cities. In Bogota, negative effects of the lag in the increase of income vis-à-vis the growth in public transit pricing is likely to be mitigated by the differential fare programs implemented. In Mexico City, public transit prices increase more slowly compared to the increase in the minimum wage. However, in this city there were no identifiable demand subsidies. Section 5.3 of this chapter will discuss in detail some of the more recent policies of differentiated fares designed to alleviate affordability burdens for specific population groups in these case studies alongside evidence from other cities in Latin America and the Caribbean.

These findings point to the differences in pricing policies for public transit. By comparing the trend in prices in real terms with that of the minimum wage over the same period of time, Table 5.3 identifies where decisions about public transit fares can have more progressive or regressive effects. Such trends are likely to have negative affordability implications for those on the lower end of the earnings distribution.

TABLE 5.3 Evolution of Fares in Selected Latin American Cities (in constant 2021 prices)

City	Transport Price in 2014 (in 2021 values)	Transport Price in 2021	Real Increase	Percent Change (over 2021 values)	Minimum Wage in 2014 (in 2021 values)	Minimum Wage in 2021	Real Increase	Percent Change	Accumulated Inflation, 2014–2021 (percent)
Bogota	2,383.35 COP (Transmilenio) 1,986.12 COP (Zonal)	2,500 COP (Transmilenio) 2,300 COP (Zonal)	116.65 COP (Transmilenio) 313.88 COP (Zonal)	4.67 (Transmilenio) 13.65 (Zonal)	815,633 COP	908,526 COP	92,892.24 COP	10.22	32.41
Santiago de Chile	873.69 CLP (Metro) 773.84 CLP (Bus)	800 CLP (Metro) 700 CLP (Bus)	-73.69 CLP (Metro) -73.84 CLP (Bus)	-9.21 (Metro) -10.55 (Bus)	275,836.53 CLP	326,500 CLP	50,663.47 CLP	15.52	24.81
Rio de Janeiro	R6.62 (Metro+Bus) R5.09 (Metro)	R7.65 (Metro+BRT) R6.9 (Metro+Bus) R5.8 (Metro)	R1.03 (Metro+BRT) R$0.28 (Metro+Bus) R0.71 (Metro)	13.46 (Metro+BRT) 4.06 (Metro+Bus) 12.41 (Metro)	R1,146.17	R1,100	-R46.17	-4.20	45.45
Mexico City	7.83 MXP (Bus long distance) 6.52 MXP (Bus short distance) 7.17 MXP (Microbus long distance) 5.22 MXP (Microbus short distance) 3.91 MXP (Metro)	7 MXP (Bus long distance) 6 MXP (Bus short distance) 6.5 MXP (Microbus long distance) 5 MXP (Microbus short distance) 5MXP (Metro)	-0.83 MXP (Bus long distance) -0.52 MXP (Bus short distance) -0.67 MXP (Microbus long distance) -0.22 MXP (Microbus short distance) 1.09 MXP (Metro)	-11.86 (Bus long distance) -8.67 (Bus short distance) -10.37 (Microbus long distance) -4.352 (Microbus short distance) 21.74 (Metro)	2,632.31 MXP	4,251 MXP	1,618.69 MXP	38.08	30.44

Source: Prepared by the author.
Note: COP: Colombian pesos; CLP: Chilean pesos; R: Brazilian reais; MXP: Mexican pesos.

Integration

Integration encompasses elements of both availability and pricing. In the context of affordability in Latin America and the Caribbean, integration is interpreted in terms of public transit reforms that aggregate services under a single operational scheme and, importantly, an integrated fare (Gómez-Lobo 2020; Rodriguez et al. 2017). Projects directed toward physical integration of public transport services have been implemented in a significant number of cities in the region in the last two decades. From the reform of public transport services in Santiago to the implementation of a multi-modal transport system in Bogota and the development of a network of interconnected cable cars in La Paz, public transport reforms and efforts towards integration can differ significantly.

Beyond physical integration of transport networks that may improve public transit coverage (see Chapter 4), it has been argued that the implementation of integrated tariffs in already consolidated public transit systems can maximize demand and increase affordability among low-income groups (Yañez-Pagans et al. 2019). However, while there can be fare integration without necessarily implementing widespread institutional, operational, and infrastructural reforms, as in some cases of informal transport in Africa (Narayanaswami 2017; Schalekamp and Behrens 2010), positive results in terms of affordability in Latin America and the Caribbean have almost invariably followed physical integration of services that helps bridge the large spatial gaps created by decades of socio-spatial segregation in cities in the region, as discussed earlier. Affordability benefits in these cases are related to reducing the excessive costs associated with the transfers between independent localized (and often informal) services to mass transit or other forms of higher-capacity or longer-distance public transit services (Cervero 2014; Rodriguez et al. 2017).

Many initiatives for integration documented in the literature in cities in Latin America and the Caribbean are underpinned by efforts to formalize transport providers or to better organize highly privatized and atomized service configurations that make it difficult to plan and coordinate operations to maximize efficiency. Such has been the case of the buses in Mexico City (Flores and Zegras 2012) and the public transport system in Bogota (Bocarejo and Urrego 2020). An analysis by the integrated transport system (MIO) service in Cali, Colombia found that poor and extreme poor users of the system had higher observed affordability than non-users (18 percent versus 20 percent for poor citizens, and 16 percent versus 17 percent for extremely poor citizens) (Scholl et al. 2016). The case of Cali, where affordability gains were complemented with travel time savings, attests to the positive effects of integration on accessibility.

A famous case for integration is the Metrocable in Medellin, Colombia, one of the most celebrated innovations in public transport for low-income areas in recent years. This service has had a two-fold effect on accessibility and social equity: travel generation has increased in the area of influence of the cable car, and the system produced travel time savings to centers of employment of between 4 and 5 minutes per trip (8 percent average reduction). However, when examined from a perspective of affordability, gains in accessibility need to be considered carefully. Although all transit users in Medellin experienced marginal increases in the monetary cost of travel (Bocarejo et al. 2014), users in the area of influence of the cable-car stations had lower increases in average travel costs in comparison with other lower-income areas without access to the system. As a result, accessibility to employment was 36 percent higher for residents living near the system relative to those in comparable neighborhoods living further away (Bocarejo et al. 2014).

An indirect effect of the investment in the cable cars stemming from affordability and accessibility gains and the added value of the built environment stemming from adjacent investments in public space, urban amenities, and local road infrastructure is that the Metrocable lines contributed to property price increases in the area of influence. Housing transactions in the area of influence of the Metrocable rose at an average annual rate of 35 percent between 2000 and 2007. The increase can be related to a rise in demand for properties in the neighborhoods near the stations, which resulted in higher property values and housing costs for residents (Bocarejo et al. 2014). This negatively affects socially vulnerable populations as it reduces the affordability of housing. Average rent prices in the areas of influence of the stations increased 61 percent during this period, which translates into an increase of 5 percent in the share of household income devoted to housing in the area (Bocarejo et al. 2014). Considering that housing costs tend to be higher than transport costs, this case presents relevant lessons for the unintended effects of integration or infrastructure-centered policies that can lead to trade-offs between savings in transport costs while increasing other expenses in socially vulnerable households.

"Sin lo trucho el pobre se muere:" Affordability and Informal Transport in the Region

Informal transport is a near ubiquitous part of the transport landscape of cities in the Global South (Behrens et al. 2021). In Latin America and the Caribbean, routed and unrouted informal transport services have played a significant role in covering gaps left by formal public transit to supply entire cities. Formal transit is often planned and delivered in response to monocentric and socio-spatially segregated urban structures, where priority is given to more central and attractive areas of the city. As a consequence, informal transport has become one of the main resources for disadvantaged populations to gain access to the city (Cervero and Golub 2007; Oviedo and Nieto-Combariza 2021; Suárez, Morata, and Delgado-Campos 2016). In the words of an interviewee quoted in Avellaneda (2007), "Hoy sin lo trucho el pobre se muere" ("These days, without informal services, the poor die").

In certain cities, particularly in some countries in the Caribbean, informal transport can meet most of the demand for urban mobility (Oviedo et al. 2020). Despite its well-documented safety and security flaws, informal transport can be attractive to many in peripheral and low-income neighborhoods due to its flexibility, geographical coverage, and affordability (Arellana et al. 2020).

Low-income groups are the most frequent users of informal transport, which forms part of their complex set of strategies to make essential trips more affordable. These strategies include walking to get places, sleeping at the workplace to avoid the cost of commuting back home, and using informal transportation (Avellaneda 2007). Using informal transport allows people to increase their benefits from existing public transport or at least reduce its cost by negotiating fares, changing schedules, and asking for additional services (Oviedo and Titheridge 2016).

In low-income informal settlements in the peripheries of Bogota and Soacha (Colombia), informal services and the transactions they facilitate have been found to improve transport affordability. The practice of negotiating prices is commonplace in areas with and without informal service, leading to savings between 30 and 40 percent of the regular fare (Oviedo and Titheridge 2016). This allows some users to avoid long walking distances and travel times, depending on the destination. Another study in Bogota confirmed the widespread practice of fare negotiation, documenting reductions of up to 40 percent (Kash and Hidalgo 2014). Such findings cast doubt on some of the commonly argued benefits of formalization and integration, as they mean that with the formalization of informal transport, users may not only be affected by the increase in the cost of the service, but also by hidden costs that informality could handle.

However, despite evidence suggesting positive effects of informal transport, its role in improving affordability and accessibility in Latin America and the Caribbean is still contested and largely context-dependent. For example, in Lima and Quito, informal transport routes respond to the need to access areas unserved by the formal transport supply, which is positive for the poor and can lead to meaningful travel cost savings. However, informal services also engage in direct competition with formal services in corridors where there is insufficient enforcement, reducing formal public transport efficiency and driving the price up for under-used routes (Gamble and Puga 2019; Jauregui-Fung et al. 2019). Analyses of routed semi-formal and informal transit in the region suggest that there is little restriction in operating times, frequency of service, and headways, and that whenever pricing is regulated, groups of operators tend to apply pressure on local authorities to adjust fares to cover increasing operating costs (Jauregui-Fung et al. 2019; Rodriguez Baquero and Nuñez Cetina 2003; Yañez-Pagans et al. 2019). Furthermore, the nature of informal transport makes it ineligible to apply subsidized fares when transfers for public transport are made directly from the government to users. Such is the case of the subsidy for public transport use in Bogota provided under the Program to Identify and Classify Potential Beneficiaries of Social Programs (Sistema de Identificación y Clasificación de Potenciales Beneficiarios para Programas Sociales - SISBEN). The subsidy only applies to services using the Transmilenio smartcard and the city's integrated public transport system, excluding services such as bicycle taxis, shared taxis, and informal minibuses (Guzman and Oviedo 2018).

There are high degrees of complementarity and interoperability between shared taxis, jitneys, motorcycle taxis and bicycle taxis, and higher-capacity modes such as BRT systems (Heinrichs et al. 2017). However, in the absence of fare integration mechanisms, informal transport services charge fares designed to yield some level of revenue, imposing full-service fares for transfers between informal and formal services on users needing to complement mass transit with informal transport. The implications for affordability are that low-income residents and other regular users of informal transport pay more for their mobility than those using only mass transit (Heinrichs, Goletz, and Lenz 2017). In mid-sized Colombian cities, motorcycle taxis provide services ranging from last-mile trips

to the majority of city-wide trips (e.g., Montería) (Goldwyn and Vergel-Tovar 2018). In Colombia and Cuba, bicycle taxis are forced to negotiate the road space and compete for short-distance passengers. In Colombia, they set their own fares, while in Cuba, there is a complex negotiation with local authorities, despite the taxis being considered informal, often making the service pricier for users with lower purchasing power (Warren and Ortegon-Sanchez 2016).

Despite the benefits to users of informal transport, experiences with it in the region serve as a reminder that not all citizens are in the same position to take advantage of its positive service features. For instance, while prices of informal services can be negotiated and this can lead to lower expenditure, women in Lima report feeling less able to bargain or uncomfortable doing so and end up paying more than men or paying the full fare (Dominguez Gonzalez et al. 2020). Unwritten social norms and power relations between users and operators of informal transport can render some of the flexible features of these services inaccessible for some disadvantaged groups such as women or persons with disabilities. Furthermore, for many social groups the affordability of informal transport is a trade off with the increased risk of traffic accidents when using these services and their added vulnerability to externalities, given the lack of insurance and other mitigating mechanisms (Behrens, Chalermpong, and Oviedo 2021). Box 5.2 shows the implications of a primarily informal public transport service for affordability, building on the case of Port-Au-Prince in Haiti.

Box 5.2 examines the benefits and drawback of using taps-taps, a popular informal transport service in Haiti.

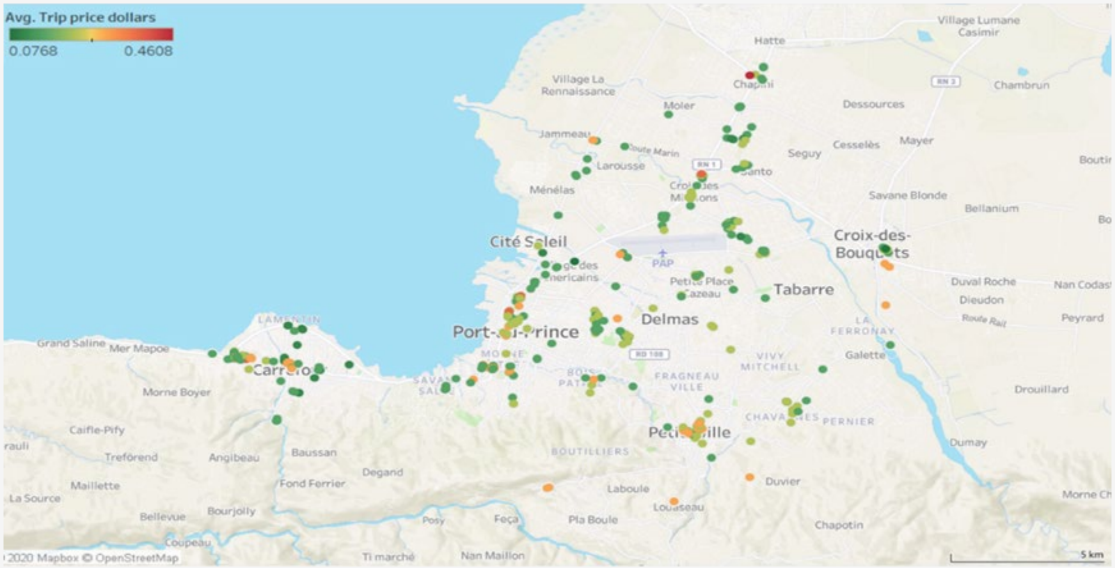
BOX 5.2

Tap-Taps in Port Au Prince: Affordability Analysis of a Largely Informal Transit Service

Public transportation within metropolitan Port-au-Prince, Haiti is primarily provided through privately owned vehicles known as tap-taps that operate defined routes within the urban area and its periphery. The tap-tap fleet typically consists of pick-up trucks, minibuses, or canter trucks that have been modified and adapted to transport 14 to 16 passengers. Modified pick-up trucks are predominant, accounting for approximately 90 percent of all tap-tap vehicles.

A survey of operators by the Inter-American Development Bank examined the distribution of travel costs for tap-tap services. Figure 5.2.1 shows the distribution of prices at different points of the tap-tap coverage area according to the survey. As shown, trip prices have a broad distribution across the area of analysis. However, 92 percent of trip costs reported run between 10 and 20 gourdes (HTG), based on an exchange rate of US$1 = 79.6 HTG.

FIGURE 5.2.1 Sample of Average Trip Cost in a Tap-Tap in Metropolitan Port-au-Prince



The minimum wage published by the Haitian government on October 31, 2019 by sector of activity provides a good indication of the differences in basic income across different sectors of the economy. Given lack of sufficient data for a more sophisticated analysis of affordability, Table 5.2.1 presents a summary of the percentage of daily incomes for a roundtrip commute using tap-taps for workers in each of the categories defined by the national government to determine the minimum income threshold for different industries.

TABLE 5.2.1 Average Expenditure for Commuters Earning the Minimum Wage by Economic Segments Using Tap-Taps

Segment	Examples of Sectors of Activity	Minimum Daily Wage (8-hour Shifts (in HTGs)	Percent of Daily Income Used for Commuting			
			Weighted Average Tap-tap Return Trip Cost (13.3 HTG)		Average Cost for a Return Trip from Outer Residential Areas to the Central Business District (21 HTGs)	
			No Transfer	One Transfer (+10 HTGs)]	No Transfer	One Transfer (+10 HTGs)
A	Electricity, financial institutions, telecommunications, funeral directors	500	5.3%	8.4%	9.3%	12.4%
B	Mining, clothing	440	6.0%	9.6%	10.6%	14.1%
C	Restaurants, agriculture	385	6.9%	10.9%	12.1%	16.1%
D	Domestic workers	250	10.6%	16.8%	18.6%	24.8%
E	Textile industries and manufacturing	500	5.3%	8.4%	9.3%	12.4%
F	Security agencies and the oil sector	440	6.0%	9.6%	10.6%	14.1%
G	Private vocational schools and private health institutions	440	6.0%	9.6%	10.6%	14.1%

Source: IDB Transport Division Team – Haiti.

As shown in Table 5.2.1, daily transport expenditure as a function of the daily minimum wage reflects marked inequalities across different sectors of the economy. Sectors that employ a more qualified workforce such as communications and manufacturing have a much higher minimum wage threshold than more traditional sectors such as agriculture. Furthermore, sector D, which includes domestic workers – a highly gendered occupation – have expenditures that nearly triple the affordability index of textile workers spending the weighted average cost of a tap-tap trip or less.

Furthermore, results in Table 5.2.2 show how residential location and coverage of public transport play a role in transport affordability for residents of Port-au-Prince. Trips from areas further away from the city center and originating in areas with less available routes have a much higher cost for those earning less. Findings show high expenditure levels compared to international standards. Data from other cities in Latin America and the Caribbean suggest that low-income inhabitants spend between 15 and 20 percent of their income on transport, with the cost of a roundtrip with one transfer for the lower-earning group being considerably higher than such a benchmark. Although the costs are comparatively affordable for a single fare, the daily operational scheme of the tap-taps would normally involve transfers within the same service and with other transport modes such as motorcycle taxis. Using the cost for the low-wage earners as a benchmark, this suggests that the cost of public transport in Port-au-Prince is likely to exacerbate already high economic vulnerabilities for low-income families far from the central area.

Transport Affordability and Intersecting Disadvantages: What Are the Social Costs of Unaffordable Transport?

Public transport is a necessity for the urban poor in Latin American and Caribbean cities (Gandelman, Serebrisky, and Suárez-Alemán 2019), but social inequalities make affordability one of the most relevant obstacles for them to have decent levels of accessibility. Individuals sacrifice the consumption of another good or service, or forgo access to specific opportunities, in order to afford public transport (Gomide, Leite, and Rebelo 2006). This situation points to the complex trade-offs users make in relation to individual and household budgets when making travel choices to access essential opportunities via public transport. However, individuals with overlapping disadvantages tend to make disproportionate sacrifices in terms of accessibility, well-being, and participation in society. These sacrifices shorten the path to social exclusion for people in conditions of poverty, disability, and those with intersecting social identities of gender, age, ethnicity and other individual characteristics that place them in a disadvantaged position to afford transport. It is important to note that trade-offs between transport affordability, decisions to forgo trips, and the use of informal or non-motorized transport alternatives, on the one hand, and the sacrifice of other essential goods and services, on the other, take place at different scales and in the short, medium, and long terms, with some trade-offs being conscious decisions and others unintended.

Higher degrees of housing affordability in the long term are traded off with day-to-day costs of transport and, potentially, immobility of some household members, particularly in low-income families. In Latin American and Caribbean cities, trade-offs between housing and transport affordability lead many to relocate to peripheral areas. This is reflected in the declining density in the last 20 years in cities such as Santiago de Chile, Montevideo, La Paz, Buenos Aires, and Brasilia (Fay et al. 2017). Those living in informal housing make the most substantial trade-offs with transport affordability, given the limited access to infrastructure and public transport services most informal communities face in the long term. Affordability constraints are exacerbated by unavailable transportation options in high- and low-accessibility low-income areas. Despite such challenges, higher housing affordability of informal settlements and the ability to own a home in the long term is often traded off with location and its associated transport costs (Rojas, Muelder, and Shannon 2015). A negative loop of opportunity concentration in the affluent and financial sectors of the city puts a burden on the conditions of accessibility and affordability of low-income groups, who are likely to become captive walkers or public transport users with an inadequate level of service (Tiznado-Aitken 2020). As argued earlier in this chapter, the vicious circle of lack of services and opportunities in the region is exacerbated by the poor's inability to afford to overcome socio-spatial segregation via transit.

Low-income residents in informal settlements make trade-offs within their households to maximize their limited income and their ability to accumulate capital in the form of housing (Oviedo and Titheridge 2016). However, transport becomes unavoidable because of the necessity to travel to income-earning activities. Although household priorities are focused on reducing travel expenditure as much as possible, priority is given to maintain any available source of income, leading those household members who work to use most disposable income to travel via public transit, and more often than not, to do so only for work (Oviedo and Titheridge 2016). The focus on work trips rather than non-mandatory trips or trips to meet household needs contributes to a cycle of unaffordability and exclusion of some groups, especially women. In most cases, public transport unaffordability has been proven to limit accessibility to non-mandatory opportunities for individuals in low-income neighborhoods with a limited supply of local opportunities (Moreno-Monroy and Posada 2018; Oviedo and Guzman 2020a).

Gender inequalities tend to amplify affordability inequalities. Affordability constraints on women's mobility keep them away from income sources and services, with implications for the household, children, and, more broadly, the social objectives of development (Uteng and Turner 2019). Greater disadvantages in access (e.g., due to low-quality infrastructure and extended time constraints) are added to constraints related to gender and social class that hamper women's access to jobs and opportunities, especially in low-income areas (Dominguez Gonzalez et al. 2020). Furthermore, the lack of personal safety on public transport (harassment, perception of insecurity) leads women to prioritize security at the cost of affordability (Dominguez Gonzalez et al. 2020; FIA Foundation and CAF 2017). Overall, women tend to be more dependent on public transportation than men due to having less financial capacity, either because of pay gaps or because of unequal distribution of disposable income inside the household. As a result of inequalities in available disposable income for travel and more complex travel needs associated with the mobility needed to provide care, women walk more and use more informal transport than men, as reflected by evidence from Lima, Santiago de Chile, and Buenos Aires (Ariza-Álvarez, Arranz-López, and Soria-Laria 2019; Dominguez Gonzalez et al. 2020; Herrmann-Lunecke et al. 2020).

Most public transit systems in the region have unfavorable fare structures for multistep journeys, which translates into more expensive trips for women. Given the need for circumferential routes, which are often treated as secondary by operators, women have fewer options and therefore pay higher costs for transfers and rely on modes of transport that are more expensive but have better spatial reach or added flexibility (Dominguez Gonzalez et al. 2020). What is more, women in the region tend to prioritize safety in their transport choices, which often comes at the expense of affordability and speed. This disproportionate time and money spent on commuting has been shown to negatively impact women's accessibility to job opportunities (Dominguez Gonzalez et al. 2020; FIA Foundation and CAF 2017). One innovative solution is seen in Buenos Aires, where women reported using WhatsApp groups to put mothers in touch and arrange travel logistics to take children to and from school – ultimately enhancing the mothers' mobility and helping to navigate affordability issues (Dominguez Gonzalez et al. 2020).

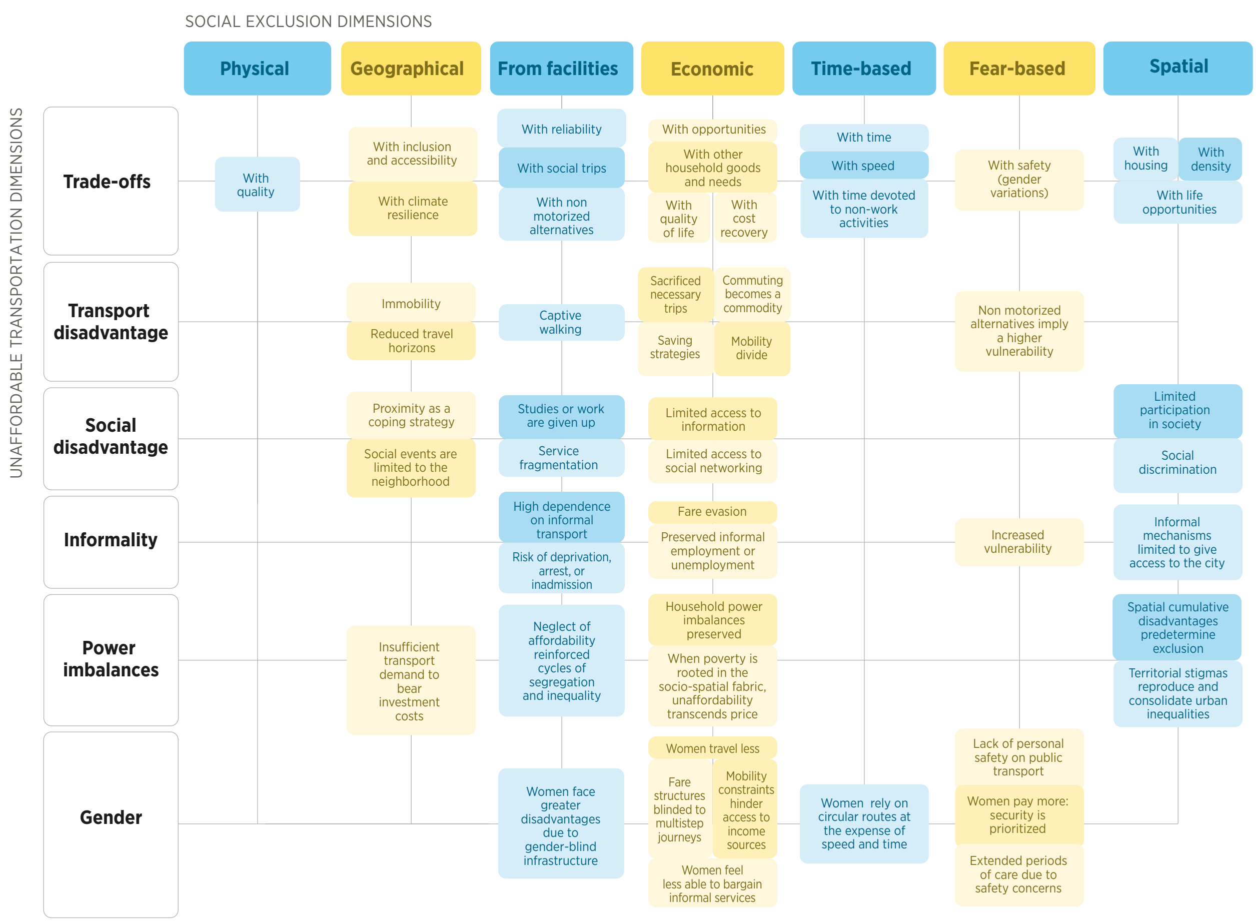
People in the region who cannot access public transport due to financial barriers tend to rely on non-motorized transport or remain immobile (Falavigna and Hernandez 2016; Gandelman, Serebrisky, and Suárez-Alemán 2019). High transport fares have been proven to lead to captive walkers in cities in the region, with poor people forgoing trips due to financial constraints (Falavigna and Hernandez 2016). Around 40-45 percent of the trips of low-income groups in Latin America and the Caribbean are on foot, and many are for mandatory purposes such as work and education (Rivas, Serebrisky, and Suárez-Alemán 2019). A closer examination of walking in certain Latin American cities suggests not only that the poor walk more, but that there is an intrinsic inequality in who is able to walk or cycle in the face of financial barriers to access public transport. Data from different studies suggests that in cities like Barranquilla, São Paulo, and Santiago de Chile, low-income captive walkers tend to be younger and without disabilities, and that low-income men walk and make a higher number of trips than women at the same socioeconomic level (Arellana et al. 2021; Ariza-Álvarez, Arranz-López, and Soria-Laria 2019; Guimarães, Lucas, and Timms 2019; Sagaris and Tiznado-Aitken 2020).

Facing the combination of lack of transit system coverage and the inability to pay for travel for purposes other than access to healthcare, low-income persons with disabilities also find their mobility and access curtailed. For instance, Oviedo and Titheridge (2016) report the case of a disabled woman who was confined to immobility because her travel costs were always higher than those for other members of the household due to her limited choice of transport modes and the need to always travel with a caregiver. This case illustrates the circumstances faced by many vulnerable population groups that need care, such as children, the elderly, and people with cognitive and physical disabilities.

Summarizing: Affordability and Transport-related Social Exclusion in the Region

Figure 5.2 summarizes the evidence discussed above from studies in the local and international literature showing the trade-offs and (dis)advantage considerations of affordability and categorizing them using the dimensions of transport-related social exclusion presented earlier (Figure 5.1). Figure 5.2 suggests that affordability can represent a significant obstacle to socio-spatial integration (Rivera 2012) and an aggravating factor of other dimensions of social exclusion for the urban poor and the socially vulnerable.

FIGURE 5.2 Impacts of Limited Transport Affordability on Social Exclusion in Latin America and the Caribbean



Source: Prepared by the author.

5.2.3 Affordability Policies in Latin America and the Caribbean: Are Subsidies the Only Option?

The Landscape of Transport Affordability Policies

Several countries in the region have made efforts to counterbalance affordability barriers through a variety of measures. Measures inside and outside the transport sector can have direct and indirect effects on affordability. Direct actions such as supply-side and demand-side subsidies (i.e., transfers of resources from the public sector to users and operators), differentiated fare schemes, fare integration, and targeted improvements in public transport supply in areas previously disconnected from public transit seek to alleviate the burden of transport affordability for both the general population and different disadvantaged groups. Other policies such as housing subsidies near areas with a concentration of opportunities, improvements in the availability of information about direct measures for potential beneficiaries, and improvements in data for targeting subsidies can have indirect effects on affordability.

In one of the first assessments of pricing policies in public transport from an affordability perspective in Latin America and the Caribbean, Serebrisky et al. (2009) conducted a quantitative assessment of the distributive impact of public transport subsidies in different contexts during the previous decade. The study concluded that attempts to improve affordability for the poor were insufficient, and advocated for a transition from supply-side (i.e., direct transfers of funds to operators to reduce the share of operational costs covered by user fares) to demand-side public transport subsidies (i.e., direct reductions in fares to individual users who meet specific requirements) (Serebrisky et al. 2009). Studies following this work, particularly in Global South contexts, have supported the need for targeted cost-alleviating policies for the poor and socially vulnerable, and have pointed to the relevance of inter-sectoral work, recognizing the limitations of urban transport policies for redistribution (Bueno Cadena et al. 2016; Gandelman, Serebrisky, and Suárez-Alemán 2019; Gomez-Lobo 2011; Guzman and Oviedo 2018; Oviedo et al. 2019; Rodriguez et al. 2017).

Various governments in the region have standardized efforts to enable affordability relief to citizens sharing any or various conditions of disadvantage, often in the form of differentiated fare schemes for (formal) public transit services. However, when conditions of disadvantage intersect with poverty, the most common result is a disproportionate cost for the household and cumulative vulnerability of those responsible for care, who are frequently women (Hernández and de los Santos 2020; Lira 2020). Both research and practice in the region have suggested that differentiated fares targeting specific population groups can induce the use of public transport and facilitate access to transport services for captive users such as students or the elderly (Jara-Díaz, Cruz, and Casanova 2016). However, limited access to information, limited ability to register and prove eligibility for targeted subsidies, and lack of independence can become added obstacles to efforts to alleviate the burden of public transit fares for students, the elderly, and disabled people in low-income neighborhoods.

As shown in Table 5.4, the region has experienced recent policy and regulatory changes that have shifted the focus from minimizing the costs of investments and maximizing efficiency in the provision of access to a focus on attaining affordability of consumption (Estache, Bagnoli, and Bertomeu 2018). Quito, Bogota, and Mexico City built their BRT systems as a first stage towards establishing an integrated system, with their financial model based on fare revenues covering operating costs (Flores and Díaz 2019; Hidalgo and Gutiérrez 2013). Such systems illustrate a tendency in the region toward guaranteeing financial sustainability of operations of public transit systems, which has negative implications for affordability.

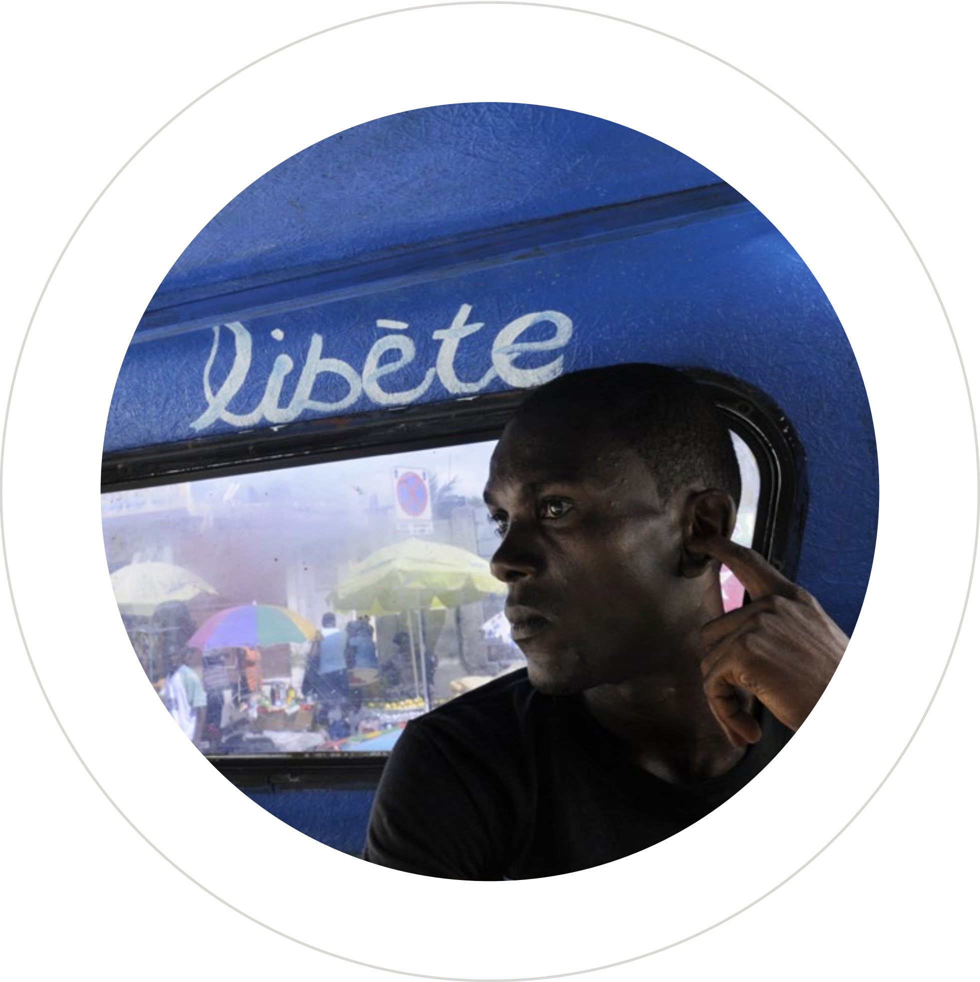


TABLE 5.4 Policy Alternatives to Improve Affordability

Type	Category	Policy	Description	Objective(s)	Criteria for Evaluation	Strengths	Weaknesses	Example
Demand-side interventions	Conditional cash transfers	Government conditional cash transfers	Direct transfers of cash benefits for eligible users for transport expenses	To increase purchasing power of vulnerable populations	- Effectiveness of targeting mechanisms - Inclusion errors - Exclusion errorsw - Increase in purchasing power - Induced mobility	- Can directly benefit most vulnerable populations - Influences income as a determinant of affordability - Relies on sophisticated targeting mechanisms for identifying beneficiaries	- Targeting mechanism is often data-intensive - Potential exclusion errors - No way of guaranteeing use of resources on transport	SISBEN III, Colombia (2007)
		Cash assistance for job search	Direct transfers of cash benefits for eligible users for transport expenses	To increase purchasing power of unemployed populations	- Effectiveness of targeting mechanisms - Inclusion errors - Exclusion errors - Increase in purchasing power - Induced mobility	- Can directly benefit most vulnerable populations - Influences income as a determinant of affordability	- Targeting mechanism is often data-intensive - There is no way of guaranteeing use of resources on transport	
	Subsidies	Employer-based public transport subsidy	State-imposed requirement for employers to include a public transport allocation in addition to salary and social protection contributions	To reduce the burden of travel to work for household economies	- Coverage - Level of use by beneficiaries - Induced mobility/ access to opportunities other than work	- Direct delivery mechanism - Reduction of cost of frequent travel	- Only available for formal workers - Likely to meet political resistance - Requires regulatory reform	
		Cycle to work	Employer-based subsidized credit scheme to enable purchasing of a bicycle	To increase travel choices for employees to get to work	- Coverage - Level of use by beneficiaries - Induced mobility/ access to opportunities other than work	- Direct delivery mechanism - Reduction of cost of frequent travel - Explicit health benefits	- Only available for formal workers - Likely to meet political resistance - Requires regulatory reform - Requires strong partnerships between public and private organizations	Cycle to work scheme (United Kingdom)
		Fuel subsidies	State subsidy to the price of fuel (most frequently fossil fuels)	To reduce the overall cost of running vehicles (including public transport)	- Reduction of operational expenses of public transport - Reduction of transport cost for vulnerable groups needing private vehicles	- Direct delivery - Can improve affordability of the public transport fare for the general population - Can make car/ motorcycle use more affordable for those without a different choice	- Incentivizes private vehicle use - Increases fuel consumption and pollution - Benefits groups that do not need subsidies	Subsidies for fuel in Panama (2015)

Type	Category	Policy	Description	Objective(s)	Criteria for Evaluation	Strengths	Weaknesses	Example
Demand-side interventions	Differentiated fare schemes	Discounted fares for specific user groups	Reduced price of access for public transport/smart card with a specific number of pre-paid trips for specific population groups (e.g., students, the elderly, persons with disabilities)	To reduce the cost of public transit access for vulnerable populations	- Reduction of share of income devoted to transport - Access to the program by eligible populations - Increase in individual mobility of beneficiaries	- Can directly benefit vulnerable populations - More efficient use of limited resources - Reduction of inequalities in access to public transit for vulnerable populations - Easy implementation - Simple eligibility criteria	- No control over abuse - Potential inclusion errors	Buenos Aires (2012) Bogota (2011)
		Targeted discounted fares	Reduced price of access for public transport/smart card with a specific number of pre-paid trips for residents who meet specific eligibility criteria	To reduce the cost of public transit access for lower-income populations	- Reduction of share of income devoted to transport - Access to the program by eligible populations - Increase in individual mobility of beneficiaries	- Can directly benefit the most vulnerable populations - Reduces the burden of transport costs - Uses sophisticated targeting mechanisms to identify beneficiaries	- Targeting mechanism is often data-intensive - Potential Inclusion/ exclusion errors - Risk of arbitrary cut-offs of eligibility score	SISBEN public transit subsidy (2013) (Bogota)
		Temporally/ geographically differentiated fares	Reduced price of access for public transport for users traveling to/from specific areas of the city or at specific hours of the day	To reduce the cost of public transit for people in specific locations or who need to travel at specific times	- Reduction of share of income devoted to transport - Access to the program by eligible populations - Increase in individual mobility of beneficiaries	- Reduces the burden of transport costs - Can benefit vulnerable populations in socio-spatially segregated cities - Enables cross-subsidization - Can induce new trips from specific zones and at specific times	- Requires detailed spatial information and rigorous definition of beneficiary zones/times - Potential inclusion/ exclusion errors - Cross-subsidies can lead to discontent	Peak/off-peak subsidy (2014) (Bogota)
		"Hopper" fare	Transit fare that enables more than one trip/transfer within a fixed time period (e.g., an hour)	To reduce the cost of chained mobility patterns and transfers within the transit system	- Level of use - Induced mobility among users	- Considers mobility needed to provide care - Can induce new trips or enable previously forgone trips	- Can incur a reduction of revenue for operations - Highly dependent on sophisticated smart cards and technology	Hopper Fare (London) 2019

Type	Category	Policy	Description	Objective(s)	Criteria for Evaluation	Strengths	Weaknesses	Example
Supply-side interventions	Subsidies to operators	Reduced flat fare	Reduced transit fare price compared to technical fare	To reduce the cost of public transport for all users	- Level of use of public transport system - Reduction of share of income devoted to transport - Induced mobility of vulnerable groups	- Benefits all users of public transit - Simple implementation	- Requires high levels of funding and operational efficiency - Likely to meet political resistance - Can lead to decrease in quality of public transport	Subsidies on the supply side, Chile (2009)
		Zero-fare public transit	Reduced transit fare price compared to technical fare	To reduce the cost of public transport for all users	- Level of use of public transport system - Reduction of share of income devoted to transport - Induced mobility of vulnerable groups	- Benefits all users of public transit - Simple implementation	- Requires high levels of funding and operational efficiency - Likely to meet political resistance - Can lead to decrease in quality of public transport	
	Optimal fare design/ operational efficiencies	Cross-subsidization	Flat fare that is above the real cost of the fare for advantaged groups and less than what disadvantaged users would have to pay	To reduce the cost of public transport for disadvantaged users without affecting operations funding	- Level of use by segments of demand - Induced mobility of vulnerable groups	- Benefits disadvantaged users - Simple implementation	- Requires high levels of funding and operational efficiency - Likely to meet political resistance - Can lead to decrease in quality of public transport	Transmilenio, Bogota (2001)
		Integrated fares/ transfer cost reduction	Reduced costs for transfers between public transport services	To reduce the cost of public transport for all users	- Level of use of public transport system - Reduction of share of income devoted to transport - Induced mobility of vulnerable groups	- Benefits all users of public transit - Simple implementation	- Requires high levels of funding and operational efficiency - Likely to meet political resistance - Can lead to decrease in quality of public transport	Transantiago, Chile

Source: Prepared by the author.

Subsidies to Specific Population Groups: Who Benefits and How?

The most common policies to address affordability in the region have targeted public transit fares (Gandelman, Serebrisky, and Suárez-Alemán 2019; Rivas, Serebrisky, and Suárez-Alemán 2019). Implementation of subsidies has aimed both to reduce the cost of transport for specific groups such as the elderly, students, and users with disabilities, and to respond to the need to increase ridership and reduce dependency on cars (Gandelman, Serebrisky, and Suárez-Alemán 2019; Rivas, Serebrisky, and Suárez-Alemán 2019). Demand-side subsidies and differentiated fare schemes have been designed to target specific population groups that may benefit from reduced cost to access public transportation, either in the form of a direct transfer (e.g., through a travel card), or via discounted fares for which the difference is transferred to the operator.

In contexts of lower inequality, policies targeting general reductions of travel costs via public transport are more likely to have positive effects on both general affordability and alleviation of the travel cost for the poor. In fact, Montevideo has introduced a 50 percent discount for low-income peripheral residents, which considerably reduces expenditure by the poor (Rivas, Serebrisky, and Suárez-Alemán 2019). Cities showing inequality ratios above the average (e.g., Santiago de Chile, Brasilia, San José, Tegucigalpa, and Nassau), likely need similar targeted policies to reduce the affordability burden of the poorest demand segment.

The use of demand subsidies as a preferred policy alternative in Latin America and the Caribbean can be traced back to the beginning of the 2000s. Most subsidy schemes in place in the region address transport companies and their operational costs (Gandelman, Serebrisky, and Suárez-Alemán 2019). However, in the early 2000s, Gomide et al. (2006) established a direct correlation between affordability and accessibility and made a case for providing targeted subsidies to those who did not qualify for the Vale Transporte (a local subsidy to public transport users who are classified as formal workers), such as self-employed or informal workers in Belo Horizonte. Serebrisky et al. (2009) conducted a quantitative assessment of the distributive impact of public transport subsidies and concluded that demand-side subsidies have greater benefits for low-income persons' public transport affordability. Research in Bogota supports the need for targeted subsidies by showing that they are an effective way to redress longstanding social and spatial inequalities in highly socioeconomically segregated cities (Guzman and Oviedo 2018).

Examples of demand-side subsidies across the region include the aforementioned Vale Transporte in Brazil (1985-to date); teleféricos (cable cars) in Rio de Janeiro (2011–2016); the bilhete unico (single ticket) in São Paulo (2004-to date); feeder lines in Medellín (2004- to date); and more common subsidies seen across the region targeting students, the elderly, persons with disabilities, and members of the police force (Rivas, Serebrisky, and Suárez-Alemán 2019). Such policies have had mixed results due to difficulties in identifying and targeting strategic social groups and to the potential abuse of transfers and discounted fares (Fay et al. 2017; Gandelman, Serebrisky, and Suárez-Alemán 2019; Gómez-Lobo 2011). The effectiveness of demand-side subsidies is also constrained by the widespread use of informal transport modes across cities in the region.

Table 5.5 revisits the four case studies to identify the evolution of affordability indices and present a comparison of subsidy policies in cities across the region. As shown, there is a wide range of approaches to defining fares and differentiating pricing mechanisms to improve access to public transport by specific populations. In Mexico City there are no demand-side subsidies and the city has opted for a general supply-side intervention to maintain lower fares for all seeking equality. Rio de Janeiro has made efforts to increase the types of beneficiaries of discounted fares to improve equity. Bogota deployed targeted subsidies for low-income public transit users using a social policy targeting mechanism (SISBEN) to identify beneficiaries and increase equity in affordability (Guzman and Oviedo 2018).

Most subsidies in Latin America and the Caribbean have deficiencies when it to comes to targeting those most in need. New technologies such as smart cards have allowed for subsidy-related innovations such as improving flexibility and focusing on target groups and securing their adequate use of systems. The SISBEN subsidy has used personalized smart cards to enable beneficiaries to make use of the service at a discount rate of 50-60 percent of the cost of different services for up to 40 trips a month.

Subsidies on the supply side are also used across Latin America and the Caribbean, though less frequently. They involve the transfer of resources to reduce operating costs, which enables offering a discounted fare to users. According to Rivas, Serebrisky, and Suárez-Alemán (2019), from a human-centric approach, the targeting capacity of supply-side subsidies is limited and can lead to benefiting users who do not need fare relief. However, such subsidies can be instrumental for the territorial integration of remote areas (Rivas, Serebrisky, and Suárez-Alemán 2019). One example of the use of such subsidies is Chile's support for public transportation in Arica, Tarapacá, Aysén, Magallanes, Palena and Chiloé in 2009 (División de Transporte Público Regional 2018).

Affordability in Policy and Practice: A Case Study of Bogota

Box 5.3 presents a case study prepared for this chapter on public transit affordability in policy and practice in Bogota. The case study draws on interviews with a wide range of key stakeholders and examines the need for mechanism to ensure both affordability for users and the long-term financial viability of the system. Topics examined include the main challenges and opportunities for affordable policies in public transit, the governance and politics of progressive pricing policies, and the challenges for financing public transport as viewed from different perspectives.

TABLE 5.5 Evolution of Fares in Selected Latin American Cities: Affordability Indicators Estimated for a Fixed Basket as a Percentage of the Minimum Wage, and Differentiated Fare Schemes

City	Transport Cost (2014 to 2021)1	Average Transport Cost	Minimum Wage (2014 to 2021)	Average Minimum Wage	Affordability Index as a Percentage of the Minimum Wage (2014 to 2021)[2]	Average Affordability Index	Differentiated Fare Schemes	Beneficiaries of Differentiated Fares
Bogota	1,500 COP - 2,500 COP	2,069 COP	616,000 COP - 908,526 COP	760,401 COP	11.6 - 14.9 percent	13.52 percent	Special rates and discounts (limited to a number of monthly trips) and cash transfers to transport cards	- Elderly - People with disabilities - Low-income (SISBEN)
Santiago de Chile	620 CLP - 800 CLP	712.5 CLP	221,000 CLP – 326,500 CLP	273,250 CLP	10.7 - 15.5 percent	12.9 percent	Special rates	- Secondary and tertiary education students - Elderly
Río de Janeiro	R3.5 - R7.65	R5.52	R788 -R1.100	R967.53	21 - 34.8 percent	28.04 percent	Free use limited to a number of trips per month	- Elderly - People with disabilities - Basic and secondary education students - People with chronic illnesses - Low-income university students and beneficiaries of the Universidade para Todos program - Children age 5 or younger
Mexico City	3 MXP - 7 MXP	5.45 MXP	2.018 MXP - 4.251 MXP	2.799,11 MXP	5.9 - 14.8 percent	10.2 percent	No differentiated fare schemes identified	No demand-side subsidies/ General subsidies for operations

Source: Prepared by the author.
Note: COP: Colombian pesos; CLP: Chilean pesos; R: Brazilian reais; MXP: Mexican pesos.

1. All costs are in nominal values for the respective year.
2. Monthly transport costs were assumed as 50 trips.

BOX 5.3

Bogota: Public Transit Affordability in Policy and Practice

This case study draws on 45-90 minute semi-structured interviews with current and former decision-makers, key stakeholders and experts in the civil service, academia, local political arenas, and international development agencies conducted between July and September 2021. The case study summarizes a detailed content analysis of the responses of nine participants. Interviews covered, among other topics, the main challenges and opportunities for affordable policies in public transit, the governance and politics of progressive pricing policies, and the challenges for financing public transport as viewed from different perspectives.

Incorporating Affordability into Decision-making: The Urgent versus the Important

In recent years, Bogota has witnessed significant milestones in the expansion of its public transport network, including implementation of the first cable-car line in a low-income neighborhood in the southern side of the city, a renovation of the Bus Rapid Transit (BRT) fleet that involved changing the historical business model for provision of the service, and the adoption of new technologies (i.e., electrification of the fleet) in line with growing decarbonization agendas at the national and city levels (Oviedo and Guzman 2020a). However, efforts to improve the coverage, quality, and sustainability of public transit in Bogota stand in stark contrast to the number of urgent challenges for securing the system's survival in the long term.

On a regular pre-COVID-19 workday, demand for Bogota's Public Transit System (Sistema de Transporte Urbano de Bogota - SITP) amounted to approximately 4.5 million journeys per day. The SITP marked significant progress in Bogota's efforts to formalize and technically update public transport (according to interviewee number 4, from the multilateral group of interviewees, notated as "4, Multilateral"). However, imbalances between supply and demand have persisted, endangering the city's ability to afford to maintain its public transport supply. High levels of demand prior to the pandemic, coupled with financial constraints for expanding the system's capacity, have challenged the city's ability to maintain uniform service levels across its public transit network. According to data from 2019, the SITP suffered significant increases in fare evasion both as a result of price increases and a perceived reduction of quality that led to discontent among some user groups (Guzman et al. 2021). In parallel, although the city has made efforts to reduce the cost of using public transit for selected user groups since 2011, limited available resources to fund differentiated fare schemes has led to a limited capacity for inclusion of beneficiaries, prompting debates about the systems' overall effectiveness and sustainability in the long term (8, Politician - City Council) .

These challenges have been compounded by the demand and fiscal deficits left in the wake of the COVID-19 pandemic. As interviewee 1 (Civil Service) noted, demand decreased in 2020, bottoming out at 13 percent of the total passengers the system would have had previously on a normal pre-pandemic day. According to various respondents, even since the economic reopening in 2021, at least a third of public transit demand has yet to return (interviewees 1, 3, 8). Furthermore, complex public-private arrangements and tensions around fare prices have prompted debates about ways to maintain the uninterrupted supply of public transit services financially and logistically in the city. As a result, decision-makers find themselves in a crucible between the urgent (financing the operation) and the important (reducing inequalities), in a context where COVID-19 has both exacerbated poverty and income inequalities across the board and dealt significant blows to public finances in all development sectors (interviewee10, Political Technical Advisor).

Two Competing Priorities and Their Effects on Affordability: Reducing the Overall Fare versus Targeted Subsidies/Differentiated Fares

Recognizing differences in purchasing power among users has received increasing attention in Bogota's transport-related policy and political arenas in recent years. This has led to tensions between two often competing visions of affordability: a fare that maximizes access without threatening the financial viability of operations versus differentiated pricing and subsidy schemes that reduce gaps in access to public transit for vulnerable populations. According to most interviewees, although discussions about incorporating users' purchasing power in the definition of transit pricing have gained relevance among civil servants and politicians alike, attention remains devoted to reducing the fiscal deficit and "keeping the buses running," as one interviewee put it (8, Politician - City Council). It is unclear how to resolve existing tensions between what can be conceived as transport formalization and modernization measures versus social policies aimed at reducing affordability inequalities, although the strategic local government plan (Bogota's Development Plan 2020–2023) sets both as key priorities.

On the one hand, those who argue for prioritizing the city's ability to supply formal and modern public transport services to as many people as possible tend to favor fare policies that guarantee a stable revenue stream for the SITP. Such respondents are involved in decision-making in areas such as finance and urban mobility. Interviewees across the board recognized that perhaps the biggest challenge associated with the current fiscal arrangements to finance operations is the need to cover the difference between the total cost of operation (which defines the technical fare) and what is generated from user fares. For some, covering the difference between the technical and user fares could be considered a subsidy, since it involves demand for public resources without an explicit benefit. The administration of Bogota has approached the allocation of resources as a sponsorship commitment to the system. Interviewee 5 (Civil Service) argued that local authorities were aware of the need for public resources to secure the provision of public transport services from the moment the SITP was put into operation. This is reflected by the sponsor agreement signed between the city and the system's managing agency, Transmilenio, in 2009, which aimed at securing the allocation of public funds for the duration of the public-private partnership (PPP) contracts underpinning the SITP (24 years) in the event of a deficit from operational sources of revenues (i.e., fare collection). Such a practice represented the continuation of the position originally adopted by public authorities during implementation of the city's BRT system in 2000. This involved committing public funds to supplement deficits in the funding of operations, a commitment that was ratified in 2018 when new PPP contracts for the SITP were signed (interviewee 5, Civil Service).

On the other hand, measures aimed at reducing inequalities to pay for transit services continue to be considered and implemented to improve access for specific population groups. Since implementation of the SITP, Bogota has adopted diverse schemes of differentiated fares, with some approved by the City Council and others implemented by decision of the Mayor. Table 5.3.1 shows how demand-side interventions adopted in Bogota have combined different delivery mechanisms. Some are differentiated fares with specific target populations (i.e., the elderly, the poor, and persons with disabilities), while others, such as the peak/non-peak differentiated fare (Hora Pico-Hora Valle), are designed as an indirect allocation of resources to the SITP aimed at reducing the fare costs for the general public at specific times.

TABLE 5.3.1 Historical Subsidies Adopted by the Public Transit System of Bogota

Name	Adopted by	Year of Adoption	Legal Document	Benefit Based on	Characteristics	Special funding mechanism	Financed with	Implemented	Modified
Elderly	City Council	20111	Decree 073/2020	Age	Subsidy for elderly population age 62 or older. Requires a personalized smart card to use the SITP. Beneficiaries pay an average of 86 percent of the user fare for up to 30 journeys per month. Direct assignation.	No	City's General Budget	Yes	Yes, Decree 073/2020
SISBEN	Mayor's Office	2011	Decree	Socio-economic status	Subsidy for low-income users 16 years of age or older. Requires a personalized smart card to use the SITP. Beneficiaries pay an average of 72 percent of the user fare for up to 30 journeys per month. Direct subsidy.	No	City's General Budget	Yes	Yes, Decree 073/2020
Disabled users	City Council	2011	Agreement 484/2011	Physic conditions	Subsidy for disabled population registered in the data basis of the District's Health Office. Requires medical evidence of the disability and a personalized smart card to use the SITP. Direct subsidy.	No	City's General Budget	Yes	Yes, Decree 073/2020
Peak-non-peak	Mayor's Office	2012	Decree 356/2012	Day of the week and peak/ non-peak	Differentiated fare based on the day of the week and time of day. Indirect.	No	City's General Budget	Yes. Ended in 2016	Yes. Decree 046/2016
Students	City Council	2015	Agreement 615/2015	Activity	Benefit for students in socioeconomic strata 1, 2 and 3 studying further than 1 km from their residences. Direct subsidy.	No	No	No	No

Source: Prepared by the author.
Note: SISBEN: Sistema de Identificación y Clasificación de Potenciales Beneficiarios para Programas Sociales (Program to Identify and Classify Potential Beneficiaries of Social Programs); SITP: Sistema de Transporte Urbano de Bogota (Public Transit System of Bogota).

1. The subsidy for the elderly was adopted in 2011. However, the initial decree was revoked, and the current valid Decree 073 was adopted in 2020.

Interviewees acknowledged that existing demand-side interventions, in particular those targeting low-income public transit users, such as interventions by the Program to Identify and Classify

Potential Beneficiaries of Social Programs (Sistema de Identificación y Clasificación de Potenciales Beneficiarios para Programas Sociales - SISBEN) are highly political. The conditions for the targeting and scale of those benefits are set by mayoral decree and budgets are approved by the City Council. Approval of the yearly allocation of public resources to the SITP by the City Council involves complex negotiations and political trade-offs. Relevant criteria such as eligibility scores and the number of trips allocated in smart cards for beneficiaries are defined by different authorities depending on the specific policy. In the case of Sisben, these are defined directly by the Mayor (interviewees 1, I5, Civil Service), while for measures such as those targeting elderly or disabled populations, decisions about implementation are made by the City Council. Complex political and governance relationships have an effect on key determinants of the impact of demand-side interventions, such as the conditions for eligibility and the individual value of each subsidy. Even in cases where subsidies have been adopted by the Mayor's Office, it is necessary to engage in political discussions with the City Council to secure the necessary resources to finance the policy.

The performance of demand-side interventions has been monitored since implementation, and modifications to targeting mechanisms have been adopted in response to the observed evolution of both funding and levels of use of each measure by its beneficiaries (interviewee 5, Civil Service). Despite skepticism from detractors in political and public opinion circles, current subsidies in the SITP represented only 11 percent of the total public resources allocated by the city to cover operational costs of the SITP before the pandemic (interviewee 5, Civil Service). By contrast, most public funding has been devoted to cover the fiscal deficit left by the difference between the actual technical fate and revenues collected from user fares.

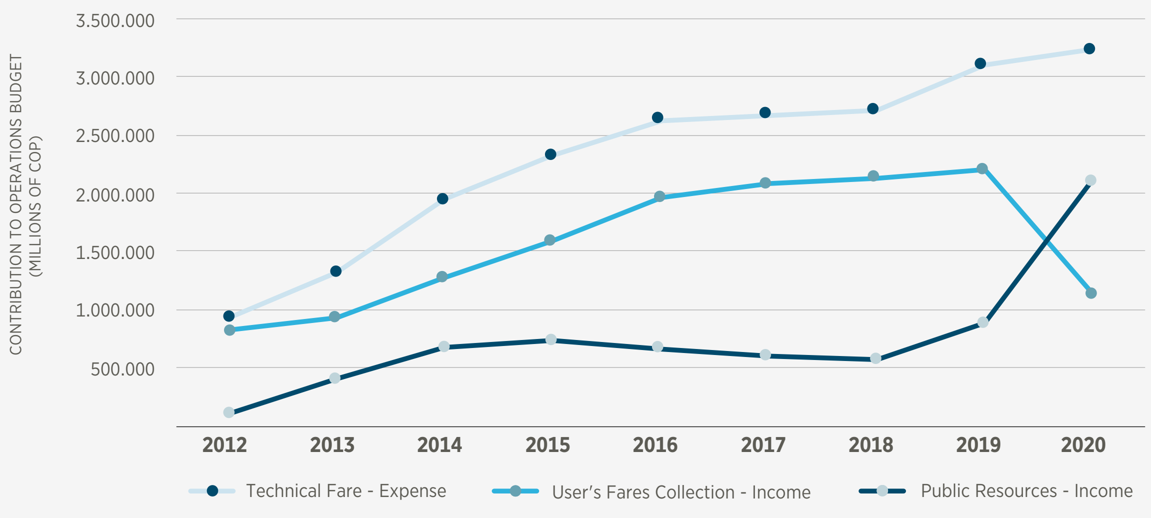
According to interviewees in the civil service and practitioners, most of the current flow of resources from the public coffers to public transport is devoted to cover private operators' contractually agreed-upon revenue and to fund the operation of other organizations involved in providing public transit, including Transmilenio S.A. Furthermore, a significant weakness of the current approach to demand-side affordability interventions is the lack of impact evaluations to understand the effect of differentiated fare schemes. Such a weakness not only constrains the ability of authorities to measure the impact of fare policies on reducing inequality; it also limits the availability of evidence that can support potential expansion of current policies and ease some of the complex political negotiations involved in securing funding for transport-related subsidies. Interviewee 6 (Civil Service) suggested that this is not simply a matter of lack of evaluation and control mechanisms but is rather linked with the complex governance and accountability arrangements of public transit provision in the city. As the interviewee stated: "It is not clear who is responsible or has the technical capacity to collect and analyze the required information for an impact evaluation."

In sum, the overview of differentiated fare policies and interpretations of affordability by stakeholders of public transit in Bogota suggests that while some progress has been made towards more progressive fare designs in the city, the planning and evaluation of them lacks formality, policy objectives and performance are often unclear, and fares are significantly vulnerable to changes in the political tides.

Financing Mechanisms and Practical Implementation Issues Faced by Progressive Pricing Policies

The notion of financial self-sustainability, understood as the ability of the system to sustain is operations almost completely from fare revenues, has been persistently present in public transport policy and operations in Bogota since original adoption of the Transmilenio BRT system. With the development of the SITP, this concept has slowly evolved towards recognition of the need to invest public resources to cover not only capital investments (e.g., rolling stock and infrastructure development), but also operational expenses. Consequently, despite a constant increase in public transit fares every year since 2016, the city has witnessed a considerable increase in the fiscal pressure on public transport operations in the city's budget. This is particularly true for 2019 and 2020, when more than 3 million COP (US$1 billion) of public resources were allocated (Figure 5.3.1).

FIGURE 5.3.1 Historical Incomes and Expenses of the Public Transit System of Bogota, 2012–2020 (in millions of COP)



Source: Prepared by the author based on data from Transmilenio.

Within this context, attaining more efficient distribution of not only the share of public resources but the way the SITP's operational expenses are funded overall has been recognized as one of the city's highest priorities (interviewee 1, Civil Service). However, discussions about alternative funding sources for the operations of Bogota's public transit system have now gone on for years without much visible progress, despite the existence of national-level regulations that allow territories to implement different tools to collect funding for urban transport (i.e., National Development Plan Laws 1753/2015 and 1955/2019). Some noteworthy alternative funding sources included in the National Development Plan are parking charges, congestion charges, and land-value capture. However, the procedures, conditions, and destination of resources collected via these mechanisms are defined by local authorities (interviewee I7, Civil Service). High levels of decentralization of power regarding local finances have limited the national government to determining general guidelines and policies regarding local budgets and their composition. Consequently, as noted by interviewee I5 (Civil Service), Bogota is still in a stage where the city's regular and general budget is covering the costs and expenses of the SITP not covered by user fees, rather than considering alternative funding sources as a way to extend the scale and sustainability over time of differentiated fares and other operational expenses.

Next to the need for new mechanisms for financing and their associated implementation issues, there are significant practical challenges for the long-term financial feasibility of transit services in the city. For instance, the SITP has used its PPPs as an instrument to develop new infrastructure with the adoption of new business models in the contracts signed with operators in 2018. At that time, Transmilenio adopted a scheme under which private operators are in charge of providing the rolling stock alongside associated infrastructure such as garages, charging stations, offices, and general logistics infrastructure. Consequently, and as noted by interviewees I2 (Independent), I3 (Civil Service), and I4 (Multilateral), with the adoption of these new PPP policies and the implementation of new infrastructure, the city considerably increased the fiscal pressure that operations were imposing on an already high fare. This effectively meant transferring the costs of new infrastructure items to the user, as fares were the only explicit source of revenues included in the operators' contracts.

New business models and a growing regulatory landscape that enabled new forms of revenue-collection mechanisms led to a rise in voices calling for a revision of the SITP's operational expenses. Politicians and decision-makers have raised structural questions and made claims about renegotiating the existing PPPs. On the one hand, City Council debates have tended to focus on questioning the profitability of private operators rather than critically examining what services are contracted by Transmilenio. On the other hand, although the City Council sanctioned Agreement 863/2021 to mandate a review and renegotiation of PPP contracts between Transmilenio and the private operators, there is no clear scope or guidelines for this process. As noted by interviewees I2 (Independent) and I5 (Civil Service), little attention has been paid to the fact that the city still does not know the real cost of the provision of public transport services. PPP contracts allow remuneration to be based on a fare offered during the bidding process by each operator, which allows operators to define their own cost schemes as long as minimum standards are met. These obscure mechanisms make it difficult to understand operators' operational trade-offs and potential hidden inefficiencies that may be affecting the price of the fare.

A final significant practical constraint is the governance structure of the city's public transit. Different actors at the city and national levels linked to the transport sector have agreed that a more hierarchical and articulated relationship among entities in the local administration, such as between the mobility and treasury offices and Transmilenio, could improve flows of information and access to technical capacity to support decision-making. More transparency and open sharing of information could therefore foster better understanding and coordination of the technical and financial dimensions of the public transport supply in Bogota.

Alternative Policies and Funding Mechanisms to Improve Affordability for Social Inclusion

The undeniable pragmatism of delegating public liabilities to private actors has meant higher compensation for operators during the execution of PPP arrangements to provide public transit in Bogota. Despite agreement that a "heavy fare" – understood as one that covers most operational expenses – goes against affordability and can jeopardize the system's continuity in the long term, the city has made little progress in reducing the contribution of fare revenues to the public transit budget. Despite increasing fare prices, more public resources have been required to cover the operational expenses and some of the capital and infrastructure investments assigned to private companies operating the SITP routes. This suggests the need for a lighter business model in which specialized stakeholders focus on their known practices rather than executing a broader project. In this regard, alleviating the fare can go a long way in improving affordability by reducing the items covered by user fare revenues. Furthermore, there is an explicit need to identify in more detail the real expenses of the public transit system, as well as to distinguish which expenses could be covered by the city in a more efficient way rather than extending their payment in a longstanding contractual relationship.

The regulatory landscape has opened ways forward to identify new revenue sources for the financing of public transit operations. However, there is a need for more imaginative and direct interventions to increase funding from public transport's positive externalities to the city. For instance, new technologies and more sustainable practices that have recently been adopted by the city are benefiting direct users as much as the rest of the Bogotanos. Using the notion of Ardila-Gomez and Ortegon-Sanchez (2016, 16) that "who benefits pays," the city should move towards a broader analysis of sectors, activities, and, in general, those who historically have been silently getting benefits from the positive effects of the public transport system. By the same token, more efforts and political will is necessary to bring to the fore the costs of less sustainable transport modes such as the private vehicle. Interviewee I8 (Politician - City Council) mentioned that it is politically easier to increase the public transit fare than it is to increase parking costs or other charges related to private vehicles. In this vein, it is essential to offset the carbon contributions and negative health impacts of the private vehicle via explicit charges that can contribute to the city's public transport budget.

The above mechanisms have the potential to increase a revenue stream that at present is overly dependent on user fares and public contributions from the city's general budget. However, new charges will do little to reduce the fare of public transit or increase the coverage and benefits of current differentiated fare policies without the ability to devote such revenues explicitly to public transport. It is therefore necessary to implement regulatory reforms that allow for explicit allocation of resources to public transit operations and progressive fare reduction initiatives. This will enable alternative funding sources to contribute to improving transit affordability rather than entering the black box of public expenditure without a clear impact on transit inclusion and equality.

5.3 Policy Recommendations

Framing transport affordability as a critical social concern sheds new light on an often elusive policy discussion about the opportunities and challenges associated with achieving a more economically accessible yet sustainable urban transport system. On the one hand, the many social implications of affordability can inform the development and adoption of mechanisms to reduce the economic burden of accessing sustainable transport for individuals and households with different intersecting social identities and diverse travel needs. On the other hand, affordability exhorts practitioners and decision-makers to consider the significant practical implementation challenges involved in reducing transit fares for at least some population groups without compromising equally relevant objectives such as carbon reduction and sustainable development.

Policies, programs, and strategic actions to improve transport affordability must be assessed against strategic objectives as well as their feasibility in the short, medium, and long terms. Strategically, policies need to contribute to the dual long-term objective of maximizing the positive externalities of public transit while minimizing the inequalities in accessibility and exclusion associated with the cost of transport for users with different purchasing power. Achieving these long-term targets requires trade-offs between alleviating the cost of public transport for its users and securing the financial stability of the system's operation and its ability to grow in scale and quality so as to reduce transport's carbon footprint. As such, it is also key to define clear short- and medium-term objectives that can inform necessary reforms to fare mechanisms, operational schemes, and regulatory environments so as to enable the adoption of policies and funding mechanisms that support continuous improvements in transport affordability. These objectives can include, among other things, improving knowledge and information about the operational costs of public transit, transforming revenue streams for funding operations to reduce the contribution of fare revenues to covering such costs, exploring alternative funding sources, and strengthening regulatory frameworks that enable decision-makers to both implement affordability policies and allocate specific resources to public transit. This chapter has not intended to make an exhaustive list of alternatives, but rather to present a set of considerations for policy and practice that can open new avenues for the development of affordability policies that can reduce exclusion and inequalities in the short, medium, and long terms.

5.3.1 Potential Avenues to Improve Transit Affordability in the Region

There is a wide repertoire of policies and mechanisms to improve transit affordability in cities of Latin America and the Caribbean. These range from pricing mechanisms and operational reforms to the implementation of targeted services for vulnerable populations. Some of these alternatives, like the provision of informal transport services for the elderly and people with disabilities, are covered in other chapters of this report. Therefore, the emphasis of this chapter's recommendations will be on policies targeting the cost of accessing transport and those seeking to improve users' purchasing power and disposable income to afford transit services.

- Improve information and targeting mechanisms to identify potential beneficiaries of affordability policies. Table 5.4 showed that there is a wide array of measures that can alleviate the cost of public transport for vulnerable users. However, precisely identifying such vulnerable users requires detailed information and therefore instruments for data collection and management that can inform the selection mechanism to choose beneficiaries. There are important lessons to be learned from conditional cash transfer programs that have deployed means-tested targeting mechanisms to select their beneficiaries, as is the case of SISBEN in Colombia. That system is based on a sophisticated survey with levels of representativeness similar to those of the national census for low-income populations. The system was developed to have waves of data collection across low-income citizens, complemented by a self-reporting system where people can input their own data and get a score that will determine whether they are eligible for social assistance. This logic can be applied to public transport subsidies. However, to do so it is necessary to develop and implement the necessary instruments and platforms for data collection and management that can then be used to target beneficiaries. Furthermore, smart cards that enable delivery of the allocated subsidies to beneficiaries are also an essential part of these programs.

- Develop differentiated fare mechanisms aimed at reducing inequalities. In line with the above recommendation is the development of differentiated fare mechanisms that reduce the economic cost of accessing public transport for socially and transport-disadvantaged populations. As shown in Table 5.4, these mechanisms can include discounted fares for the elderly and disabled populations as well as spatially and temporally differentiated fares. The focus of such programs must be underpinned by the recognition of structural inequalities in each context. Some cities in Latin America and the Caribbean are more socially and spatially segregated than others, which leads the poor to live in the peripheries – thus making it sensible to implement fare relief for neighborhoods on the outskirts of the city. By the same token, there are cities where differences in age, gender, ethnicity, and (dis)ability, among other characteristics, can place significant constraints on providing public transport. The recognition of such specific disadvantages can inform the development of differentiated fares targeting those who need them the most. However, the first criterion must be the reduction of inequalities.

- Consider the temporality of transport demand and affordability needs. There are case-specific drivers of unaffordability that manifest at different times as much as across population groups and the city's geography, and that intersect with different social identities. The recognition of specific time-related disadvantages and dynamic travel needs can contribute to reducing the cost for different population groups identified throughout this chapter. For example, the implementation of "hopper fares" whereby users can make different trips or transfers across public transit modes within a fixed time (e.g., one hour) without paying more than their first fare can greatly benefit women, children, and those users making chained trips for different needs. As noted in the chapter about vulnerable populations, women make more trips related to care and these are often made in succession. The recognition of such travel needs via a specific fare that has an allocated time for completing various activities between displacements can greatly reduce the total cost of travel for women and other users with similar travel needs. In a similar vein, it is important to enable access to public transport for those who do not travel at the same times as the average user. Peak/off-peak fares have been implemented in countless public transit system, in many cases making it cheaper to travel during off-peak times and improving affordability for a considerable share of the population. Such recognition must also be extended to the night-time economy and those citizens whose livelihoods may depend on traveling at night or the early mornings and who often do not have access to public transport. This aspect is partly covered in the chapter about coverage and quality of public transport of this report on the coverage and quality of transit systems. However, it is worth noting that reducing fare costs at night can improve access and induce mobility for users who are often ignored in decision-making processes.

- Work across sectors and think holistically about household expenditures on transport. The framework introduced at the beginning of this chapter shows that affordability depends as much on the cost of transport as it does on the purchasing power of those using it. In this regard, it is relevant to think about affordability as a cross-sectoral problem beyond transport. Table 5.4 identified some mechanisms to increase disposable income to pay for transport via employer contributions on top of the salary of formal workers to cover, at least partially, the cost of traveling to work. Such contributions are contingent on the development of partnerships and regulatory frameworks that help operationalize these contributions. Considering the nature of Latin American and Caribbean cities, these types of programs need to be complemented by mechanisms to reach informal workers so that they are not excluded from potential increases in their disposable income. Furthermore, there are other nonfinancial and non-transport-related mechanisms that, although covered in other chapters, are worth mentioning here. On the one hand, there is the potential to develop social housing interventions that reduce the cost of housing for low-income populations, and can also improve access to housing in areas with higher accessibility and coverage of public transport, in order to reduce the overall cost of mobility for their residents. Furthermore, social housing programs can be used as a vehicle for the selection of beneficiaries for targeted transport subsidies. By combining housing and transport incentives, it is possible to increase the positive impact of social housing policies.

- Define long-term affordability targets and synergize current public transport agendas with affordability objectives. One of the potential avenues to improve affordability identified in this chapter is the overall reduction of fares so all users can make use of public transport. While many governments in the region strive to maintain low fares that can still contribute to cover some of the operational costs of the system, this chapter suggests defining more ambitious long-term targets to improve affordability. One example of such a target is the implementation of a zero-fare public transit fare in a period of 30 or 40 years. By setting such targets, the conversation shifts from maintaining fares that cover some share of the operation to the progressive reduction of fare contributions to operational expenses and the active search for alternative funding sources to reach the long-term objective of reducing fares, at least for the most vulnerable. This long-term vision of affordability needs to be accompanied by short- and medium-term interventions that are consistent with the trajectory of development of public transport in each city. In the case of cities implementing public transit reforms geared towards integration and formalization, affordability targets of reductions in transfer costs, recognition of negotiated fares in informal transport, and the search for operational efficiencies to reduce affordability inequalities (such as cross-subsidization) can contribute to reducing inequalities around the pricing of public transport. These general recommendations are an invitation to explore new timeframes, scales, sectors, and population groups in which to intervene to improve affordability. The evidence presented in the chapter supports the need for all levels of intervention to secure a sustainable reduction of the economic burden of travel on the poor and disadvantaged.

5.3.2 How to Fund It? Implications for Public Finances

Despite having an ample array of alternatives to improve affordability at their disposal, policymakers and decision-makers seeking to implement any of these potential solutions face the common challenge of securing funding sources that can be sustained in the long term. Public resources are limited, and national and city budgets need to be distributed across different development sectors. With this in mind, whatever is allocated from the public coffers to transport will therefore represent a trade-off with other social and economic needs of the population or compromise the ability of public authorities to access credit in the future. Furthermore, the effects of COVID-19 on transit operations in the region and the growing deficit of demand and revenue of urban public transport as a result of the pandemic is endangering the ability of public and private stakeholders to run services in the short and medium terms.

In this context, public authorities are challenged to balance the often-competing priorities of maintaining operations (i.e., keep the buses running), implementing technological and operational reforms to improve service quality and environmental sustainability (i.e., through modernization of the fleet, energy transitions), and reducing the economic cost of accessing the system for users. The identification of sources for funding, as shown in Box 5.3 in the case of Bogota, requires structural changes as much as operationalization of new ways to manage public transport finances.

Structural Changes

At the structural level, perhaps the most relevant change needed in the region to implement necessary transport affordability policies is to recognize public transport as a social service. As with social assistance, the key role that public transport plays in enabling access to livelihoods and human and social capital more broadly must be protected. This argument can serve as an entry point for the allocation of public resources to develop and operate public transport.

Other structural changes involve starting dialogues across stakeholders in policy, political, and regulatory circles to reform current regulations in order to enable implementation of both alternative funding mechanisms as well as specific allocation of resources to public transport. While there is a wide range of potential revenue sources for the transport sector, as discussed below, without the necessary regulations and political buy-in they will never be adopted in the scale required to address the transport affordability challenge in Latin America and the Caribbean.

Finally, it is necessary to level the playing field in terms of governance and representation in the transport sector. Many of the proposed initiatives are subject to political debate and approval in arenas such as city councils and national senates. However, there is little representation of public transport users in these arenas, especially in comparison with powerful interests such as car manufacturers and users, and even public transport operators. It is necessary to recognize and give voice to those more affected by fare policies and actions that affect the affordability of public transit so that interventions to change the cost or disposable income for transport have a chance of being approved and implemented in the different spheres where their consideration takes place.

Changing the "Outs" of Public Transport Systems

The necessary reforms to fund progressive affordability polices involves understanding the costs involved in the provision of public transit services. Box 5.3 showcased the many complexities involved in public-private partnership arrangements for public transport provision in Bogota. Such arrangements are common across cities in the region, and they often suffer from the same issues. It is imperative therefore to break self-reinforcing cycles that lead to increases in the costs of operation, such as long contract periods, loose conditions for fleet renewal without taking into account technological transitions, and the extension of incentives adopted in early phases of implementation or modernization of public transport systems. Furthermore, it is important to reduce asymmetries of information between private operators and the public sector. By investing in more transparency and sharing of information, it will be possible to uncover hidden operational efficiencies that may reduce the overall cost of providing public transit services. Such efficiencies are in most cases only known by operators and therefore translate in revenue rather than into a reduction of costs for the user.

Moreover, it is necessary to redefine what the user should be charged, considering the many health and environmental benefits of public transit for society in general. For instance, fleet renewal has been challenged as a cost that should be covered by fare revenues given the impact that cleaner vehicles have on air quality across a city (Ardila-Gomez and Ortegon-Sanchez 2016). A similar logic can apply to infrastructure costs and other operational expenses, which may carry enough societal benefits to justify being covered by a revenue stream other than fares.

Changing the "Ins" of Public Transport Systems

At present, one of the main challenges many public transport systems in Latin America and the Caribbean face is the lack of sufficient resources to fund their continued expansion, modernization, and operation. To change the funding sources of public transport services means making explicit the positive externalities of public transport as well as the negative externalities of other road users. Funding for transit operations can draw from sources such as fines, congestion charges, parking costs, and the development of environmental charges that can offset the carbon contribution of private vehicles and other pollutants within the transport sector. Furthermore, the health benefits of public transport need to be made explicit as the cost savings for medical care of people exposed to air pollution is drastically reduced by the operation of public transit. These benefits can be added to property taxes in lower-emission zones and other levies at the city level that contribute to the city's budget. Other sources for revenue within public transit systems are advertising, land-value capture, and monetization of know-how via technical assistance.

5.4 Conclusions

Latin America and the Caribbean is characterized by marked disparities in affordability both in terms of aggregate travel expenditure for public transit users in general and users with lower incomes. Differences at the city and other local levels reflect variations of structural factors such as land use and functional urban configurations, transport supply structure, pricing policies, integration, and informality. Not everyone is in the same social position to afford public transit and to make trade-offs between the cost of accessing public transport and other goods, services, or opportunities for themselves or other members of their household. Evidence from various cities across the region shows that women, those living in informal settlements, and people in need of care are among those most vulnerable to being priced out of public transit and therefore from fully participating in the opportunities urban societies in the region can offer.

Most Latin American and Caribbean cities have historically prioritized the financial self-sustainability of their transport systems, which has placed an extra burden on people's personal finances since the development and implementation of these systems. Recent policy changes demonstrate that improving transport affordability has become a priority in the region and that commitments with agendas such as the SDGs have given a push to the development and adoption of progressive public transit policies. Nonetheless, significant effort and commitment will be needed to achieve affordable and inclusive transport given the decades during which affordability issues were neglected, reinforcing cycles of segregation and unequal access to transport, land use, and opportunities reachable via transit.

Although the region's policymakers have mostly focused on subsidies to address affordability, other alternatives, such as conditional cash transfers, cross-sectoral subsidies, and implementation of hopper fares, can have positive effects on reducing the financial burdens of transport for household economies. Pricing measures coupled with other structural interventions such as improving coverage and quality can go a long way towards reducing time and monetary costs for the poor. The most effective measures to improve both affordability and accessibility involve mechanisms for physical and technological integration, and adequate information systems that allow for targeting beneficiaries and for monitoring and evaluation. Subsidies remain a key option, particularly to achieve equity and reduce disparities between the average user and individuals in conditions of disadvantage. However, targeting mechanisms need to better recognize the diversity of intersecting needs for specific groups (e.g., low-income women), and strategies are needed to improve the chances of these groups to access opportunities at a lower cost taking into account their specific mobility and other needs.

Finally, addressing the challenge of improving affordability of public transport should include a holistic approach that considers urban form and the entire transport network. For instance, policies should incorporate alternatives that improve housing affordability – a key priority for low-income households – and that also mitigate the associated transportation trade-offs people face. By the same token, given the high reliance on informal and non-motorized transport in Latin American and Caribbean cities, exploring synergies and alliances between informal operators and elements of formal transport systems (e.g., shared bicycles or other formal operators of on-demand service) could contribute to improve coverage and connectivity at integrated rates that make it cheaper and more convenient to transfer from local services to long-distance ones (i.e., mass transit).

To address the affordability challenges in transit services in Latin America and the Caribbean it is necessary to think beyond the conventional limits of transport planning. A key aspect of this effort is to work across disciplines and areas of urban governance and planning to reach holistic solutions that build on the strengths of other sectors. Examples of these more holistic approaches are the use of targeting mechanisms, such as SISBEN, and the recognition of specific vulnerable groups (such as informal workers) that are unique to regional contexts and have already been addressed by other areas of local governments. This chapter has provided metrics and evidence to support such objectives. However, the goal of achieving equitable and affordable transport is possible only to the extent that other dimensions of social inclusion in transport are addressed along with affordability, for which connecting this with other chapters of this report becomes very important.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Active Transport: Taking Steps Towards Enhanced Mobility for Low-Income Populations

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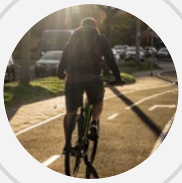


María Eugenia Rivas
Tomas Serebrisky

This chapter analyzes the critical role of active transport modes in the mobility of low-income populations. The aim is to understand the active transport landscape in the region and identify policies that could enhance the mobility and accessibility of the most disadvantaged people and promote social inclusion in the region.

In Latin America and the Caribbean, active transport modes – primarily walking and cycling – play a central role in the mobility of low-income populations. In some cities, almost half of the total trips by the poorest segments of the population are undertaken entirely on foot – more than double the share of total trips among the highest income group. For the poor, however, reliance on active transport modes, especially walking, arguably has less to do with sustainability and health benefits and is more likely driven by affordability or lack of sufficient access to other transport modes. They walk primarily because they have no other choice, and usually have to do so under unsafe conditions, since income disparities in the region are also reflected in infrastructure quality. Residents of less affluent neighborhoods are more likely to contend with low-quality or lack of pedestrian and cycling infrastructure (e.g., bicycle paths, crosswalks, and sidewalks) that are also essential to make active transport safe.

Walking or cycling is more than moving from point A to point B using active transport modes. The experience of active travel involves the interaction of pedestrians and cyclists with the environment, as well as their walking and cycling behavior. The terms "walkability" and "bikeability" refer to a framework for analyzing the interaction of users with the infrastructure and their individual perceptions about the environment.[1] Efforts to more exactly define a walkable and cyclable place have received increased attention and been the subject of much debate in recent years, reflecting the growing importance of active transport modes in citizens' mobility choices and patterns. When analyzing the walking environment and walking behavior, it is possible to identify three categories: (i) accessibility, related to the characteristics of the built environment such as the geographical distribution of socioeconomic opportunities; (ii) safety, related to security and road safety conditions when walking; and (iii) pleasurability, which attempts to capture comfort and aesthetics (Oviedo et al. 2021). Similarly, when analyzing the concept of bikeability, several characteristics can be identified, including (i) comfort, convenience, safety, and efficiency of a track segment; (ii) capacity to access

1. The term "walkability" can refer to different kinds of phenomena. Some relate the concept to making environments walkable, while others relate it to the outcomes obtained (lively places, sustainable transport, or exercise), and yet others use the term as a proxy for good urban planning (Forsyth 2015). At the individual level, the most basic need for walking is feasibility, which means being physically able to walk (Alfonzo 2005). The term "bikeability" emerged as an extension to all active modes from the concept of walkability (Porter et al. 2020). Bikeability is a broad concept that relates different factors to cycling depending on the focus of analysis, including transport, urban planning, public health, and welfare (Castañon and Ribeiro 2021).

destinations; (iii) existing policies and practices to encourage cycling; (iv) attributes of the natural and built environment related to cycling; and (v) individual skills to ride a bicycle safely, following traffic rules (Castañon and Ribeiro 2021).

Therefore, the analysis of walkable and cyclable places for specific groups should include not only the presence of physical infrastructure that enables active travel, such as adequate sidewalk and street width or parking and cycling facilities, but also accessibility to opportunities and the environmental conditions allowing for secure and safe trips and a sense of comfort.[2] Although low- and middle-income groups have significant shares of active transport modes in the region, the evidence suggests important disparities in access to infrastructure and general conditions for walking and cycling. There is a clear imbalance between the supply and demand conditions for active transport travel, where the most disadvantaged – who are more likely to rely on active modes – face poor walking and cycling conditions and are exposed to greater safety and security risks, exacerbating inequality.

Low-income groups tend to live on the periphery of major cities where connectivity is limited, affecting their mobility alternatives and access to opportunities. Limited access to social and economic activities – employment, education, healthcare, and other services – negatively impacts their quality of life and exacerbates social exclusion. In fact, there is a strong correlation between inadequate mobility and lack of access to socioeconomic opportunities, which exists as both a cause and consequence of social exclusion (Kenyon, Lyons, and Rafferty 2002). Living in the poorest neighborhoods, generally located far from areas where work opportunities are concentrated, requires traveling long distances. For these long trips, active transport modes alone do not represent a viable mobility alternative. Integrating them with public transport networks represents the most efficient and effective way to improve accessibility and social inclusion.

Given high levels of income inequality in Latin America and the Caribbean, adopting policies that help promote more equitable, inclusive, and affordable transport systems for all is key to promoting social inclusion and reducing poverty (IDB 2020; United Nations 2021). Improving access to better-quality and more integrated active transport services that are supported by appropriate and high-quality infrastructure represents an opportunity to improve the accessibility of low-income groups. Achieving this goal will require increased citizen participation, greater emphasis on planning, and strong support from public policymakers in the region. The potential of active transport modes lies in recognition of their crucial role in achieving sustainable transport systems and the synergies with other transport modes to improve access for under-served groups.

2. Ideally, infrastructure indicators and the attitudes and perceptions of pedestrians and cyclists should be included when measuring walkability and bikeability. Even though measuring perceptions is a complex process, recent research in the sector has examined perceptions of the built environment when analyzing walkability and bikeability (Arellana et al. 2020; Ferrari et al. 2020).

6.1 Active Transport Modes: The Scale of the Problem for Low-income Persons

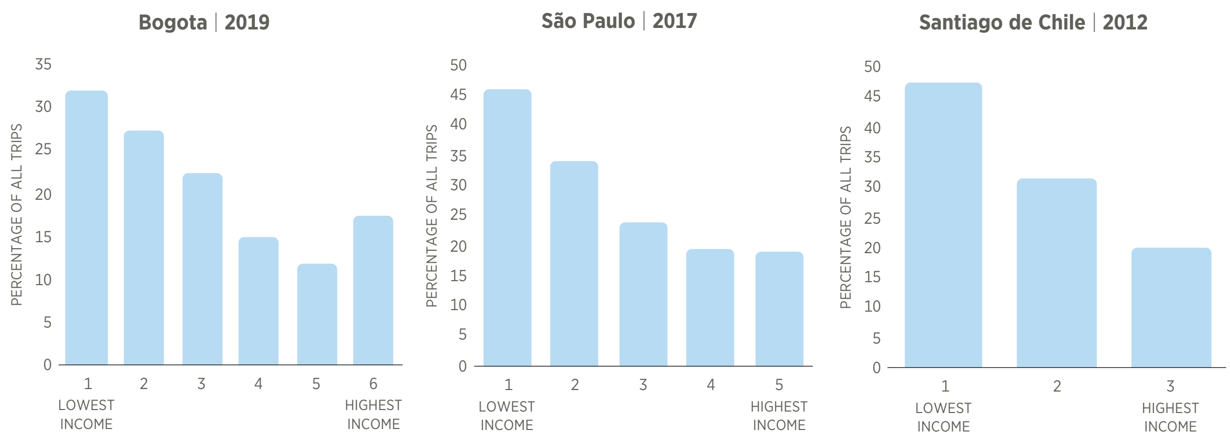
The benefits of active transport far exceed the objective of mobility itself in terms of fitness, health, and enjoyment, as well as benefits for the rest of the society. Cycling has multiple health benefits, including physical health, as well as benefits for mental health and well-being, cognitive functioning, emotional well-being, and social relationships (Garrard, Rissel, and Bauman 2012). Walking also has multiple health benefits, including physical benefits such as a reduction in rates of chronic disease, psychological benefits, and a decrease in healthcare costs (Lee and Buchner 2008; Kelly, Murphy, and Mutrie 2017). More broadly, a shift towards more active transport also has a positive impact on society. If walking and cycling represent a higher share of trips, at the expense of motorized transport, there are positive impacts in terms of reduced congestion, noise, and air pollution, improved traffic safety, and transport cost savings. Active transport is an essential component of developing more compact, cohesive, and livable communities, and it also contributes to increased property values.

But when walking or cycling represents the only affordable or accessible choice, as is the case for some disadvantaged and marginalized social groups, several equity dimensions emerge that may undermine some of the benefits of active mobility, especially from the user perspective. Imposed active travel represents limited access to socioeconomic opportunities and full enjoyment of the activity involved. In some cities in Latin America and the Caribbean, access to job opportunities by single cycling or walking trips for low-income people living in the urban periphery is significantly lower than job access for people living in more-central locations (ITF 2020). Impacts can go beyond limited access to job opportunities when active travel is mandatory instead of voluntary, such as generating physical and mental fatigue.

Many people in the region rely on walking and cycling for transport not out of choice, but out of necessity. For many disadvantaged groups, walking and cycling trips respond to economic, cultural, and urban space characteristics beyond their control, forcing them to rely on active transport modes when they would prefer another transport mode if given the choice. In this sense, improving infrastructure and services to support active transport modes should not only recognize the benefits in terms of sustainability and health. It is also a means of improving mobility and access to opportunities for low-income persons who often depend on these transport modes for their daily travel.

Walking can represent a significant share of transport modes for low-income groups in some cities in the region, often significantly higher than for high-income groups. For example, in Bogota, São Paulo, and Santiago de Chile, from 30 to 45 percent of all trips taken by low-income persons are on foot (Figure 6.1). In contrast, this figure is about 20 percent for higher-income groups. Walking trips are also longer for low-income groups, which take more time on average to reach destinations, with significant adverse impacts.[3] A study of active travel in Latin America, including Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru, and Venezuela, shows that travel time for walking and cycling trips is significantly higher in the lowest socioeconomic strata overall (de Moraes Ferrari et al. 2020).

FIGURE 6.1 Share of Walking Trips in Transport, by Income Level, in Bogota, São Paulo, and Santiago de Chile (percent)



Source: Prepared by the authors based on Steer-CNC (2019), STM – Metro SP (2019), and SECTRA (2015).

As highlighted in Chapter 5 on transport affordability, people – and especially the poor – may forgo motorized trips (in particular public transport) because of affordability concerns, thus becoming "captive" walkers for trips over relatively long distances (Cavallo, Powell, and Serebrisky 2020). In fact, an analysis for a selected group of cities in Latin America showed that the financial burden of a basket of transportation trips for the bottom income quintile exceeds 25 percent of their monthly income in half of the analyzed cities for a 60-trip basket (Rivas, Serebrisky and Suárez-Alemán 2018). Becoming captive walkers is especially common among women, who often walk and make trips for care-related tasks,[4] as well as in other specific circumstances. In Haiti, for example, women working in mango plantations walk one-hour distances to reach their work in the morning hours, and they return by motorcycle in the afternoon (Gandini, Monje-Silva, and Guerrero 2021).

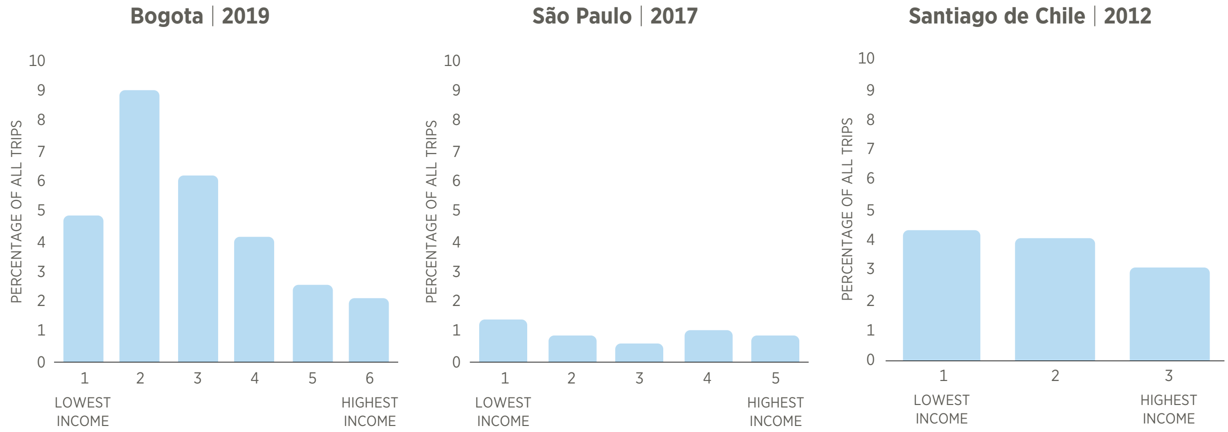
3. Associations between active transport and well-being are not favorable when poor settings are considered. For instance, long trips by foot generate physical fatigue and stress in managing the demands of children who themselves are worn out from walking (Bostock 2001).

4. Low-income mothers walk mostly by necessity, often in unsafe traffic environments.

Beyond affordability, physical distance from access points to motorized transport can also exacerbate the plight of captive walkers. Many neighborhoods in the outskirts of cities are informal settlements or slums that are poorly served by public transport services, forcing residents to walk, often long distances, for most of their trips to access goods, jobs, and services (see Chapter 4). Pedestrians from low-income groups may walk because it is the only available travel choice. In Montevideo, around 27 percent of low-income persons say they walk because they have no other transportation option, while this figure is only 5 percent among high-income groups (Mauttone and Hernández 2017). Moreover, accessing public transport services on foot takes longer for disadvantaged groups. A study of Lima's Bus Rapid Transit (BRT) shows that nearly 35 percent and 25 percent of the Strata C and D population (middle- and low-income areas, respectively) live within a 15-minute walk of the BRT, while only 12 percent of the population from Stratum E (extremely poor areas) can reach the BRT by foot in this amount of time (Scholl et al. 2016).

Regarding cycling trips, the evidence of socioeconomic differences is not as strong as for walking trips (Figure 6.2). The differences may arise from characteristics of cities' urban patterns, cultural factors, and the extent of bicycle use, which is quite different between cities, with Bogota at the top of the ranking in the region with a cycling mode share of 6.6 percent. In a people from low-income groups ride bikes much more than people from other income groups. In 2019, the share of cycling trips made by low-income persons in Bogota was 2 to 4 times higher than the share of bike trips made by the highest income group. In the lowest and second-poorest income groups, cycling trips represent 4.8 percent and 9 percent of all trips, respectively. People from low-income groups can ride several miles daily to avoid public transport costs, but this requires them to spend more time traveling. The average travel time of a bicycle trip in 2019 for the poorest stratum (42.6 minutes) was almost twice that of the richest stratum's travel time (23.6 minutes) (Steer-CNC 2019). In addition, even though bicycle use significantly reduces travel costs, the cost of buying and maintaining a bicycle can sometimes be prohibitive (Rodríguez et al. 2017) and can be a factor contributing to the lower share of bicycle trips among the poorest income group in Bogota.

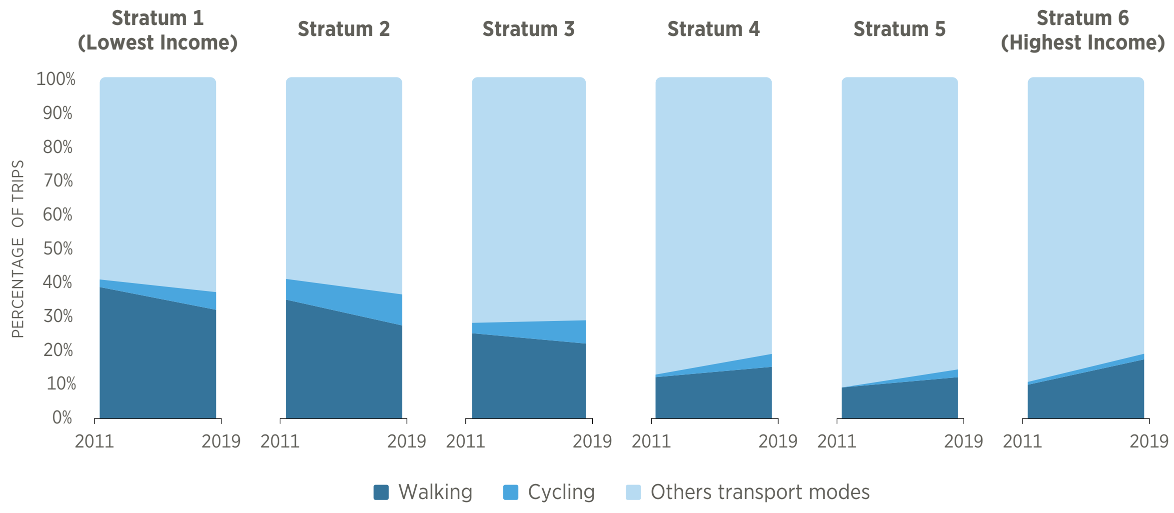
FIGURE 6.2 Share of Cycling Trips in Transport, by Income Level, in Bogota, São Paulo, and Santiago de Chile (percent)



Source: Prepared by the authors based on Steer-CNC (2019), STM – Metro SP (2019), and SECTRA (2015).

In some cities, mobility patterns are slowly changing, and walking is representing a smaller transport mode share for low-income groups than in the past. Between 2011 and 2019 in Bogota, there was a decrease in walking as a share of total trips for the three poorest strata, whereas the richest three strata increased their share of walking trips over the same period (Figure 6.3). These changes in transport mode shares reflect an increase in access to private modes of transport among low-income groups (an average increase of 1 and 3 percentage points for car and motorcycle trips, respectively), and a recognition of the individual and social benefits of walking among high-income groups. A similar trend is observed in Santiago de Chile when comparing the two most recent origin-destination surveys. Between 2001 and 2012, there was a decline in walking trips from 53 to 48.7 percent for lower-income groups and from 36.2 to 31.5 percent for middle-income groups, whereas walking trips increased from 14.7 to 20 percent for high-income groups (Herrera and Razmilic 2016). The reduction of walking trips among low- and medium-income groups was linked to an increased private transport share and a slight reduction in the public transport share. The overall increase in cycling trips from 2.1 to 3.9 percent was mainly driven by medium- and high-income groups. It is important to note that the increase in bicycling and walking in the high-income group may also be driven by their concentration in more central locations, closer to employment and commercial centers, with better access to services and other facilities (see Chapter 3). This change could be motivated by an increase in travel times around the city, resulting in an increased premium being placed on more consolidated – and thus more convenient – neighborhoods.

FIGURE 6.3 Evolution of Shares of Walking and Cycling Trips in Transport in Bogota, by Income Level (percent)



Source: Prepared by the authors based on Steer-CNC (2019).

6.2 Worse Mobility Conditions for Those Who Need It Most

6.2.1 Disparate Infrastructure Reinforces Inequality

Walking

Of all socioeconomic groups, the low-income group has the highest share of walking in total trips, yet this group faces the poorest walking conditions. Walking conditions in low-income neighborhoods are usually suboptimal at best, can be severely hazardous, and are often characterized by unpaved, weather-vulnerable, poorly lit, isolated, and insecure routes, or by heavily trafficked streets lacking adequate pedestrian infrastructure such as sidewalks, medians, and protected crosswalks (Figure 6.4). As a result, low-income walkers are disproportionately exposed to several environmental risks, including air and noise pollution, and traffic-related risks, particularly if streets are designed to maximize the volume of automobile traffic flow and speed. These harsh conditions make mobility even more difficult for specific subgroups such as the persons with disabilities and women (see Chapter 2).

FIGURE 6.4 Examples of Poor Walkability Conditions in Latin America and the Caribbean

UNPAVED ROADS,
COATZACOALCOS, MEXICO

LACK OF SIDEWALKS,
QUETZALTENANGO, GUATEMALA

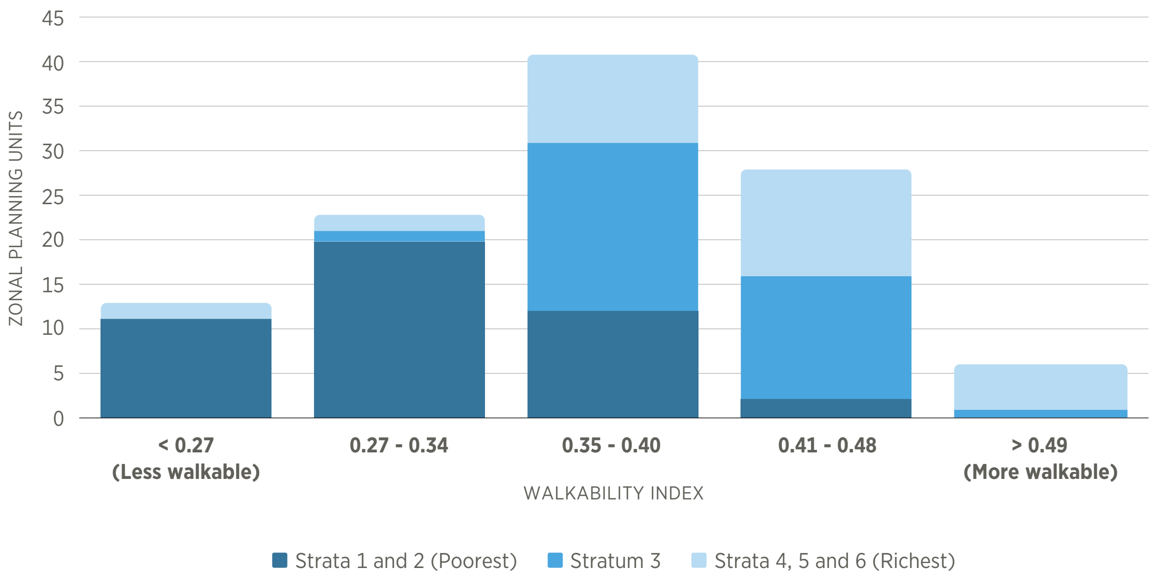
HEAVILY TRAFFICKED STREETS AND
LACK OF ADEQUATE PEDESTRIAN FACILITIES,
CUMANÁ, VENEZUELA

STEEP SIDEWALKS,
TEGUCIGALPA, HONDURAS

Photo: IDB (2014).

Spatial inequalities regarding walkability conditions are significant in cities in the region. In Barranquilla and Soledad, Colombia, for instance, high-income areas have more and better availability of paved and other pedestrian infrastructure, making them more pedestrian-friendly than other zones (Arellana et al. 2021). Similarly, an analysis of Bogota shows that walkability is closely related to socioeconomic level. Even though Bogota is recognized for promoting active travel as a key transport mode, households living in Zonal Planning Units (*Unidades de Planeamiento Zonas* - UPZ), which house low-income individuals, are characterized by low walkability levels compared to households in the highest socioeconomic strata (Figure 6.5).

FIGURE 6.5 **Walkability Index by Socioeconomic Strata in Bogota, 2018**



Source: Prepared by the authors based on Alcaldía de Bogotá D.C. (2018) and socioeconomic data from the District Secretariat of Planning.
Note: The walkability index is a weighted average of five subindexes on environmental quality, density, proximity, comfort, and entropy.

Walkability conditions are often worse in informal settlements where sidewalks are largely absent and roads tend to be unpaved or poorly maintained, making them arduous to traverse and sometimes even impassible during and after periods of inclement weather. In informal settlements in Buenos Aires, for example, roads become impassable or difficult to use on and after rainy days (as long as the mud lasts), making walking environments hazardous or uncomfortable due to the risks of falling or the discomfort of having to wear boots or other protective gear (Scholl et al. 2020). It is not uncommon for children from impoverished areas to miss school on rainy days because of the challenges of traversing muddy terrain and to avoid the social stigma of arriving at school with muddy shoes. Difficulties associated with rainy days are aggravated due to the location of informal settlements in flood-prone areas, drainage obstruction, and lack of greenery to retain surface runoff. In Caribbean countries, in addition to rain and floods, walkability conditions worsen due to exposure to humidity and extreme heat.

In several cities in Latin America and the Caribbean, people living in poor neighborhoods are also exposed to geographic barriers, which further compromise walkability. In hilly cities, the richest neighborhoods are usually located in valley areas and the poorest neighborhoods on the outskirts in hilly terrain. People face long walks on steep slopes, compounded by a lack of sidewalks and cycling infrastructure, lack of public lighting and video surveillance, and sun exposure in the hottest months due to the absence of greenery.[5] In Lima, for example, low-income groups live mostly in the hills of the city periphery and take longer-than-average trips over steep roads where there is no adequate non-motorized infrastructure (Ortegon-Sanchez and Hernandez 2016).

As shown in Box 6.1., innovative solutions can positively impact vulnerable areas, as in the case of the outdoor public escalators in Medellin. Many cities are experimenting, albeit in incipient and pilot form, with urban interventions to improve walkability conditions. In particular, "pedestrianization" has acquired relevance over the years in cities including Buenos Aires, Santiago de Chile, Bogota, and Quito (Hidalgo and Huizenga 2013). In Buenos Aires, pedestrianization of its micro-center has humanized the public space, transforming streets that were conflictive by definition into quality public spaces (Marcús 2018). Plan Centro in Santiago de Chile has successfully promoted active transport modes, and it is recognized as the first of its kind in the city to prioritize pedestrians and cyclists over cars (Herrmann-Lunecke et al. 2020). Regarding what are called *Ciclovías Recreativas* – programs that close streets to motor vehicles and open them to people for leisure activities – Latin America has been a worldwide leader, with 93 percent of the programs located in the region (Sarmiento et al. 2017). Bogota has been the pioneer. Today, Bogota's *Ciclovía* is the largest worldwide event that takes place each Sunday and on holidays, offering more than 120 km of *Ciclovías*, with the participation of 1.5 million people walking and biking (Flues et al. 2020).

5. In Santiago de Chile, for instance, the four highest-income municipalities concentrate 32.2 percent of the total surface area of green areas, while the four poorest municipalities have only 4.1 percent (Reyes Päcke and Figueroa Aldunce 2010).

BOX 6.1

Innovative Solutions: Outdoor Public Escalators in Comuna 13 in Medellin, Colombia

Comuna 13 is a densely populated area with around 140,000 people scattered in 19 neighborhoods in the hilly and poor outskirts of Medellin, Colombia. In addition to being one of the poorest sections in the city, it has one of the most violent histories, deeply marked by the country's armed conflict. In 2007, the planners of the Urban Development Company (*Empresa de Desarrollo Urbano* - EDU) developed the Integrated Urban Project for Comuna 13 to improve the social and physical connection between the planned and the informal city by creating an accessible route from the upper parts of the neighborhood to the San Javier metro station (Reimerink 2018). The outdoor public escalators installed in the neighborhood of Las Independencias represented just one, although the most visible, of the integrated measures implemented in Comuna 13.

The objective of the public escalators, inaugurated in 2011, was to improve accessibility throughout the neighborhood. This novel project represents the first urban mobility system of this type in Colombia and worldwide, replacing 350 concrete steps and directly benefiting more than 12,000 citizens (Terminales Medellín 2020). As a comparative reference, the escalators of Medellin's Comuna 13 are equivalent to ascending 16 floors in 12 sections (six ascending and six descending) and a total length of 384 meters (Correa 2021). The escalators improved walkability conditions for Comuna 13 inhabitants. For example, their availability represented a saving of 50 minutes per week for a man who delivers five gas tanks in the area (Reimerink 2018). But benefits went beyond mobility. The escalators encouraged new projects, including different types of art surrounding the location, reinforcing a sense of pride in the people of Comuna 13.

Despite the positive impact of the escalators, however, the project has also faced limitations. Some argue that as the escalators have become a popular tourist site, they have contributed more to Medellin's international image than to its residents' mobility (Naef 2020). In addition, despite the fact that the escalators have shortened travel times, the project has been criticized for having an impact limited to an area of approximately 200 meters around the escalators, and for being impractical for local working people who need to use it before its opening time at 6 am (Reimerink 2018). In addition, at the beginning of the COVID-19 pandemic, when tourism stopped, operations were reduced to two just hours (Naef 2020), and the inhabitants of Comuna 13 had to intervene with the authorities to reactivate the escalators. When all is said and done, however, even though the project is not free from criticism, it shows that it is possible to promote and implement mobility projects in disadvantaged areas. In this sense, the integration of mobility projects into urban development plans is crucial for their success.

Recently, what is called "tactical urbanism" – flexible, low-cost, and often short-term changes to the built environment – has represented an effective way to progress toward long-term goals related to street safety, walking, and public spaces. The Panamá Camina ("Panamá Walks") intervention in 2018 included the pedestrianization of part of the busy intersection of Plaza de Mayo square in Panama City and the promotion of art and culture. In 2018, prior to the intervention, around 90,000 people walked and 60,000 vehicles transited around the district of Santa Ana – where the Plaza de Mayo is located – yet just 20 percent of the public space was designated for pedestrians (IDB 2018). The successful intervention generated 73 percent more walking space and 78 percent more visits during weekends, and according to one survey, 72 percent of visitors viewed the intervention positively and 45 percent said they felt safer. An intervention in Santiago de Chile's historical and civic neighborhood known as Paseo Bandera is another positive example of tactical urbanism in the region.

However, these positive walkability initiatives are localized in central areas and are associated mainly with commercial and business activities. There is a need to develop and promote peripheral interventions so that low-income groups can also benefit directly from them. An example is the tactical urbanism intervention to create a safe walking route in the poor neighborhood of Alto Perú at the foot of the Morro Solar hill in Chorrillos, Lima (see Chapter 2).

Cycling

Specialized infrastructure for biking or cycling is recognized as an effective tool to increase citizens' active mobility and accessibility, as it is one of the most important factors influencing the decision to ride a bike.[6] The improvement and expansion provided by biking infrastructure – and the associated enhanced safety and comfort for users – can induce latent demand for cycling. In Bogota, for example, living in close proximity to cycling infrastructure (mostly off-street bike paths) has a positive, though marginal, impact on the probability of an individual using a bicycle as the main transport mode (Rodriguez-Valencia et al. 2019). In turn, increasing demand for cycling trips and attracting new cyclists of differing abilities (such as children, elderly, or novice cyclists) to the road space can lead to a higher demand for specialized infrastructure. The increase in the number of people using bicycle infrastructure also helps improve the behavior of drivers, who are more likely to expect and effectively share road space with cyclists (Jacobsen 2003). This "safety in numbers"

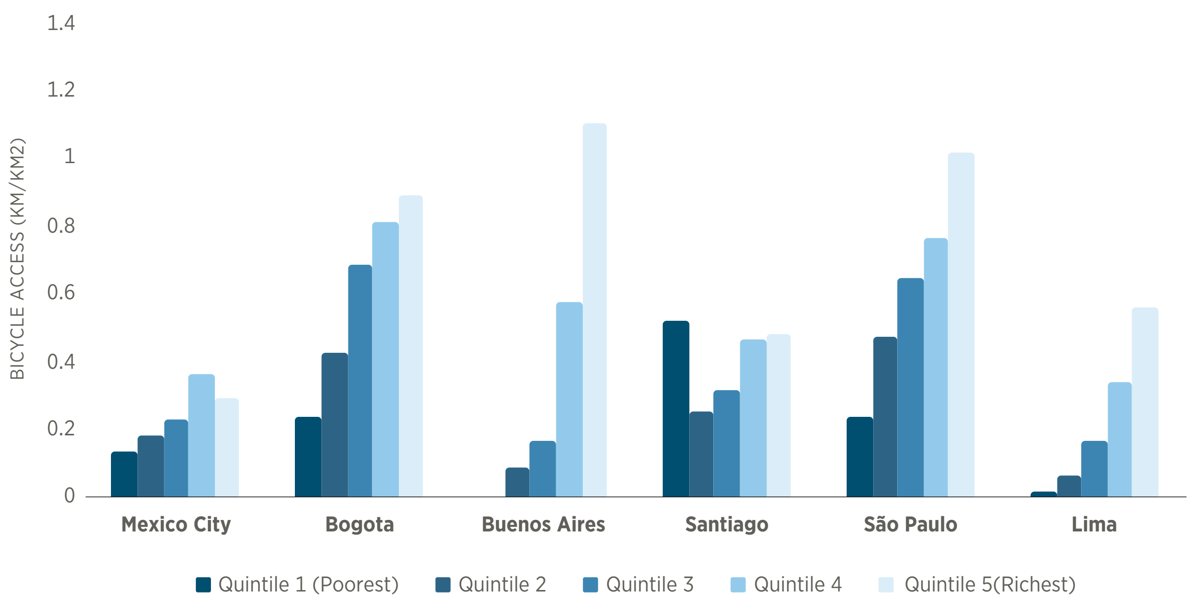
6. Specialized infrastructure for biking or cycling infrastructure can be defined in broad terms as roads or paths reserved partially or exclusively for bicycle traffic, ideally physically segregated from motorized traffic and pedestrians. In general terms, countries in the region also consider roads or paths not reserved solely for bicycle traffic as cycling infrastructure. The terminology to define different types of cycling infrastructures differs significantly between and within countries, as well as according to different cycling guides, including bike boulevards or combined traffic/cycle streets, bike or cycle lanes, cycle/moped tracks, and green paths/bike lanes, among others (Ministerio de Transporte de Colombia 2016).

results in fewer fatalities and better road-safety outcomes (Rodríguez et al. 2017).[7] International studies focused on high-income countries show reductions in collision rates ranging from 30 to 68 percent over 24 years, while a study for Bogota found a decrease of 55 percent in 7 years per million kilometers traveled, consistent with the safety in numbers hypothesis (Carvajal et al. 2020). However, the authors highlight that when comparing the fatality rates of bicyclists with the average of all road users in Bogota, cyclists remain among the most vulnerable to traffic crashes.

Evidence shows that the availability of specialized bike infrastructure can make cycling more attractive and, thus, increase usage. However, the cycling infrastructure network does not equally benefit all income groups in Latin America and the Caribbean. Instead, it tends to be fragmented and unequally distributed, with the best-served areas concentrated in tourist and high-income areas. For example, in Rio de Janeiro and Curitiba, the supply of bicycle infrastructure in the wealthiest quintiles is more than double that of the lowest income quintile in terms of area and population (Tucker and Manaugh 2018). An analysis for six Latin American cities shows that the bicycle infrastructure density (km/km2) tends to increase with income (Figure 6.6). The gap in the availability and quality of cycling infrastructure reinforces inequality, particularly because of its socio-spatial dimension that translates into different levels of access to and usage of the infrastructure among different social groups (Rodríguez et al. 2017).

7. The concept of safety in numbers is not free of controversy, including that causal mechanisms are not well understood. It is also argued that safer environmental conditions can explain better safety results for active transport users, and that the concept can undermine pedestrian safety interventions (Bhatia and Wier 2011).

FIGURE 6.6 Bicycle Infrastructure Density by Income Quintiles in Selected Cities



Source: Camacho (2017).

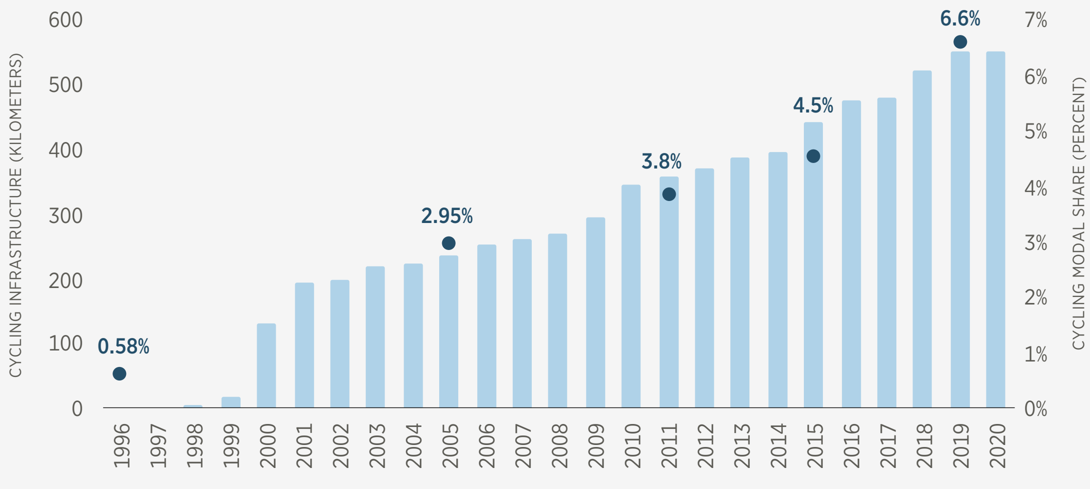
Despite socioeconomic disparities in the provision and quality of cycling infrastructure, some Latin American cities have shown remarkable progress in the last five years. São Paulo, Brasilia, and Bogota have the largest cycling network in the region. São Paulo's cycling infrastructure saw the most extraordinary growth in the last five years (82 percent), reaching 655 km in 2020 (CET 2020; ITDP 2015). Brasilia's cycling infrastructure grew by 64 percent between 2015 and 2020, and is now 554 km (SEMOB 2020). Bogota's 552 km network reflects an increase of 25 percent from 2015 to 2020 (Instituto de Desarrrollo Urbano 2020). Bogota represents a successful reference point for the region in terms of cycling infrastructure and bicycle use, but it still has several challenges to address (Box 6.2).

BOX 6.2

Bogota: A Regional Reference for Cycling and Challenges Ahead

There has been significant and continuous growth in Bogota's cycling infrastructure over the last 20 years, from a practically non-existent network in 1998 to 552 km in 2020 (Figure 6.2.1). This expansion has facilitated growth of the bicycle transport mode share, which increased from 0.58 percent in 1996 to 6.6 percent in 2019. Among the factors that explain the successful results are the latent bicycle culture developed in the early years that contributed to increased bicycle acceptance, the positive influence of advocacy groups, and a continuation of pro-cycling policies and political leadership (Rosas-Satizábal and Rodriguez-Valencia 2019). However, the sector still faces key challenges in increasing bike use, including reducing crash rates, improving maintenance of the existing network, implementing a bike-share system, and reducing bicycle theft (Rosas-Satizábal and Rodriguez-Valencia 2019). Addressing these challenges is especially important in a context of disproportionate distribution of trips by gender, with men taking most bicycle trips (75.8 percent) (Alcaldía de Bogotá D.C. 2020), which likely reflects underlying concerns related to security, road safety and mobility, and cultural patterns.

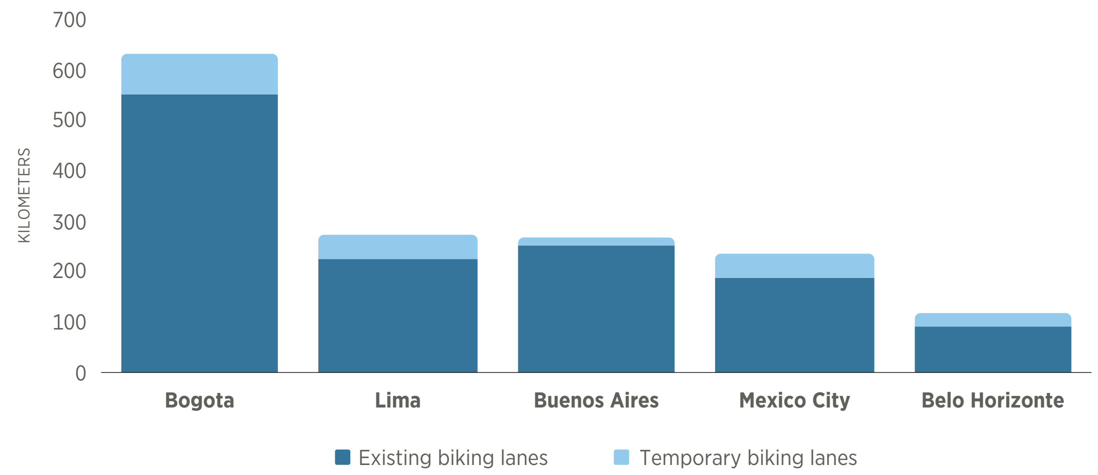
FIGURE 6.2.1 Evolution of Cycling Infrastructure and Modal Share in Bogota



Source: Prepared by the authors based on Observatorio Ambiental de Bogotá (2021), Prada (2013), Rosas-Satizábal and Rodriguez-Valencia (2019), and Origin-Destination surveys.
Note: Cycling infrastructure in Bogota is known as the Ciclorrutas network, which includes road corridors, an alternative to the roadway that is adjacent to the sidewalk in road dividers or avenues The Ciclorrutas are intended for the exclusive traffic of cyclists, allowing people who wish to travel from one place to another on bicycles, skates, or other transport modes to do so safely (Instituto de Desarrollo Urbano 2020).

During the COVID-19 pandemic, walking and biking were recommended as preferred transport modes, as they could simultaneously facilitate social distancing and provide a way to get daily physical activity (WHO 2020). Since the onset of the pandemic, governments have implemented pop-up bike lanes in several cities in the region, accelerating the growth of bicycle networks and dynamizing the sector. Some of the measures implemented by governments include expanding cultural and commercial areas in public spaces on sidewalks and roadways, such as in Buenos Aires (Ministerio de Cultura 2020), and installing pop-up bike lanes – a rapid, low-cost solution to provide more mobility solutions. The growth of bicycle infrastructure in 2020 across the region ranged from 6.8 percent in Buenos Aires to around 30 percent in Mexico City and Bogota (Figure 6.7). In some cities, such as Bogota, authorities are considering more permanent installations (Bogotá 2020a). The network's growth represents a boost for improving cycling conditions in the region, taking space previously reserved for private vehicles. Overall, the implementation of pop-up bike lanes has been successful, but there have been some unintended negative consequences due to the absence of pre-feasibility studies. For instance, traffic flow has been severely affected on some streets where pop-up bike lanes were installed, which in turn has had an unplanned impact on essential services such as ambulances. There also remains the challenge of ensuring that low-income groups can also reap the benefits of these improvements.

FIGURE 6.7 Bicycle Infrastructure Improvements during COVID-19 in Selected Latin American Cities, 2020



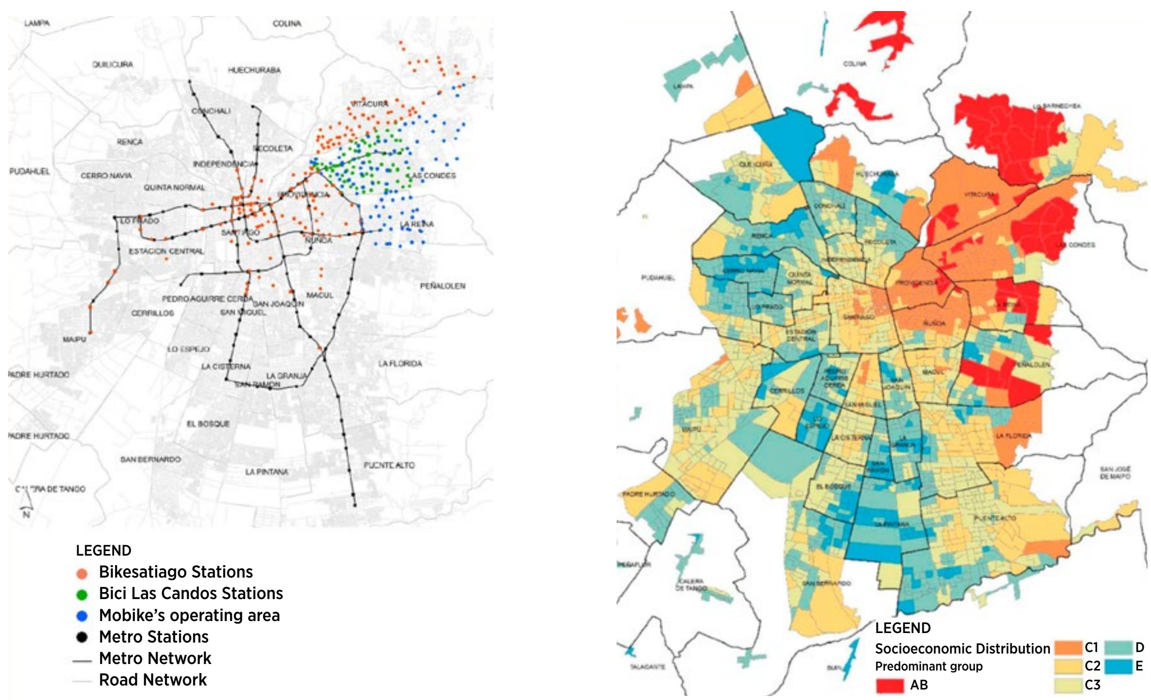
Source: Prepared by the authors based on Bogotá (2020b), Municipalidad de Lima (2020), Buenos Aires (2020), Gobierno de la Ciudad de México (2020), and Mobilize (2020).

Unfortunately, uneven access to active mobility alternatives in the region is being reinforced, as access to new infrastructure services such as bike-share systems seems to be following the same pattern. In general, the first phases of the bike-share systems in Latin America are in wealthier areas, and this unequal distribution remains over time. In five large Brazilian systems, only a small portion of the population (between 6 and 18 percent) and area (between 8 and 25 percent) were covered by the systems (Duran et al. 2018). These systems are located mainly in the wealthier neighborhoods, where the mean income of served areas is twice the city's mean income. In Santiago de Chile, bike-share systems are also concentrated in high-income areas, mostly in the northeastern part of the city (Figure 6.9). The new dockless bike-sharing systems further complicate the challenge of ensuring the availability of the services in low-income areas. However, from an equity perspective, the implementation of public bicycle systems has the potential to serve as an effective instrument to improve accessibility and more equitably distribute the costs and benefits of urban mobility (Rodríguez et al. 2017).

FIGURE 6.9 Bike Sharing Stations and Socioeconomic Distribution in Santiago de Chile

A. BIKE SHARING STATIONS AND METRO NETWORK

B. SOCIOECONOMIC DISTRIBUTION



Source: Mora and Moran (2020).
Note: The AB and C1 groups are the most affluent, and the E group is the poorest.

For low-income groups, access to bike-share systems goes beyond physical proximity to the services. The main challenges include access to the banking system, the ability to pay, and levels of use of electronic payment systems (Rodríguez et al. 2017) (see Chapter 7). The trip cost of bike-share systems can be equal to or higher than a public transport fare, which further restricts access for the poorest citizens (Flues et al. 2020). Moreover, the 30-minute use limit that most systems allow without time-of-use penalties can represent a restriction for low-income groups living on the outskirts of the city. The implementation of targeted subsidies benefiting low-income groups through, for example, social benefit systems, is one way to ensure access to bike-share systems for everyone. Such is the case of the Washington, DC system known as the Capital Bikeshare for All, which offers affordable options for those who qualify for certain state or federal assistance programs. The benefits, accessible for a low annual membership of US$5, include unlimited rides with the first 60 minutes of each trip, while the normal annual membership is US$95 with just the first 45 minutes of each trip included (Capital Bikeshare 2022).

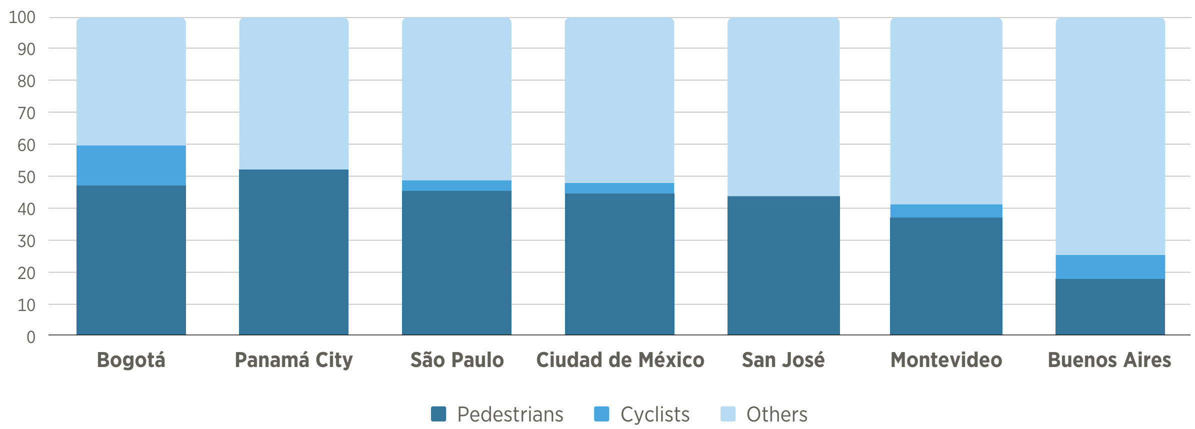
6.2.2 Infrastructure and Beyond: Walking and Cycling on Unsafe and Insecure Routes

Specialized infrastructure is important to promote active transport, but in developing countries safety and security conditions can be key determinants in the decision to travel by foot or bicycle instead of using public transport or other motorized modes, or even deciding to forgo the trip. The results of a study of a medium-sized city in Latin America shows that the most crucial factors affecting walkability are perceptions of security and traffic safety, in contrast to the perceptions in developed countries that sidewalk condition and attractiveness are the most important factors (Arellana et al. 2020).

In the context of urban road safety, the concept of vulnerability refers to the relationship between the transport mode and the risk of being injured, and this is influenced by the interaction in the urban space with motorized transport modes, roadway design, and mobility management. In this sense, pedestrians and cyclists are among the most vulnerable users. In several cities in the region, nonexistent or poorly maintained sidewalks force pedestrians to walk in the streets, exposing them to a higher risk of being injured in traffic crashes. For example, in Coque, Brazil, where residents mostly rely on walking, they must walk on the street because the pathways are usually occupied by informal market stalls where safety conditions are getting worst due to the increase of motorbikes (Maia et al. 2016). In addition, road safety outcomes are also negatively impacted by delays in the arrival of an emergency vehicle at the scene of the crash (with delay times varying across cities depending on their health systems). The mobility characteristics (transport mode share and user behavior), the transport infrastructure, and the promptness of the emergency systems all contribute to road safety outcomes.

The distribution of road fatalities by type of road user differs between cities (Figure 6.10). In some cities in the region, such as Bogota and Panama City, pedestrians and cyclists – the most vulnerable users – account for more than half of road traffic deaths. At a national level, in countries such as Haiti, the proportion of pedestrian deaths (41 percent) is also significant, and higher than in the Caribbean region (30 percent) (Chiavassa and Dewez 2021). Even though there are no available statistics of crashes by income level, one can surmise that the burden falls mainly on low-income groups because they are more likely to rely on active modes of transport such as walking and cycling. From an equity perspective, the negative impacts of transport in terms of traffic crashes are not equally distributed among different types of users. In this sense, a fairer method to evaluate the impact of transport interventions to reduce collisions should seek to address injury outcomes and also other equity issues (Davis and Pilkington 2019).

FIGURE 6.10 Traffic Fatality Statistics by Road User Type in Selected Latin American Cities, 2018–2019 (percent)



Source: Prepared by the authors based on city government information.
Note: Data for Panama City and San José are for 2018; data for Bogota, Buenos Aires, Mexico City, Montevideo, and São Paulo are for 2019.

The existence of policies, standards, and regulations focused on walking and cycling, which are uneven across Latin America and the Caribbean, also influences road safety outcomes in the region (Table 6.1). Most countries, except those in the Caribbean, have national or subnational policies promoting walking and cycling. However, regionally, just 30 percent of countries have design standards to promote the safety of active transport users. The improvement of active mobility also requires the design and implementation of integrated policies that ensure the safety of pedestrians and cyclists. For example, Salvador de Bahía in Brazil was able to reduce road traffic deaths by more than 50 percent – from 266 fatal crashes in 2010 to 121 in 2017 – by bringing together institutions with the common goal of improving road safety (PAHO 2019). In particular, its "Life Not Traffic" program is notable for its work in data evaluation and qualification, and for incorporating health into traffic discussions, improving infrastructure to protect those most vulnerable, investing in implementing drunk-driving laws, and developing children's education programs (PAHO 2019).

TABLE 6.1. Percentage of Countries with Policies Promoting Active Transport and Safety Standards

Sub-region	Policies Promoting Walking and Cycling		Design Standards for the Safety of Pedestrians/Cyclists	
	Subnational	National	Partial	Yes
Caribbean	0.00	50.00	75.00	25.00
Central America	50.00	16.67	50.00	33.33
North America	0.00	100.00	0.00	100.00
South America	25.00	41.67	58.33	25.00
All subregions	26.09	39.13	56.52	30.43

Source: Prepared by the author based on WHO (2018).
Note: Caribbean: Barbados, Dominican Republic, Jamaica, and Trinidad and Tobago; Central America: Belize, Costa Rica, El Salvador, Guatemala, Honduras, and Panama; South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, and Venezuela; North America: Mexico.

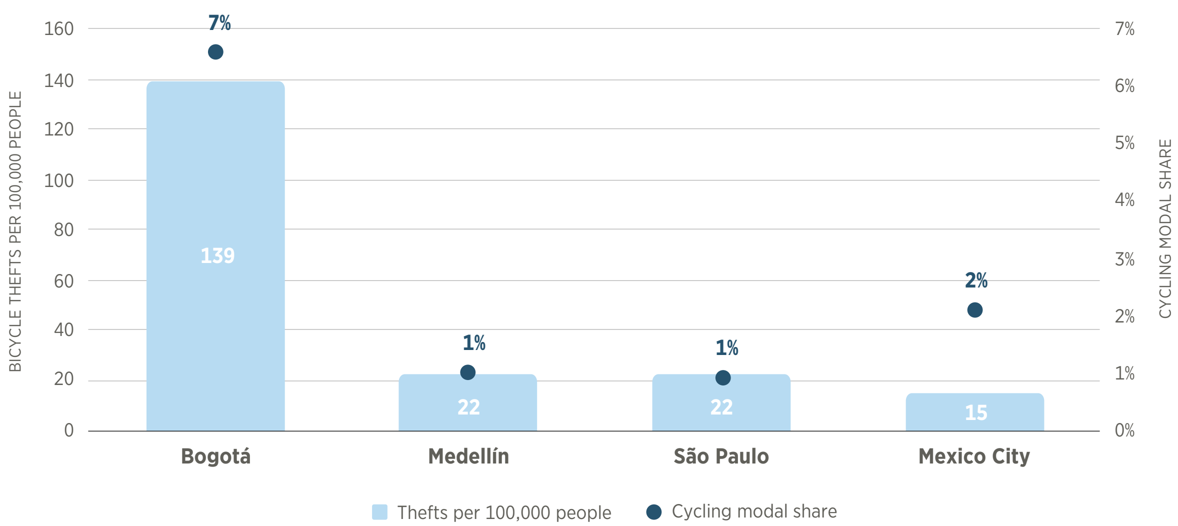
Personal safety and security also have a significant impact on travel choices. In Latin American and Caribbean cities, insecurity can represent a strong deterrent to walking, especially in low-income areas. Walkability conditions can be seriously affected by crime and violence, limiting the areas and times where it is possible to walk. In fact, people condition travel choices based on how safe and visible routes feel. In Soacha, a municipality on the periphery of Bogota with a high level of informal settlements, an insecure environment leads people to use longer but better-illuminated walking routes and to walk in groups or use regular and informal buses to travel during unsafe hours in the neighborhood (Oviedo and Titheridge 2015). Residents of informal settlements in Buenos Aires report timing their trips with other neighbors to travel in groups and taking the bus – thus incurring an additional financial and time cost – for trips that would have been easily walked were it not for security concerns. They also report family members accompanying and waiting at the bus stop with those traveling (Scholl et al. 2020). In addition, walking and public transport space represent opportunities for sexual harassment for women, conditioning and limiting their access to opportunities (see Chapter 2). For example, in a group of Latin American cities,[8] safety was highlighted as crucial in women´s travel decisions to avoid street harassment, robbery, and violence (Páramo et al. 2021).

Insecurity is also an increasing concern for cyclists. In some cities in the region, bike thefts are widespread, driven by the selling of second-hand bikes and the lack of police control (including lack of video surveillance in poor areas) and penalties for perpetrators. In addition to the fact that bike theft is treated as a petty crime, prosecuting the thieves is difficult because there is practically no way of associating a stolen bicycle with its owner, as in the case with car or motorcycle thefts, where a brand, license plate, or even a serial number are linked in the police report.

Another issue is the lack of transparency and availability of data disaggregated by type of theft in most cities in the region, which makes it difficult to monitor the sector's statistics and design prevention policies. Among the cities reporting bicycle thefts, the differences per 100,000 population are significant (Figure 6.11). These statistics can be affected by some people deciding not to report the crime because they lack confidence in recovering the bicycle, and due to differences in the practicality of reporting systems. In Bogota, bicycle theft is the only crime that increased during the COVID-19 lockdowns in 2020, peaking in May. Bicycle theft increased by 32 percent in 2020 compared to 2019 (Secretaría Distrital de Seguridad 2020). While noting that cycling has thrived in Colombia during the pandemic, the city's insecurity has led bicycle users to take extreme measures, such as taking self-defense courses. In other cities in the region, although the situation is not as extreme, bicycle thefts represent a disincentive for cycling. Some strategies to avoid bike thefts include using old bicycles (Scholl et al. 2020), riding in groups, or taking longer but better-lit routes.

8. Arequipa in Peru, Bogota and Tunja in Colombia, Buenos Aires in Argentina, Mexico City and Guadalajara in México, Montevideo in Uruguay, and Talca in Chile.

FIGURE 6.11 Bicycle Thefts per 100,000 Population and Cycling Mode Share in Selected Latin American Cities



Source: Prepared by the authors based on official statistics of thefts and Origin-Destination surveys.

Eliminating traffic-related deaths and improving public safety and the personal security of pedestrians and cyclists for all income groups and ability ranges is key to promoting active transport modes in a socially inclusive and sustainable manner over time. In developing countries, these aspects have been shown to be crucial in transport mode choice and accessibility to opportunities, especially in low-income communities. Regarding road safety, cities in the region should continue working on the five pillars of road safety – road safety management, safer roads and mobility, safer vehicles, safer road users, and post-crash response (WHO 2011) – reinforcing their commitment to the coming decade of action to reduce road traffic fatalities and injuries by half, in line with the Sustainable Development Goals to be achieved by 2030 (United Nations 2020). In the case of public safety and personal security, the problem exceeds the field of action of the transport sector itself and requires coordinating efforts with police and public space authorities to improve security for pedestrians and cyclists. Improving public lighting, reinforcing video surveillance systems, and designing and implementing bike registries play a key role in making active transport modes safer, more attractive, and more accessible for all.

6.3 Benefits for All: Promoting Investment in Active Transport

When analyzing active transport and its impacts on society, it is possible to identify two issues. The first is associated with promoting active transport and its importance for disadvantaged groups that must rely solely on active travel. Targeting specific groups requires transport policies that consider their particular travel needs. The second issue is associated with developing interventions and investments in projects to promote walking and cycling broadly for all users. Unfortunately, from a public policy perspective, the importance of active transport is frequently neglected, and non-motorized transport is given only a modest priority, receiving low levels of investment and scarce attention from authorities. Moreover, there is a general absence of an enabling environment that recognizes the key role that those active modes play in urban mobility.

Active transport modes promote healthier lifestyles and contribute to the development of sustainable transport systems by making cities safer, greener, and more accessible and inclusive. The benefits of walking and cycling for users of these modes and for the cities in terms of health, the environment, and quality of life are widely recognized (Pucher and Buehler 2010; Litman 2021). In general terms, one of the main attractions of active transport modes is that they represent a sustainable and healthy option, convenient for short and medium distances when suitable conditions are provided. Walking or cycling to work, for example, not only helps to reduce transport costs but is also a good form of daily exercise and brings with it the associated positive impact on physical health (Oja et al. 2011; Celis-Morales et al. 2017; Dinu et al. 2019), mental health and wellness (Avila-Palencia et al. 2018), and increased productivity at work (Ma and Ye 2019). Furthermore, the promotion of safe active transport can have significant impacts on society. To the extent that it substitutes for motorized trips, safe active transport can decrease the negative externalities (noise, air pollution, and congestion) associated with motorized vehicles (De Nazelle et al. 2011; Neun and Haubold 2016; Brand et al. 2021). It can also alleviate the burden on health systems by reducing the risk of disease among active travelers (Grabow et al. 2012; Jarrett et al. 2012).

The promotion of walking and cycling goes hand-and-hand with transit-oriented development strategies, which cluster a mix of retail, housing, and commercial land use near transit hubs to reduce trip distances and enable more trips by foot, bicycle, or public transit. Thus, investment in active transport infrastructure and services underpins the development of cohesive and compact communities. From a more overarching perspective, non-motorized transport modes also impact economic development and quality of life. Active transport modes play a key role in promoting equality and inclusion, considering that they are affordable across socioeconomic levels and represent a significant share of total trips for low-income groups.

One way to understand if active transport projects and interventions are good for society is by quantifying their costs and benefits (Table 6.2). The emergence and growing popularly of the terms “bikenomics” and “walkonomics” have highlighted the importance of applying the economic tools in these two sectors.[9] Cost-benefit analysis can provide policymakers with valuable information for making investment decisions in the sector. In Latin America and the Caribbean, cost-benefit analysis is not widespread for walking and cycling projects, though its use has increased recently. In Toluca, Mexico, a cost-benefit analysis of the *Huizi* bike-share system was conducted together with other initiatives in the framework of a low-emission zone (Cohen et al. 2017). In addition, when information about income levels is included in cost-benefit analyses, impacts on equity can be estimated. For instance, the cost-benefit analysis for Bogota’s TransMilenio and Mexico City’s Metrobus classify results by income strata, highlighting that net benefits accrue mostly by lower-middle-income groups (Carrigan et al. 2013).

Estimates of the costs and benefits of active transport facilitates more accurate comparison with other transport modes, contributes to increased transparency, and helps to drive change towards sustainable transport systems. Using cost-benefit analysis in non-traditional ways, such as comparing different transport modes, allows for new perspectives on transport investment decisions (Gössling and Choi 2015). In Europe, for example, it was found that cycling and walking provide a societal benefit of US$0.21 and US$0.42 per kilometer, respectively, while car travel represents a cost to society of US$0.12 per kilometer on average (Gössling et al. 2019). In terms of the number of kilometers driven, the external cost of the car represents US$565 billion per year, while cycling and walking bring benefits of US$27 billion and US$75 billion per year, respectively. Cycling is also economical from a personal perspective. The annual costs of cycling in Santiago de Chile, for example, are approximately US$300 annually (Iglesias et al. 2019). In comparison, the cost of owning a private car in Santiago de Chile is around US$5,300 annually, and that same cost averages US$4,600 for the region (Rivas, Serebrisky, and Calatayud 2019).

9. The terms were developed by Decisio, a Dutch economic policy research and consulting firm.

TABLE 6.2. Active Transport Costs and Benefits

	Improved Active Transport Conditions	More Active Transport Activity	Reduce Car Travel	More Compact Communities
Benefits	• Improved user convenience, comfort, and safety • Improved accessibility for non-drivers, which supports equity objectives • Option value • Higher property values • Improved public realm (more attractive streets)	• User enjoyment • Improved public fitness and health • More local economic activity • Increased community cohesion (positive interactions among neighbors) • More neighborhood security	• Reduced traffic congestion • Road and parking facility cost savings • Consumer savings • Reduced chauffeuring burdens • Increased traffic safety • Energy conservation • Pollution reduction • Economic development	• Improved accessibility, particularly for nondrivers • Transport cost savings • Reduced sprawl costs • Open-space preservation • More livable communities • Higher property values • Increased security
Costs	• Facility costs • Lower traffic speeds	• Equipment costs (shoes, bikes, bike locks, etc.) • Increased crash risk	• Longer travel times	• Increases in some development costs

Source: Litman (2021).

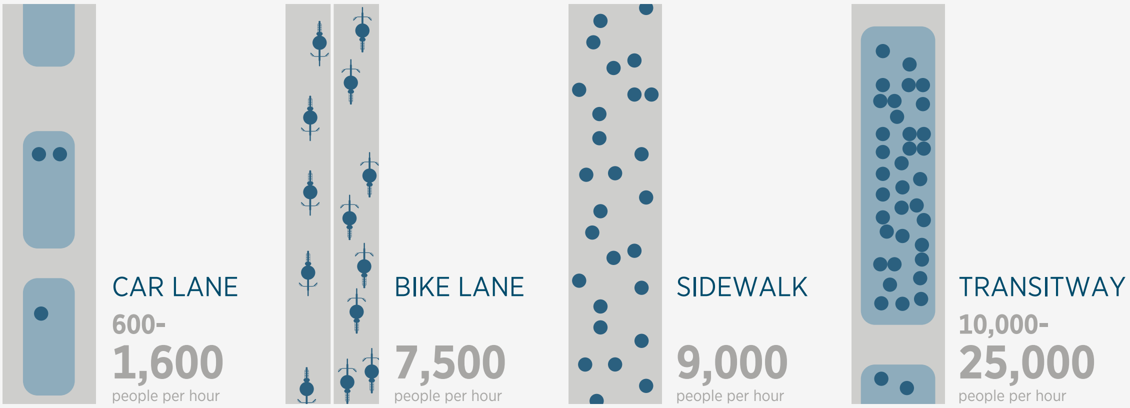
However, even though it is widely recognized that cycling and walking offer a significantly superior use of urban space (Box 6.3), and that the transport infrastructure required to facilitate active transport is relatively inexpensive, the sector receives very low levels of investment. Car-oriented planning in most cities in the region is reflected in high investments in motorized infrastructure to the detriment of public transport and non-motorized infrastructure.

BOX 6.3

A Battle Worth Fighting: Reclaiming Public Space from Cars

Cars rule the urban space in most cities in Latin America and the Caribbean, leaving little public space for active transport modes and recreational purposes. In addition to the lack of sidewalks, pedestrian facilities and bike lanes are usually blocked by cars parked in prohibited places. Despite the disproportionate balance favoring private cars, cycling and walking offer a significantly superior use of urban space. A moving car (50 km/h and one occupant) takes 140 m2 of public space, 28 times more than a moving bicycle (5 m2), and 70 times more than a pedestrian walking (2 m2) (Harms and Kansen 2018). Measuring the people who move on a street in a specific amount of time (e.g., an hour), provides a complete picture of the efficiency of transport modes (Figure 6.3.1). Public transit has the highest capacity, followed by walking and biking, whereas private cars are the most inefficient transport mode for moving people. A single travel lane for biking and walking traffic might move up to 5.6 and 4.7 times more people per hour than a lane of private vehicle traffic, even considering the most conservative scenario of two passengers per vehicle.

FIGURE 6.3.1 Transport Mode Efficiency

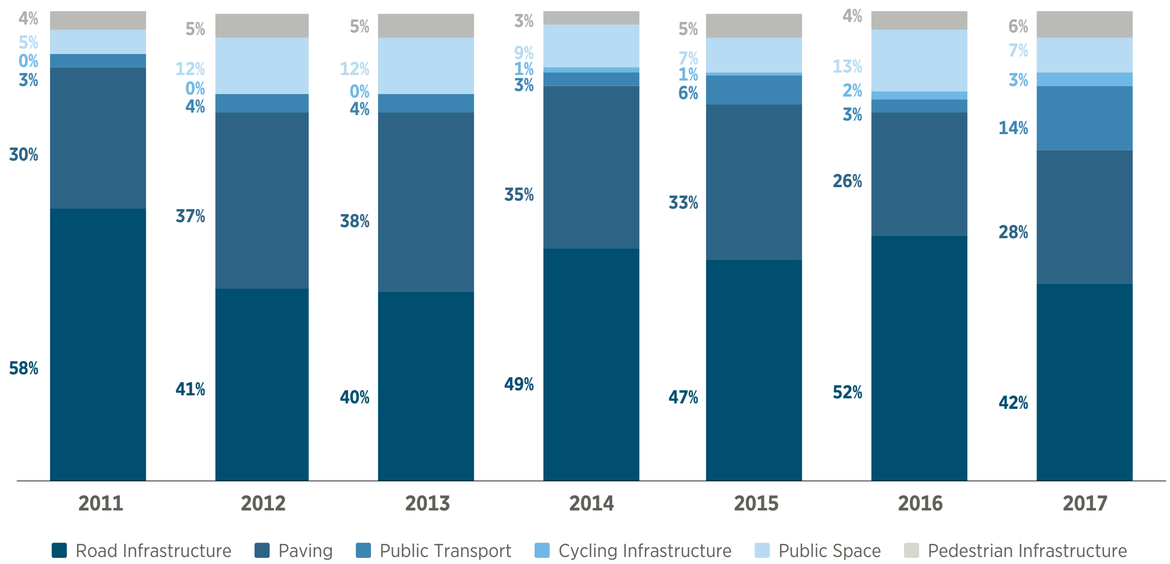


Source: National Association of City Transportation Officials (2016, 2019).

Note: The figure shows a capacity of a single 10-foot lane (or equivalent width) at peak conditions with normal operations. Private vehicle traffic range varies based on one to two passengers per vehicle and 600 to 800 vehicles per hour. On-street transitway traffic range varies based on bus or rail.

Planning and investment skewed towards automobile transit is also counter-productive to policies to encourage walking and cycling. Over 2011–2017, investment in infrastructure dedicated to private vehicles (road infrastructure and paving) accounted on average for 80 percent of transport investment in metropolitan areas of Mexico. In contrast, investment in cycling and pedestrian infrastructure received only 6 percent of total investment (Figure 6.12). This analysis also shows that public investment is inequitable. In 2015, 81 percent of the investment was dedicated to private vehicles, which account for just 31 percent of trips to work and 25 percent of trips to school. In stark contrast, just 13 percent of the investment was dedicated to public space and cycling and pedestrian facilities, even though these modes represented 24 percent of trips to work and 43 percent of trips to school (ITDP 2017).

FIGURE 6.12 Distribution of Investment in Mobility Projects in Metropolitan Areas of Mexico, by Type of Project, 2011–2017 (percent)



Source: ITDP (2020).
Note: Based on 59 metropolitan areas of Mexico.

This imbalance in investment in infrastructure by transport mode is also evident in other cities in the region. In Santiago de Chile, investment in walking facilities represented just 2.78 percent of total investments from 2010 to 2016, whereas investment in bicycle infrastructure was much lower, translating into poor quality infrastructure (Iglesias et al. 2019). In Quito, according to its 2020 municipal budget, the investment in road infrastructure was seven times the investment in active transport infrastructure (Municipio del Distrito Metropolitano de Quito 2019). Cities in the region usually do not report investment data by type of project and neighborhood or socioeconomic level. In this sense, there is a need to improve the accountability of investment in active transport modes to better quantify inequalities in the sector.

The low levels of investment in active transport modes, coupled with their associated benefits, represents a paradox. This paradox can be mainly explained by the lack of social demands and unequal degrees of political influence among various socioeconomic groups. Historically, it has been highlighted that low-income people's voice in the political process is relatively weak. This is due not just to geographic isolation, but to political isolation as well (Gannon and Liu 1997). The lack of representation and participation of vulnerable groups, particularly in informal neighborhoods in Latin American and Caribbean cities, is a potential obstacle to the involvement of these communities in planning processes for cycling (Rodríguez et al. 2017) and walking. The prospects for implementing policies that support active transport are affected by inadequate representation of disadvantaged groups in the political process and the unwillingness of high-income groups – who often favor the convenience of motorized transport – to surrender space. Recently, the region has seen an increase in social demand driven by civil society organizations that support bicycling, which has helped drive the growth of its transport mode share in several cities, boosted by the recent pandemic. But there is still room for improvement to generate a participatory political process that gives equal attention to the needs and voices of all transport users.

6.4 Better Together: Integration of Active Transport Modes with Public Transit

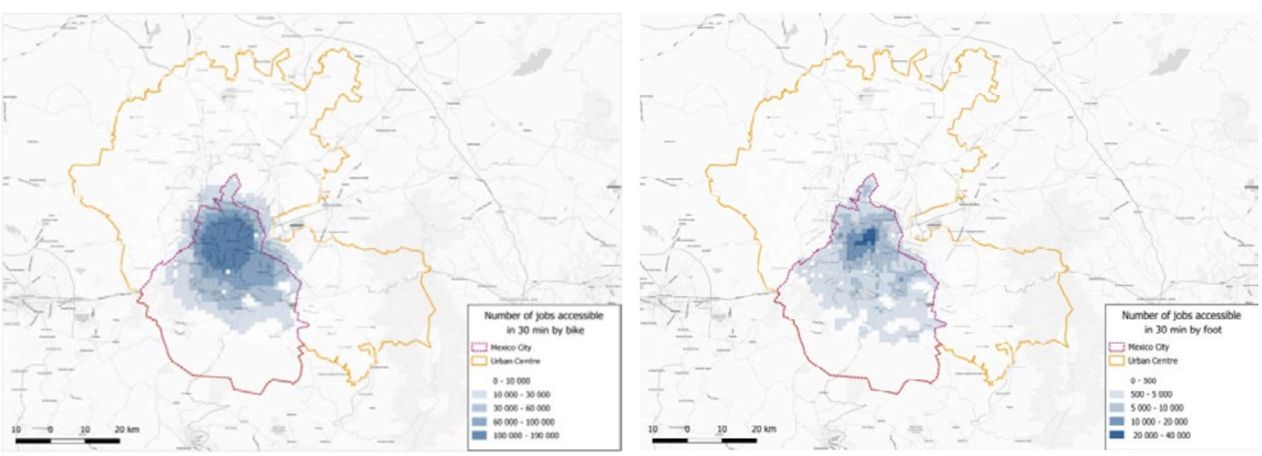
6.4.1 Just Biking or Walking: Limited Access to Opportunities

Relying solely on active transport modes may limit access to opportunities for people living in disadvantaged areas. An analysis of accessibility levels to jobs by walking and cycling in Mexico City, Bogota, Montevideo, and Santiago de Chile highlights the limitations of active transport modes to reach jobs for people living in peripheral areas. In these four cities, walking to formal jobs is an option only in downtown areas, reflecting highly concentrated formal employment markets (ITF 2020). On the other hand, cycling improves accessibility, as bikes facilitate travel over longer distances. Considering that most economic activities and job opportunities tend to be concentrated in the urban center, low-income residents who lack reliable and affordable access to motorized transportation – private or public – are likely to be limited to informal or lower-paying jobs closer to their residence on the outskirts of cities. For instance, in most places on the outskirts of Mexico City, active transport modes are not a feasible option to access employment. Outside Mexico City, less than 500 jobs can be reached within 30 minutes by bike or foot (Figure 6.14), whereas inside Mexico City 40,000 jobs can be reached in 30 minutes on foot and 190,000 by bike. Higher job densities and policies to promote pedestrian and cycling activity may explain these higher accessibility levels inside Mexico City.

FIGURE 6.14 Accessibility of Jobs by Active Transport Mode in Mexico City

A) CYCLING

B) WALKING



Source: ITF (2020).

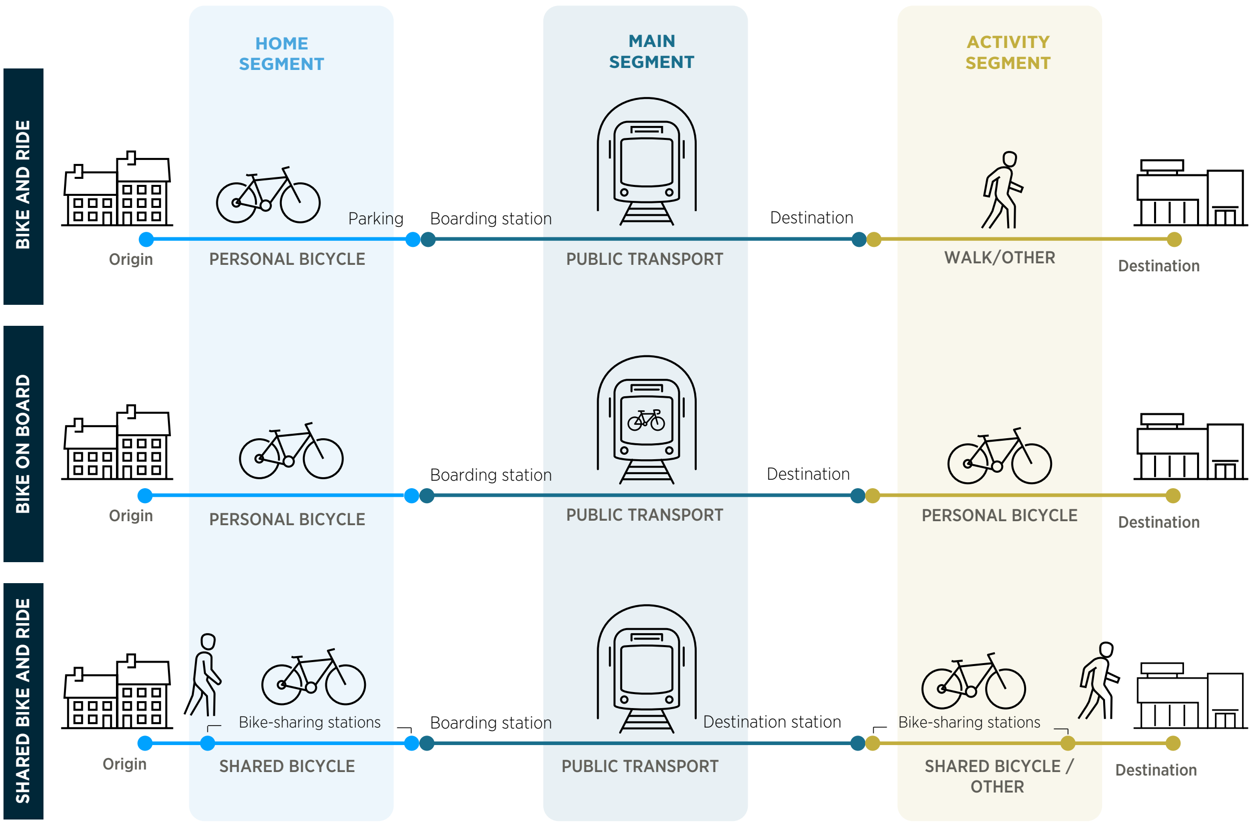
The potential accessibility of employment and educational opportunities via active transport modes differs between different socioeconomic groups. A study of Barranquilla, Colombia shows that low-income zones have higher walkability indexes but lower potential pedestrian accessibility to job and study opportunities, and specific barriers to walkability (Arellana et al. 2021). In contrast, the highest potential pedestrian access to economic or educational opportunities are in medium- and high-income areas where, paradoxically, people rely more on motorized (and private) transport modes. For cycling, a study of Bogota shows that half of cyclists have access to less than 10 percent of socioeconomic opportunities (Rosas-Satizábal, Guzman, and Oviedo 2020), despite the city's long history of actively promoting cycling accessibility. As highlighted in that study, accessibility inequalities in bicycling in Bogota are mainly explained by residence location, vehicle ownership, and gender. The top 10 percent of cyclists – in terms of income – have access to around 30 times more opportunities than the bottom 40 percent.

6.4.2 The Potential of Integrated Transport Systems

In some cities in the region, the location of peripheral neighborhoods far away from employment centers can represent travelled distances of more than 10 kilometers, which disincentivizes and makes impractical non-motorized trips. Non-motorized transport modes are completely flexible in terms of timetables and route design, but for most users they are not suitable for long distances (Giles-Corti et al. 2010). A bicycle can be used to complete an entire trip without being combined with any other transport modes, such as the metro, bus, or rail systems, but it becomes less appealing for very long trips. Since most vulnerable and low-income people in Latin America and the Caribbean are located outside main cities, some people avoid travelling long distances and look for opportunities in the same area, whereas others choose to travel the distance necessary to reach the opportunities they need. In fact, even though cycling trips can outperform car-based trips in terms of travel times, this does not apply to people living in peripheral locations. In Bogota, for example, 76.5 percent of trips would have the same or less travel time by bicycle as by a car (Oviedo and Sabogal-Cardona 2022). However, the areas experiencing travel time losses are middle- and low-socioeconomic strata due to longer travel distances and peripheral locations.

The limitations of non-motorized transport modes to reach opportunities reinforce the need to integrate active transport modes with other modes, particularly public transport, in order to improve accessibility and social inclusion. Multimodal integration consists of using two or more different transport modes. In bicycle and public transport mode integration, one of the trip segments is made by bicycle and the other by public transport, which in general is a high-capacity system. When considering these two transport modes, three types of integration can be identified (Figure 6.15). The first, multimodal integration, consists of using a personal bicycle and parking it in close proximity to the origin-destination public transport stations. The second involves transporting a personal bicycle onboard public transport, and the third involves using a shared-bicycle close to the entrance to the origin-destination stations. Each multimodal alternative presents distinct advantages for different travel needs and situations, and thus contributes to improved integration between transport modes and access to opportunities. Other types of multimodal integration include combining walking with taxis, which is a transport mode reserved for special situations (e.g., emergencies or when public transit services are unavailable at night) in low-income areas in some cities in the region, such as Buenos Aires (Scholl et al. 2020). However, the potential of these types of integration is limited in terms of the affordability and efficiency of the public transport system.

FIGURE 6.15 Examples of Bicycle and Public Transport Integration for a Trip from Home to Destination



Source: Prepared by the authors.

The benefits of integrating active transport modes with public transport can be very significant in terms of mobility. Together, public transport and bicycling provide more flexible alternatives than each transport mode on its own and can play a key role in replacing car trips. The hybrid transport mode of bicycling and public transport generates a unique synergy of speed and accessibility for long and short trips: the bicycle increases door-to-door accessibility and allows for flexibility and individual adaptation, while public transport increases the speed and spatial reach of travel (Kager, Bertolini, and Brömmelstroet 2016). An analysis of Lima shows that adequate integration of cycling facilities with public transport can increase the pedestrian coverage of high-capacity public transport by over six times (Ortegon-Sanchez and Hernandez 2016).

The quality of the surrounding urban environment and walkability conditions also impacts the choice to use public transport for a trip. In Santiago de Chile, an analysis of walking accessibility to public transport stops and the quality of the walking environment, such as pedestrian-friendly environments and sidewalk availability, found a correlation between low income and poor urban space quality and lower access to public transport (Tiznado-Aitken, Muñoz, and Hurtubia 2018).

In sum, there is an urgent need to design and implement integrated transport policies, strengthening the key role of active transport modes in multimodal trips for all. Historically in Latin America and the Caribbean, investment has been focused on stand-alone projects, with a lack of integrated policies in their different dimensions (administration, fare-setting, and modes) being the rule rather than the exception.[10] In fact, despite the effectiveness of certain stand-alone transport interventions such as the BRTs, such interventions have not sufficiently countered the negative trends of transport in the region (Rivas, Suárez-Alemán, and Serebrisky 2019). An integrated and multimodal approach is necessary to improve accessibility through active transport modes. The existence of adequate infrastructure, including bicycle lanes and parking, is a determining factor for integrating bicycling and public transport, but not the only one. In Rio de Janeiro, it was found that among the main self-reported barriers to using bicycles as a feeder mode for public transport are personal constraints, parking conditions, and public safety (de Souza et al. 2017).

10. For an analysis of the key foundations of public transport integration, see Vassallo and Bueno (2019).

6.5 Policy Actions to Improve Active Transport: A Step Towards Enhanced Mobility for Low-Income Populations

Identifying a path to improve active transport conditions for all is key to encouraging more sustainable, socially inclusive, and equitable transport solutions, especially in Latin America and the Caribbean, which is characterized by high-income inequality, poverty, and social exclusion. Cities can improve access for under-served groups by focusing on and integrating four main areas of action: developing non-motorized infrastructure and services, increasing citizen participation, improving planning and regulation, and integrating non-motorized transport services into a more connected network (Table 6.3). Even though the identified transport policies aim to enhance mobility for low-income groups, most policies generate benefits for all active transport users. For each of the four main areas of action, it is possible to identify strategies that must be prioritized in the short, medium, and long terms. The final configuration of activities per action area and their timing will depend on the policy objectives defined by city governments, the unique challenges faced for each type of transport, and the creativity with which governments can develop innovative solutions and mechanisms to promote active transport for all citizens, and especially low-income populations.

TABLE 6.3 Policy Actions to Enhance Active Transport for Low-income Groups and Improve Accessibility

Area	Short-term	Medium- and Long-term
Development of non-motorized infrastructure and services (that benefit low-income areas)	• Implement registration, subscription, and payment systems that facilitate access to bike-share systems for everyone • Install bike racks at all transit stations, including more secure systems, such as guarded rooms, in high-crime areas	• Increase the coverage and connectivity of bike-share systems in peripheral and low-income areas • • Increase the coverage and connectivity of non-motorized infrastructure for peripheral and low-income areas. • Implement differentiated rate schemes for bike-share systems, such as low annual memberships and free rides for low-income groups. • Offer fiscal incentives to promote bike use, such as tax exemptions for the provision of bicycles by companies to their employees. • Support bicycling purchases in low-income groups
Citizen participation	• • Increase the participation of civil society organizations to raise the profile and acceptance of services • • Design tools to improve communication between users and government • • Develop participatory policies for the appropriation of public space	
Planning and regulation	• • Have institutions focused on active transport • • Develop tools for infrastructure planning and management to ensure an equitable distribution of benefits (pedestrian and bicycle infrastructure provision) • • Monitor non-motorized infrastructure and use indicators, identifying low-income users • • Legally protect vulnerable users	• • Promote transport mode changes as a redistributive tool • • Use land-use planning and construction regulations to promote mixed land use and quality public spaces.
Integration of non-motorized modes	• • Collect and analyze data on active transport modes, including origin-destination, use, accidents, and theft data • • Promote road safety education and awareness	• Integrate bike-share systems into the existent transit network • • Integrate non-motorized infrastructure into urban facilities to increase the perception of security • • Develop modal transfer points • Integrate fares

• Walking • Cycling

Source: Prepared by the authors based on Ríos Flores et al.(2015) and Rodríguez et al. (2017).

The development of non-motorized infrastructure and services in the region is crucial for promoting active transport modes because it enables comfortable, safe, affordable, and space-efficient trips. Improvements in the network infrastructure and services should explicitly consider the needs of low-income groups, and specifically address the absence or poor quality of specialized infrastructure for active transport.

Having a positive walking experience involves ensuring a high-quality pedestrian infrastructure, but the experience is also related to the interconnections with the public space and the environment, which can be a challenge because it expands beyond the transport sector itself. For instance, the perception of security requires public space and security investments such as video surveillance and public lighting.

The expansion of cycling infrastructure is necessary to promote bicycle use and protect users, and its design should take into account the needs and preferences of users. One systematic review of stated preferences about cycling infrastructure by gender and age found no group preferred to share the same physical space with motorized traffic, with women reporting stronger preferences than men for greater separation (Aldred et al. 2017). In terms of preferences for cycling at the sidewalk or street level, a study in Santiago de Chile found that respondents prefer cycling infrastructure located at the road level, particularly when it is wide and not built next to bus routes (Rossetti, Saud, and Hurtubia 2019). In addition, providing physical separation from motorized traffic also improves cycling safety by preventing interaction between cyclists and motor vehicles (Pucher and Buehler 2016). Regarding transport services, the expansion of bike-share systems to disadvantaged areas,[11] together with income-differentiated pricing schemes, ensures that the benefits and flexibility of these systems can reach different users more equitably.

Citizen participation is crucial for developing effective active transport policies. The interaction and interchange between users, non-users, governments, and other key stakeholders strengthens policy design and ensures the success of an initiative by promoting greater acceptability and legitimacy and a fairer distribution of benefits. In fact, lower-income and peripheral neighborhoods are often bypassed in the process of developing connectivity networks because of their lack of power and influence (Oviedo Hernandez and Dávila 2016). Therefore, it is important to include low-income areas in community engagement efforts, with particular consideration given to the gender perspective.[12] Citizen participation and strategies to promote active transport play a key

11. Electric bicycles may play a key role in improving accessibility for long trips. Electric bicycles or e-bikes make long trips easier across different topographies, requiring less physical effort by users. In fact, electric bicycles have the potential to double travelled distances (Fyhri and Fearnley 2015). In addition, e-bikes represent transport cost savings because they can replace other modes of travel. Electric bike-share systems, still incipient in the region, represent an opportunity for low-income groups living in the urban periphery.

12. Women in the region have significantly lower cycling rates than men, so special efforts should be made to include them in citizen participation campaigns.

role in reducing stigmas about non-motorized transport. Particularly regarding cycling, in some cities there is the stigma that associates bicycling with poverty. On the other extreme, cycling in other circumstances is sometimes seen as correlating with affluence. The availability of information regarding active transport routes, services, and policies and strategies to promote cycling and walking leads to increased use, safety, and acceptability of active transport modes. Despite having recreation – and not mobility – as the primary purpose, open street initiatives have contributed to strengthening the culture of active transport modes around cities. Other initiatives, such as Bogota's *Cebras por la vida* ("Zebras for life") – which involves artistic interventions in public spaces such as zebra crossings – are also examples of successful citizen initiatives that promote better cultural and infrastructure conditions for pedestrians.

Planning can amplify access to opportunities for disadvantaged groups through the design of integrated policies. In this sense, the development of bicycle-inclusive policies is strongly related to the existence of local government institutions with exclusive functions associated with bicycling (Ríos Flores et al. 2015). Designing active transport policies requires coordination among different government levels and sectoral planning departments, including public space and territorial divisions. In some cities, such as Santiago de Chile, investment in pedestrian facilities depends on each commune's administrative budget; therefore, cities would benefit from a centralized system that ensures effective redistribution of funds (Tiznado-Aitken, Muñoz, and Hurtubia 2018). In terms of governance and planning, the availability of participatory planning tools, such as participatory budgets, represents an opportunity to promote active transport modes. The lack of representation of and participation by vulnerable groups, such as people living in informal settlements, prevents these groups from influencing planning processes (Rodríguez et al. 2017). However, the consolidation of civil society organizations to promote bike use and non-motorized transport in general can play a key role in reversing political exclusion in planning of infrastructure in cities in the region (Rodríguez et al. 2017).

Regarding road safety and regulation, normative changes are instrumental for recognizing and ensuring the protection of the most vulnerable users, who are usually exposed to unsafe maneuvers from motorized users. Finally, through planning and regulation, it is also possible to encourage transport mode shifts to pursue redistributive objectives. In Mexico City, a fuel shortage natural experiment showed that bike-share trips through the Ecobici system increased by 4 to 7 trips per hour, and the effects remained long after the fuel shortage receded (Crotte et al. 2021). In this sense, more strict policies regarding cars can incentivize bicycle use and boost its associated benefits.

There is an urgent need to consider active transport modes as an integral part of transport systems with a vital role in urban mobility, especially in promoting socially inclusive and sustainable transport. Integration should consider all the transport system components, including services, facilities, and transfer locations. A cycle-inclusive policy seeks to integrate the use of bicycles into the transport network under safe and efficient conditions (Ríos Flores et al. 2015). Fare integration with bike-share systems is crucial to ensure affordable transport services for low-income groups. Investing in secure parking facilities in public stations, imposing parking requirements in off-street parking garages in low-income areas, installing showers and lockers for cyclists at job sites, and improving the first and last mile of trips (which are mainly on foot) can significantly improve the accessibility of socioeconomically disadvantaged groups. In addition, road safety education and awareness are vital to improve cycling and walking conditions and promote an intelligent coexistence of active transport and motorized users.

In sum, in Latin America and the Caribbean, walking and cycling play a key role in the mobility of low-income persons, who account for a high share of total trips. However, their use of active transport modes is driven by affordability issues and the lack of access to other motorized transport alternatives. Compounding the disparities in access to adequate non-motorized infrastructure, the most disadvantaged also face poor walking and cycling conditions, including exposure to greater safety and security risks. This represents an additional burden when people are forced to walk or cycle. Moreover, people living in the urban periphery face long trips to access socioeconomic opportunities, particularly jobs. Their accessibility is very limited when traveling just by bike or on foot, which deepens the inequality divide and exacerbates social exclusion. In this sense, developing non-motorized infrastructure and services, increasing citizen participation, improving planning and regulation, and integrating active transport modes with the rest of the transport system are all crucial to enhance access to opportunities for low-income groups and promote their social inclusion through transport.

Finally, enhancing the active mobility of low-income persons requires improving the monitoring and evaluation of policies focused on accessibility and social inclusion. It represents a challenge for the region because of the multidimensional characteristics of accessibility and social inclusion and the lack of information on active mobility by socioeconomic groups. Improving the access to and quality of active transport modes and addressing associated affordability issues for disadvantaged groups in Latin American and Caribbean cities will require a concerted effort to fill the information gaps about active transport, including gathering disaggregated information by socioeconomic group. Shedding light on the issues associated with active transport mobility in terms of accessibility and walking and cycling conditions is vital to recognizing their role in enhancing the mobility of low-income people and improving their social inclusion.

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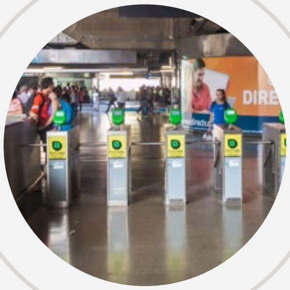
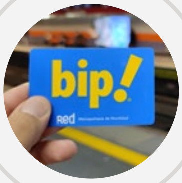
Mind the Gap[1]: Cashless Fare Collection and Implications for the Un(der)banked and Digitally Excluded

7





1. The phrase "Mind the Gap" – heard ubiquitously on the London subway system – is a warning to train passengers to exercise caution when crossing the sometimes-wide gap between the train door and the station platform.

Alana Fook

Rapid advances in technology and digital innovation in the transport sector have led to transformational gains in the efficiency, convenience, and safety of moving people (and goods) over greater distances, in less time, and using fewer resources. Along with tremendous progress, these innovations have also ushered in both challenges and opportunities for improving social inclusion in the sector.

Cashless (and often contactless) fare collection – an umbrella term referring to a variety of user authentication media, such as smart cards, mobile tickets, debit/credit card payments, and other methods that do not require the customer to handle cash or touch a ticketing machine – is one such application of technology that is revolutionizing the way this centuries-old industry operates. Cashless ticketing introduces operational efficiencies for service providers, added convenience for customers, and increased access to more accurate, passively collected user data for operators and policy makers. However, when payment of already burdensome fares goes cashless, there are potentially serious implications for the poor and other marginalized groups that are financially and digitally excluded.

Poor informal sector workers, whose income is small, irregular, and often received in cash, are typically unable to afford to store much value in a single-purpose fare media, and so they tend to top-up more frequently and in smaller amounts. As a consequence, they must make more frequent trips to top-up locations, where they also face long lines and wait times, which in turn exacerbates the already challenging issue of time poverty and increases the total cost to use the fare media. Those who are financially or digitally excluded may be more likely to rely on others – including third-party agents such as convenience stores and other small businesses – to assist them in topping up fare cards. Sometimes that leaves them exposed to not only additional fees but also increased risk of abuse and theft. Those who continue to purchase single-trip tickets or participate in pay-as-you-go schemes using cash may even pay higher fares, as they miss out on fare capping, fare integration, and lower per-ride rates available to digital fare media users who are able to purchase fares in bulk and in advance. If the cashless fare collection system relies on acceptance of contactless cards, it is likely to be a challenge for those who are low-income, informal, un(der)banked,[2] and digitally excluded from access, since they are less likely to have these payment instruments. As a result, while contactless card acceptance provides added convenience for riders and cost savings for operators, the poor and other marginalized groups are less likely to reap the associated benefits such as fare integration, free transfers, and reduced fares.

2. In this chapter, the term "un(der)banked" refers to individuals who are either unbanked or underbanked, meaning people who are without any formal financial services at all, or who have a formal transaction account but still primarily rely on alternative or informal financial services to meet their needs.

7.1 Why Fare Collection Matters

In the transport sector, the way in which passenger fares, tolls, or other user fees are collected is among the most important operational decisions for a transport service provider because of its impact on transaction speed, security, operational efficiency, and the user experience. Further, fare collection integration is one of the essential building blocks that facilitate multi-modal transport integration. In public transportation, user fees are traditionally the primary source of operating income for transport service providers but collecting and processing those payments – including ticket issuance, purchase and maintenance of fare collection boxes and other equipment and paying staff costs – also represents a significant and largely avoidable cost for operators and can range between 5 and 15 percent of annual revenue (Smart Card Alliance 2010).

Studies show that the public transport rider experience – and hence demand – is affected by not just fare levels, but also by the frequency with which commuters are asked to pay, which can increase the perceived cost of using public transportation (Zimmerman and Fang 2015). Fare collection systems where riders can plan and pay for travel on an app, or simply tap to pay on all modes of transport using a single fare media, can increase ridership by as much as 27 percent according to one study (Carrel and Walker 2015). This increased demand can help make public transport operations more financially viable for operators and more affordable for riders.

While cashless fare collection has gained traction the world over, cash is still king in Latin America and Caribbean. According to a 2018 consumer survey, 78 percent of public transport users in the region pay most frequently with cash (AMI 2018). Some cities have made inroads, primarily through the development of proprietary smart cards issued by the transit agency, with varying degrees of transport and fare integration. Table 7.1 summarizes the situation in the region and illustrates a growing use of automated fare collection systems to facilitate transit fare integration, but it appears to be more commonplace in larger cites – with 4 million or more inhabitants.

TABLE 7.1 Automated Fare Collection and Fare Integration in Selected Latin American and Caribbean Cities, as at 2019

	Country	City	AFC System	Transit Integration
Cities with 4 million inhabitants or more	Mexico	Mexico City	Yes Tarjeta Distrito Federal (TDF)	Metro (195 stations), Metrobús, Tren Ligero
	Brazil	São Paulo	Yes Bilhete Único[3]	Municipal Bus, Metro & Metropolitan Trains
	Brazil	São Paulo Metropolitan Region	Yes In addition to the Bilhete Único, the Cartão BOM[4]	Municipal Bus, Metro & Metropolitan Trains
	Brazil	Rio de Janeiro	Yes Rio Card mais[5]	bus, train, BRT, VLT, Subway, boats
	Argentina	Buenos Aires	Yes SUBE (Sistema Único de Boleto Electrónic, or the Unified Electronic Ticket System)	Used in 33 cities with populations over 100,000 and accepted on Metro, bus and train[6]
	Peru	Lima	Yes Lima Pass[7]	Municipal and Metropolitan Bus, Metro
	Colombia	Bogota	Yes TuLlave Card[8]	TransMilenio System and the zoning services of the SITP (urban, complementary, special).
	Chile	Santiago	Yes Tarjeta bip	Bus and Metro[9]
	Guatemala	Guatemala	Yes Tarjeta Ciudadana	Bus only

3. There are specific cards for certain passenger types, certain services or valid at certain times of use, such the Bilhete Único Escolar for students, the Bilhete Único Especial for elderly or disabled, the employer-paid Transport Voucher, E-Fácil card for parking, the Cartão Fidelidade for rail transportation only, but which is valid in Sao Paulo and metropolitan area, and the Bilhete Lazer (BLA), a leisure ticket which is valud from 6pm until close of operations on Sundays. http://www.metro.sp.gov.br/en/your-trip/tickets-cards/index.aspx
4. The Cartão BOM also has several categories for various passenger types, including seniors, students, the disabled, business passengers and the elderly, who travel for free (CTMP, 2019).
5. https://www.riocardmais.com.br/praticidade/
6. The SUBE card is also accepted for tolls, parking and other micropayments (MIFARE, 2018)
7. The Lima Pass is Interoperable and interchangeable with the Metropolitan Card, and both can be used for buses and trains, inside Lima and in the wider Metropolitan areas. Students (including university) are entitled to half price fares, while the disabled (as evidenced by a CONADIS card), the police and firefighters ride free with proper ID (PROTRANSPORTE, 2019)
8. The TuLlave card, which must be purchased and recharged prior to entry or boarding, replaced the Angelcom cards and were accepted on Phase 1 and II starting in September 2015 (TransMilenio, 2019).
9. There are 3 types of bip card – bip portador (unregistered and can be used by anyone in physical possession of the card, therefore the balance is unprotected in the case of loss or theft), bip personalizada (registered, customized card), bip bancaria (offered by State Bank, with debit card functionality) – which are accepted on buses and Metro and so allows integrated fares (Directorio de Transporte Público (DTP), 2019).

Cities with less than 4 million inhabitants (average 1.7 million)	Costa Rica	San Jose	Pilot Project	Bus
	Haiti	Port au prince	No	N/A
	Ecuador	Quito	Yes	BRT & feeder lines
	Ecuador	Guayaquil	Yes	BRT & buses
	El Salvador	San Salvador	Yes	BRT & some feeder lines
	Panama	Panama	Yes	BRT only
	Bolivia	Santa Cruz de la Sierra	No	N/A
	Honduras	Tegucigalpa	No	N/A
	Uruguay	Montevideo	Yes	Urban bus service and public bicycle
	Guyana	Georgetown	No	N/A
	Jamaica	Kingston	Yes	Public Bus only
	Nicaragua	Managua	No[10]	N/A
	Paraguay	Asuncion	Pilot	Expansion planned for 2020

Source: Hollnagel and Fook 2019.
Note: AFC: automatic fare collection; BRT: Bus Rapid Transit; N/A: not available; SITP: Sistema Integrado de Transporte Publico.

Overall, the pace of development and adoption of cashless fare collection in Latin America and the Caribbean is hindered by a dizzying cocktail of socioeconomic challenges that includes poverty, inequality, and economic informality. Coupled with high levels of financial and digital exclusion, these challenges contribute to the pervasive dominance of cash in the region's transit systems.

However, the COVID-19 pandemic has illuminated the need for digitization in the region, including in the transportation sector. In a handful of cities such as Lima and Callao in Peru, for example, attempts to slow the spread of the virus have included accelerating the transition to open-loop[11] payment acceptance, which went into effect on 160 buses in July 2020 (Mercado Negro 2020).

As more cities go the route of cashless fare collection to improve operational efficiency and the user experience, it is critical to ensure that fare collection systems are purposefully designed to take into consideration the region's challenges – in particular, to be accessible and attractive to the poor and digitally and financially excluded. It is also important that the potential of cashless fare collection systems to contribute to the broader digital payments ecosystem be understood and maximized. This will require several synchronized policy, operational, and behavioral changes to ensure that adoption of the technology is financially, legally, and practically feasible.

10. A smart card was in operation from 2013 until 2018 but has been discontinued since.

11. An open-loop card refers to a general-purpose card that can be used anywhere that issuer's cards are accepted. The opposite of an open-loop card is a card that can only be used at a specific retailer, known as a closed loop card.

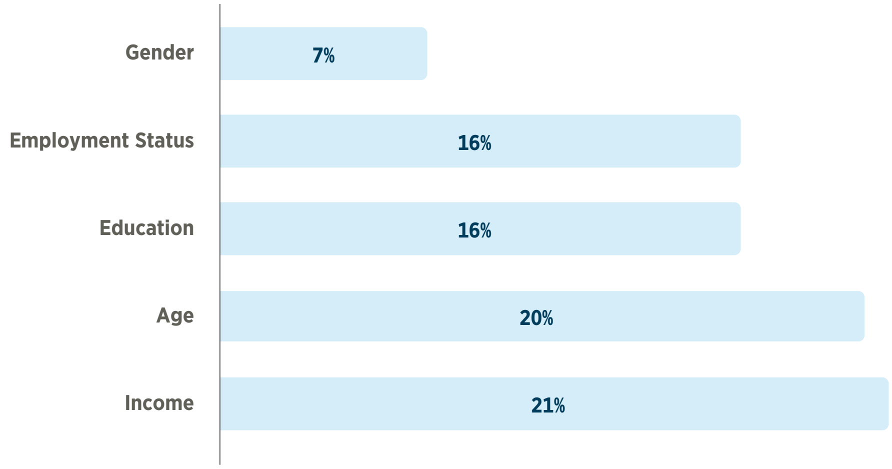
7.1.1 All Roads Lead to Cash Dominance

In Latin America and the Caribbean, 53.1 percent of workers are informally employed. Economic informality is higher in rural areas – 68 percent, compared to 47 percent in urban areas – and higher among those with only a primary education (72.5 percent) or less (82.2 percent) (ILO 2018). Moreover, approximately 38 percent of workers (and 61 percent of informal workers) are economically vulnerable – they lack access to social protection systems and coping mechanisms – meaning that precarious labor conditions put them at risk of falling into poverty (OECD 2020).

A high level of informality and economic vulnerability is associated with lower levels of financial inclusion, which refers to the ability of individuals and businesses to access useful and affordable financial products and services such as payments, savings, credit, and insurance that meet their needs and are delivered in a responsible and sustainable way (World Bank 2018). Particularly in developing economies, informal firms and workers make less use of formal financial services such as loans and bank accounts (Farazi 2014). Access to financial services is key to facilitating human capital development and investments in physical or business assets, which are drivers of wealth accumulation, vulnerability reduction, and inclusive economic growth (Bruhn and Love 2013; CGAP 2014). Low levels of financial inclusion, like inaccessible and unaffordable transport, limit the ability of poor informal workers to improve their living conditions. This in turn further compounds persistently high levels of inequality, poverty, economic informality, and vulnerability. In all cases, the costs of informality are higher among vulnerable groups that are more likely to include informal workers and that use informal financial and transport services.

Nearly half of adults – 46 percent – in Latin America and the Caribbean do not have an account with a financial institution, primarily because they do not have enough money. However, this average masks stark differences in account ownership across socioeconomic groups. Income is the most significant predictor of bank account ownership, with the gap between the level of account ownership among the richest 60 percent and the poorest 40 percent of the population at 21 percent (Figure 7.1).

FIGURE 7.1 Socioeconomic Factors Influencing Bank Account Ownership (percent)



Source: Prepared by author, based on data from Demirgüç-Kunt et al. 2018.

Transport-related constraints can also reduce access to financial services, creating a vicious downward cycle of inaccessibility and immobility that compounds poverty and inequality. The un(der)banked often cite physical distance and the associated transport costs among the disincentives to account ownership, as they raise the overall cost to open and maintain an account. This is particularly acute in low- and middle-income countries and among rural residents.

TABLE 7.2 Reasons for Not Having a Financial Institution Account (Age 15+) in Latin America and the Caribbean (percent)

Insufficient funds	58
High fees	52
Use someone else's account instead	31
Lack of trust in financial institutions	29
Financial institutions are too far away	27
Lack necessary documentation	25
Religious reasons	6
No need	1

Source: Prepared by author, based on data from Demirgüç-Kunt et al. 2018.

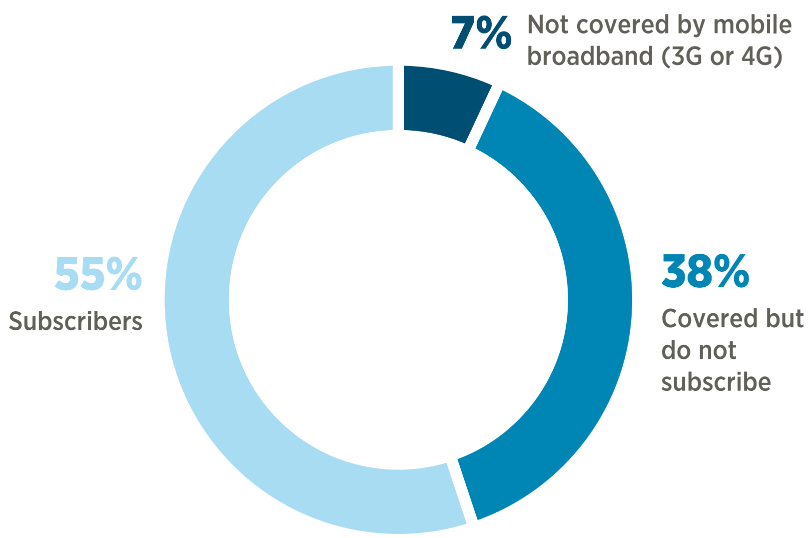
According to the 2017 update of the World Bank's Global Findex Database,12 more than one in four unbanked individuals in developing countries in Latin America and the Caribbean cite distance from financial institutions as a reason for not having an account (Table 7.2). That is the same rate as for sub-Saharan Africa, nearly double the rate for East Asia Pacific, and more than three times the rate for the Middle East and North Africa.

Digital technologies are rapidly expanding the reach of financial services and have the potential to shrink, or even eliminate, physical distance as a barrier to financial access for the millions of people who are un(der)banked. The adaptation by traditional banks of technical innovations in financial activities, known as Fintech, has facilitated digitally enabled financial services characterized by scalability, ease of use, and consumer-centric design. This in turn can facilitate daily payment transactions and encourage individuals, families, and businesses to invest for the future, prepare for unforeseen emergencies, and boost their prosperity and resilience. Unfortunately, in Latin America and Caribbean, many of these possibilities remain untapped, as low levels of access to and use of financial services are further compounded by digital exclusion, likely among those who need such services the most.

Despite the rapid adoption of smartphones in Latin America (72 percent in 2020, compared to 46 percent in 2015) and extensive broadband coverage (93 percent of the population covered by a mobile broadband network), mobile Internet subscribers account for only 55 percent of the population in the region (GSMA 2020) (Figure 7.2). Another 38 percent are covered but not yet using mobile Internet, primarily because these services are too expensive for them or because they lack the digital skills to use them. When considering the region including the Caribbean, the picture is even grimmer, as the percentage of subscribers falls to 33 percent, while the share of covered non-subscribers jumps to 57 percent, suggesting that cost and digital skill barriers may be more extreme in the Caribbean (GSMA 2016).

12. Available at https://globalfindex.worldbank.org.

FIGURE 7.2 Mobile Broadband Access and Usage in Latin America



Source: GSMA (2020).

Given the high levels of poverty, inequality, and economic informality as well as the financial and digital inclusion gaps in Latin America and the Caribbean, it is of little surprise that penetration rates of both traditional and digital financial services are abysmally low, leading to a stubborn dominance of cash as a method of payment in the region.

Even in cases where there is significant control over payment methods by the payer, as is the case for government payments and salaries, account ownership and usage are low among recipients, even in high-income countries. According to the 2017 Global Findex Database, 40 percent of wage earners in Latin America and the Caribbean receive their salaries in cash and 15 percent of government payment recipients receive those payments in cash (Demirgüç-Kunt et al. 2018). Similarly, in 2017, only 18 percent of financial institution account holders in the region had used a mobile phone or the Internet to access their account in the last year – the lowest of any developing region, and less than half the usage in East Asia and Pacific, where the rate was 44 percent (Demirgüç-Kunt et al. 2018).

The COVID-19 pandemic, however, has spurred growth worldwide in both awareness and usage of non-cash payment methods such as tap-to-pay technology for debit and credit cards. Globally, the first quarter of 2020 saw a 40 percent increase in contactless transactions, and the overwhelming majority of those transactions (80 percent) were for low-value payments (under US$25), which are typically paid for in cash (Mastercard 2020). Many consumers see contactless cards as a cleaner and safer way to pay. In Latin America and the Caribbean specifically, where penetration was very low, post-pandemic growth has been exponential, increasing by 500 percent since March 2019 (Mastercard 2020). It remains to be seen whether the transportation sector will successfully ride the contactless wave.

7.1.2 A New Way to Pay: Alternative Approaches to Fare Collection

Approaches to public transport fare collection have changed over time and have come to require an increasing level of financial and digital literacy. As illustrated in Figure 7.3, the technological development driving this evolution can be broadly classified into five stages, each with distinct advantages and drawbacks for transport operators and each being more convenient and increasingly responsive to the needs and expectations of commuters. Nowadays, some of these fare collection alternatives are offered in parallel, resulting in a wide range of payment methods available to passengers. For cities and transport systems at the beginning of moving away from cash, it is possible to leapfrog some earlier stages of development and move straight to adopting open-loop payments, as long as requisite consideration is given to access and inclusion for un(der)banked and digitally excluded populations.

FIGURE 7.3. Fare Collection Alternatives for Public Transportation

Source: Prepared by Sebastian Velazquez and Alana Fook.

Cash-based fare collection systems, while possibly the simplest and most user-friendly method from the perspective of un(der)banked or low-income passengers, create several challenges and missed opportunities for the poor and other disadvantaged groups that rely on public transit. Collecting and handling cash also brings with it several costs that, though hidden, are not insignificant. Unless passengers are required to have exact change, which would make the purchase significantly less convenient for them, operators are required to have a float – that is, cash on hand to make change at the time of payment. These transactions slow the pace of operations, and thus increase headways – the amount of time between transit vehicle arrivals at a given stop – and exacerbate issues with bus bunching and schedule reliability, while introducing safety concerns.

Further, operators handling large amounts of cash may attract the unwanted attention of criminals, which poses a security risk for both employees and passengers. Moreover, without accompanying accountability measures such as passenger counting devices or cameras, operators risk losing a significant share of top-line revenue to employee theft, which in turn can mean fare increases for passengers due to the need to maintain operating cost recovery at the fare box.

Cash equivalents such as tokens and paper tickets are essentially equivalent to cash from the perspective of the commuter in that their value is linked to physical possession, and once lost or stolen, their value cannot be recovered. The higher risk of loss or theft has significant implications for the poor, given the already high proportion of income spent on transportation, as replacing them may be more difficult. Prompted by the inevitable pilferage associated with cash, transport authorities around the world in the mid-19th century migrated towards a bell-punch ticket – a piece of paper where punched holes indicated how far a passenger could travel on the purchased fare (McKinsey and Company 2017). A simple invention by any standard, cash equivalents like the bell-punch ticket represented a slight but important improvement over cash-based fare collection and revolutionized the bus industry. The ability to conduct sales at designated, authorized locations rather than at the time of boarding or entry improves operational efficiency and, with adequate inventory management systems for tickets and tokens, discourages employee theft. For the most part, this method of payment has since given way to more modern technologies. For example, New York City subway tokens were officially retired in 2003 after being in use for 50 years and were replaced by the magnetic stripe-enabled MetroCard (Fitzsimmons 2019).

BOX 7.1

Smart Cards: The Bright Idea that Changed Fare Collection

Early smart card concepts – such as the idea of a plastic card holding a microchip – were patented by two German inventors in 1986. However, the concepts at the time were purely theoretical, as the technology to execute the concept did not yet exist. Present-day smart cards – the now-ubiquitous tiny microprocessor encased in plastic that is found in bank debit cards, mobile phone SIM cards, transit tickets, passports, and other ID cards – build on an invention patented in 1975 by a 29-year-old Frenchman, Roland Moreno (O'Brien 2005). The first smart card microchip was produced in 1977 by Motorola Semiconductor and Bull, a French computer company (Shelfer and Procaccino 2002). Three decades later, smart cards would become a multi-billion-dollar industry, fueled by the democratization of technology through affordable smart phones and growing demands for secure forms of identification and information exchange. The application of contactless smart cards in transportation fare collection – pioneered by the Upass in Seoul in 1996 and followed by Hong Kong SAR's Octopus card in 1997 and the Oyster card in London in 2003 – leveraged improvements in radio frequency identification technology to securely transfer data (Burgess 2020).

The value proposition for the use of contactless smart cards in the mass transit marketplace is well documented, but the implications on access, equity, and costs for end users, especially the poor, un(der)-banked, and digitally excluded are much less understood. The next section of the main text will explore the evolution of cashless fare collection with a specific focus on the benefits and burdens for the poor and other marginalized groups.

Building on the technological advances of the time, proprietary, closed-loop smart cards were developed. Their characteristic feature is an integrated circuit embedded in a portable card (like a credit card) capable of storing, processing, and transmitting data (Box 7.1). Smart cards opened a new era for automated fare collection, and today they are one of the most common methods of payment in the world, including in Latin America and the Caribbean. The data can be transmitted either by tapping the card against a payment portal or using near-field communication, which does not require physical contact, only close proximity. One of the most important advantages of smart cards is that their stored data can be protected against unauthorized access and manipulation, and in case of loss or theft, their value can be recovered for personalized cards. Some additional advantages of smart cards are their high level of reliability and long life compared to magnetic-stripe cards, whose useful life is generally limited to one or two years (Rankl and Effing 2002).

Despite their limited usage outside the transportation system, closed-loop smart cards facilitate the introduction of fare integration across multiple modes of transport through interoperability schemes (using a single fare media to access different fare collecting systems), as well as more complex fare structures and policies involving different fares for peak and off-peak hours (as done in Bogota between 2012 and 2015 in Colombia), or distance-driven pricing (as done by Valparaiso Metro in Chile). In addition, personalized cards offer the possibility of applying differential fares and subsidies for certain population groups such as the elderly, persons with disabilities, students, and others. *The suitability of smart cards as a payment system for the poor and digitally excluded depends most significantly on how widely acceptable the card is, at least within the transport system, since the poor and digitally excluded are less likely to have disposable income available to pay for transport in the event that the mode of transport for which the card is intended is not available*.

The advent of account-based ticketing represents a dramatic shift in fare collection in three important ways: value retention, the temporal mismatch between the exchange of cash for value, and the predictability of the fare. Account-based ticketing refers to a "transit fare collection system architecture that uses the back-office system to apply relevant business rules, determine the fare, and settle the transaction" (Smart Card Alliance 2011, 5). More simply put, customer information is maintained in an account, which is stored on servers or in the cloud, and accessed via fare media such as a physical smart card, a virtual smart card or QR Code hosted on a smart phone, or other types of devices. The device authenticates the user and processes payment by deducting the relevant fare from the pre-funded account balance either during or after completion of the trip (OSPT Alliance, undated). Since the physical fare media is used to identify and authenticate the user, rather than store value, loss of fare media does not necessarily mean loss of value, and users are able to recover the funds in their account and access with a new fare media, once registered and linked to that account.

While cash equivalents and smart cards introduce the concept of exchanging cash now for a token or ticket that represents the right to take the journey at a later date, account-based ticketing systems turn that on its head: the passenger is able to access to enter or board, and the transaction is settled later, either during the journey or after it is complete, shifting settlement risk from the passenger (who may lose the token or ticket and, thus, the right to the journey) to the operator, which must now invest in other measures to ensure that the commuter has sufficient funds to cover the trip.

Importantly, account-based ticketing systems, as well as contactless smart cards, also allow fare integration across multiple modes of transport and complex fare structures, but in a simpler way. Card-centric solutions require personalized fare media and writing every fare scheme update on each device (cards and readers), one by one, making this task very complicated. In contrast, account-based ticketing systems can deploy the changes simultaneously and directly from the central system to all accounts. However, as will be explained later, these account-based ticketing system benefits (modal integration and complex fare structures) can be a double-edged sword for the poor, un(der)banked, and digitally excluded. Fare integration has the potential to lower costs, but the challenge of accessing and decoding complicated tariff policies to calculate the exact fare in advance is a concern to those who may base decisions on when and if to travel on cost. Since the system does not know where the commuter is headed at entry or boarding, fares are not calculated and charged until the journey is complete. The introduction of the MetroCard for New York City subways facilitated the development and application of a structured fare policy, including free or discounted transfers for multi-leg and multi-mode trips, as well as daily, weekly, and monthly passes that provided discounts to frequent transit users (Foderaro 1994).

Open-loop fare collection systems accept payment instruments that consumers already have in their (physical or virtual) wallets – usually bank-issued credit or debit cards – instead of closed-loop, operator-issued cards, or merchant-specific accounts, which are single-purpose and must be a pre-funded. As transit agencies invested heavily in automated fare collection systems built around proprietary closed-loop smart cards, a parallel evolution was under way in the financial industry: the emergence of contactless payments facilitated by credit, debit, and pre-paid cards, and spurred by a growing consensus on rules and processing approaches to handle low-value transactions, making micropayments cost-effective. In the early 1990s, Europay, MasterCard, and Visa – the three dominant international payment systems – began collaborating to develop global specifications for chip-enabled payments systems that were first released in 1996 as the EMV standard (EMVCo 2014). The emergence of that standard, coupled with the establishment of the common standards for card/reader interface (ISO/IEC14443), meant that transit agencies could reduce investments in the development and management of proprietary fare collection systems, and instead directly accept contactless cards for fare payment (Secure Technology Alliance, undated). Around the world, contactless payment technology is paving the way to a ticket-less transit experience. In more than 80 cities worldwide, commuters can already use contactless devices – card, mobile, or wearable – as a ticket for public transport systems (Mastercard 2019).

After five-plus years of development, Transport for London first launched contactless card acceptance on buses in 2012, and the rest of the transit system followed two years later. Within five years of the initial launch, usage grew steadily, reaching 4 million active customers, adding 30,000 new cards every day, and resulting in a decline in fare collection costs from 15 to 8 percent of revenue by 2017 (McKinsey and Company 2017). According to a recent survey conducted by Visa, 49 percent of London commuters identified the introduction of tap-to-pay as the most significant improvement to their public transit experience (Millat and Fook 2020). Similar deployments in other major cities have also yielded positive results. The New York Metropolitan Transportation Authority (MTA) reached 1 million taps within the first 10 weeks of introducing tap-to-pay and 4 million taps within the first seven months with bankcards from 93 countries (MTA 2019).

7.2 The Benefits and Burdens of Cashless Fare Collection

When compared to cash-based fare collection systems, automated fare collection – whether issuing closed-loop, proprietary smart cards or accepting open-loop contactless payments – has several potential advantages for transport system operators and service providers, government regulators and policymakers, and commuters (Figure 7.4). Commuters benefit from the convenience of using a single fare media for the entire journey and not needing a different ticket for each leg of the trip, even if they have to transfer from one mode to another (e.g., train to bus) or use different service providers along the way. Furthermore, they benefit from a faster, more seamless boarding and payment experience, as well as improved personal safety as they no longer need to handle cash on board.

For transport operators, the improvement in transaction speed translates into faster loading/boarding times, shorter headways, and more efficient (and likely more profitable) operations. It also reduces system leakages, either from employee pilferage or crime. In addition, account-based ticketing using digital payment methods facilitates accurate, real-time, and passive collection of operational data that can be essential in identifying and responding to trends through service optimization. Government regulators and policymakers can also benefit significantly from improved data collection, as this facilitates data-driven policies and allows them to identify and measure impacts of policy decisions. Further, data can help governments improve the design, targeting, delivery, and regulation of transport subsidy programs, as well as their ability to monitor adherence to contract terms in sub-franchised operations involving the private sector.

FIGURE 7.4 Benefits of Cashless Fare Collection System

Commuters

- Use a single fare media to access several transport modes and service providers
- Board faster
- Access to integrated (and potentially lower) fares
- No longer need to carry cash, so they are less vulnerable to petty theft
- Can track journeys (and costs) in one place

↓

- Convenience
- Time savings
- Safety

Transport Operators and Service Providers

- Faster transaction speed for fare collection and faster loading/boarding times
- Passive collection of accurate, real-time trip data
- Reduction in system leakages, either through employee theft or crime
- Reduction in cash handling costs (transportation, insurance, float)
- Labor time savings

↓

- Shorter dwell-times
- Opportunity to respond more directly to passenger needs and demand trends
- Improved operational efficiency

Government Regulators and Policymakers

- Access to granular, accurate detail to improve system design, as well as inform and measure the impact of policy decisions
- Improved ability to monitor sub-franchised operations/Public-Private Partnerships (PPPs)
- Facilitates improved design, targeting, implementation and regulation of transport subsidy systems

↓

- Data-driven policies
- Improved transparency of PPP operations
- Improved efficiency and effectiveness of subsidies

Source: Prepared by the author based on Hollnagel and Fook (2019).

7.2.1 Potential Benefits of Cashless Fare Collection for Poverty Reduction and Social Inclusion

Cashless fare collection systems can significantly shorten dwell time – the time spent at stops and stations to facilitate boarding and alighting of passengers, including the time needed for opening and closing doors – which can translate into notable operational cost savings for transport service providers and time savings for passengers, which is critically important for the poor and socially excluded.

Improve Efficiency and User Experience through Shorter Dwell Times

Cashless fare collection systems can significantly shorten dwell time – the time spent at stops and stations to facilitate boarding and alighting of passengers, including the time needed for opening and closing doors – which can translate into notable operational cost savings for transport service providers and time savings for passengers, which is critically important for the poor and socially excluded.

Dwell time is among the most important determining factors affecting transit capacity and average travel speed (Transportation Research Board 2013). While many factors have an impact on bus dwell time, such as passenger volume, vehicle type and size, in-vehicle passenger circulation, and fare payment method (Transport Research Board 2013), research suggests that automating fare collection substantially reduces dwell time and improves the overall speed of travel. For example, a study of the Metropolitan Transportation Authority in Los Angeles, California found that using a smart card instead of cash cuts on-board fare collection time in half – from 4 to 2 seconds per passenger – which can add up to a reduction in dwell time of 56 hours per day per 100,000 passengers (Shockley, Salinas, and Taylor 2016).

Another study of urban bus services in Sydney, Australia found that the savings were even more remarkable: contactless cards reduced boarding times by 74 percent when compared to cash (Tirachini 2013a). Taking it a step further, off-board fare collection – where fare payment takes place before boarding and validation on the vehicle – has been identified as one of the most important changes in reducing travel time and improving the passenger experience (ITDP 2016). Off-board fare collection can reduce passenger boarding time over and above the time savings associated with the use of contactless cards a further 20 percent with one boarding door, 41 percent with two, and 55 percent with three doors (Tirachini 2013b).

For passengers, shorter dwell times translate into faster travel times overall. While beneficial for all passengers, these time savings can help reduce time poverty for low-income and socially excluded communities, which are often more dependent on public transportation. For operators, reduced dwell times result in shorter headways and higher average operation speeds, which help improve overall operational efficiency and decrease technical fares (defined as the flat fare that would be required to break even) (ITDP 2017).

Lower technical fares can be passed on to commuters in the form of lower user fees, but this potential remains untapped in the region. Improved efficiency and affordability of public transportation from shorter dwell times could have a significant impact on the poorest segments of the population, which tend to have lower rates of car ownership, are more dependent on public transportation (Yanez-Pagans et al. 2019), and spend a higher share of their income on transportation.

Further, the improved efficiency of fare collection – and the positive impact on overall travel times and consumer experience – is likely to attract even more passengers, which can further compound operational efficiency gains for operators.

Improve Affordability by Facilitating Fare Integration

When cash is the only payment method accepted for transportation, without any fare integration among or across different modes of transport, commuters are forced to pay the full fare for each leg of the trip. As highlighted in Chapter 1, low-income groups tend to live on the periphery of cities and therefore require more trips, often across different transport service providers (formal and informal) and modes. This means that it takes longer and costs more for these groups to access the same employment opportunities or education and healthcare services as higher-income populations (Bocarejo and Oviedo 2012). Cashless fare collection systems – smart cards for account-based ticketing or the acceptance of contactless payment with fare capping – facilitate the introduction of an integrated fare structure across transport service providers and modes. Practically speaking, this allows passengers to make a journey using a bus and a train, or two buses, and pay a single fare that is lower than if they had paid for each leg of the trip separately. Multi-modal fare integration also allows policymakers to use fare structure as a tool to make transportation systems more equitable by improving affordable access to better-paying jobs and better-quality services for low-income and socially excluded communities.

According to an IDB report assessing the affordability of transportation in Latin America and the Caribbean, the bilhete unico (unified ticket) in São Paulo – first implemented in 2004 – provides a good example of the potential impact of fare integration on poverty reduction and social inclusion (Rivas, Serebrisky, and Suárez-Alemán 2018). The introduction of the bilhete unico, which provided free transfers between buses and trains and subsidized multimodal trips, had a positive impact on low-income users (Rodríguez Hernández and Peralta-Quiros 2016) and encouraged more usage of the rail, as evidenced by an increase in low-income rail users from less than 5 percent before fare integration to 35 percent after (World Bank 2017).

Similarly, the development of the TransMilenio Bus Rapid Transit (BRT) System in Bogota in 2000, which has since been significantly expanded, and the associated introduction of fare integration, have been credited with an improvement in social equity indicators (Bocarejo and Urrego 2020). Bogota's urban poor, whose average income is US$5.63/day, accounted for 44 percent of the population at the time of the study. They were mostly located on the periphery of the city, where transport infrastructure and transit services were deficient and of poor quality. Following the introduction of the BRT system, low-income passengers benefited from savings in both travel time (16 minutes per trip) and costs (savings of US$0.60/day, which was 9 percent of daily wages at the time) due to fare integration. The BRT also improved access to places of employment and facilities for non-motorized transportation, and enhanced labor conditions due to formalization of unregulated services (Hidalgo and Yepes 2005).

It is important to note, however, that while digitizing fare collection can facilitate fare integration, it relies on a preexisting tariff integration policy, which is a barrier to overcome because of its political, technical, and financial complexity. Box 7.2 provides a clear example of the type of wider policy and system reforms that provide a fertile ground for digital fare media.

Enable Better Targeting and Delivery of Subsidies

Though equally important, the goals of providing public transportation services that are both affordable and financially sustainable are naturally at odds, especially in the developing-country context where high levels of poverty and inequality are often accompanied by fiscal constraints and investment gaps across many economic sectors. As outlined in Chapter 5, subsidies – especially demand-side subsidies – are the most common policy approach in Latin America and the Caribbean to address transportation affordability for the poor (Serebrisky et al. 2009). This approach – where user fees are set at or near cost-recovery levels for most of the population and targeted subsidies are provided to ensure transportation is accessible to the poor and most vulnerable – has been shown to have a greater impact on transport affordability for low-income groups (Serebrisky et al. 2009).

When fares are collected in cash, it is costly and cumbersome to gather data on demand for and usage of public transportation services, both of which are essential inputs for the design, targeting, and implementation of transport subsidy programs. There is also a greater risk that subsidies will not reach intended beneficiaries or will be used by those who should not receive them, or that the system will suffer from leakages and overall inefficiency. Encouragingly, subsidy efforts are becoming more sophisticated as cashless fare collection technology – whether closed-loop, card-centric (traditional stored value cards), or account-based ticketing systems accessed by smart cards or acceptance of open-loop contactless payments – makes disbursement more effective and efficient.

Box 7.2 presents the successful use in Bogota of a cashless fare collection system to deliver a pro-poor subsidy program that had a positive effect on hourly wages for informal workers, thus reinforcing the complementarity between mobility and the productivity of informal activities.

BOX 7.2

Cashless Fare Collection: The Backbone of the Pro-poor Transit Subsidy Program in Bogota

The city of Bogota introduced the Integrated Public Transport System (Sistema Integrado de Transporte Publico - SITP) in 2012. The system integrated operation, infrastructure, and pricing of all Transmilenio Bus Rapid Transit (BRT) corridors with the traditional bus system, bicycle network, and the subway then under construction. To balance the goals of affordability and financial sustainability, the tariff policy of the SITP was guided by cost recovery, complemented by a pro-poor transport subsidy that is targeted based on the existing national database used in other poverty-reduction initiatives (Sistema Nacional de Selección de Beneficiarios - SISBEN), and distributed through the electronic fare media (proprietary smart card) system protected by photo and/or biometric ID to verify qualifications during enrollment (Fey et al. 2017). SISBEN 1 and 2 level households – with incomes below Colombia's official poverty line – qualified to request a transit subsidy of COP900 (approximately US$0.35 cents), which reduces the cost of trunk services by 50 percent and feeder services by 60 percent at peak hours, for a maximum of 40 trips per month. Notably, recipients were required to opt in to receive the subsidy. Women, low-income persons, households with a member enrolled in education, and persons who were employed or actively seeking employment were identified as being more likely to request the subsidy. Also, both potential beneficiaries and those who applied to receive the subsidy tended to be concentrated on the outskirts of the city, where spending on public transportation was highest (16-27 percent of income, compared to 4 percent in wealthier neighborhoods), according to the 2014 Multi-Purpose Survey. The most significant positive effect of the subsidy was on the hourly wages of informal workers. Importantly, this increase in earnings is not the result of translating time savings into longer working hours, but rather of the ability of informal works to access better-paying jobs.

Source: Rodriguez et al. (2016)

Help Cities Better Manage COVID-19

To control the spread of the COVID-19 virus, governments throughout the region and the world resorted to severe restrictions on individual mobility, including international border closures, nationwide lockdowns or curfew hours, transition to remote work and schooling, and capacity restrictions or complete closure of public transportation. Though deemed essential to give countries time to strengthen health sector capabilities and build capacity for mass testing (Blackman et al. 2020), these measures were not without costs. The IDB (2020) estimates that the combined effect of lower commodity prices with expected recessions in the United States and China could result in a 5.5 percent decline in GDP in 2020 in Latin America and the Caribbean. The transportation sector undoubtedly stands out as one of the hardest hit.

Less traffic – one of the most visible effects of the public health crisis – and the associated decline in harmful transport-related emissions were heralded by many as welcome consequences of the pandemic.[13] However, the precipitous decline in public transportation demand and, hence, revenues, put tremendous financial pressure on already struggling transportation systems. According to the Moovit public transit index, public transportation ridership in Latin American and Caribbean cities plummeted dramatically during the first months of the pandemic, ranging from 67 percent in Brasilia to as high as 94 percent in Lima in April 2020 (IDB 2021). All across the region, commuters were changing their habits in response to the pandemic. One survey measuring the impact of Covid-19 on public transportation found that, on average in the Latin American cities surveyed, 6.8 percent of persons stopped using public transportation completely, while 44 percent did so less frequently (Moovit 2020).

Whether driven by government enforcement measures or a voluntary shift in mobility patterns fueled by fears of being in confined spaces with strangers, the falloff in demand threatens to delay or reverse public policy measures aimed at shifting demand away from private cars in favor or more space- and fuel-efficient modalities, and it could spell financial ruin for a sector already hanging in the balance. As discussed in Chapter 9, service quality could be negatively impacted, especially in less densely populated areas and at night, as operators resort to reduced frequencies in response to scarce demand. These operational changes – especially in markets where real-time, GPS-enabled routing and schedule information is not available to passengers – have meant even longer, less predictable journeys than usual, exacerbating the burden of time poverty for commuters. Lower service levels and loss of consumer confidence fuel a vicious cycle of declining demand, as those with financial means revert to private modes of transportation – deemed safer and more convenient – while those without alternatives forgo trips or contend with higher risks of infection (Goldbaum and Cook 2020). In the informal sector, transport service providers may be forced to

13. By June 2020, global carbon emissions for that year were projected to decline 8 percent, falling to levels not seen in a decade (IEA 2020).

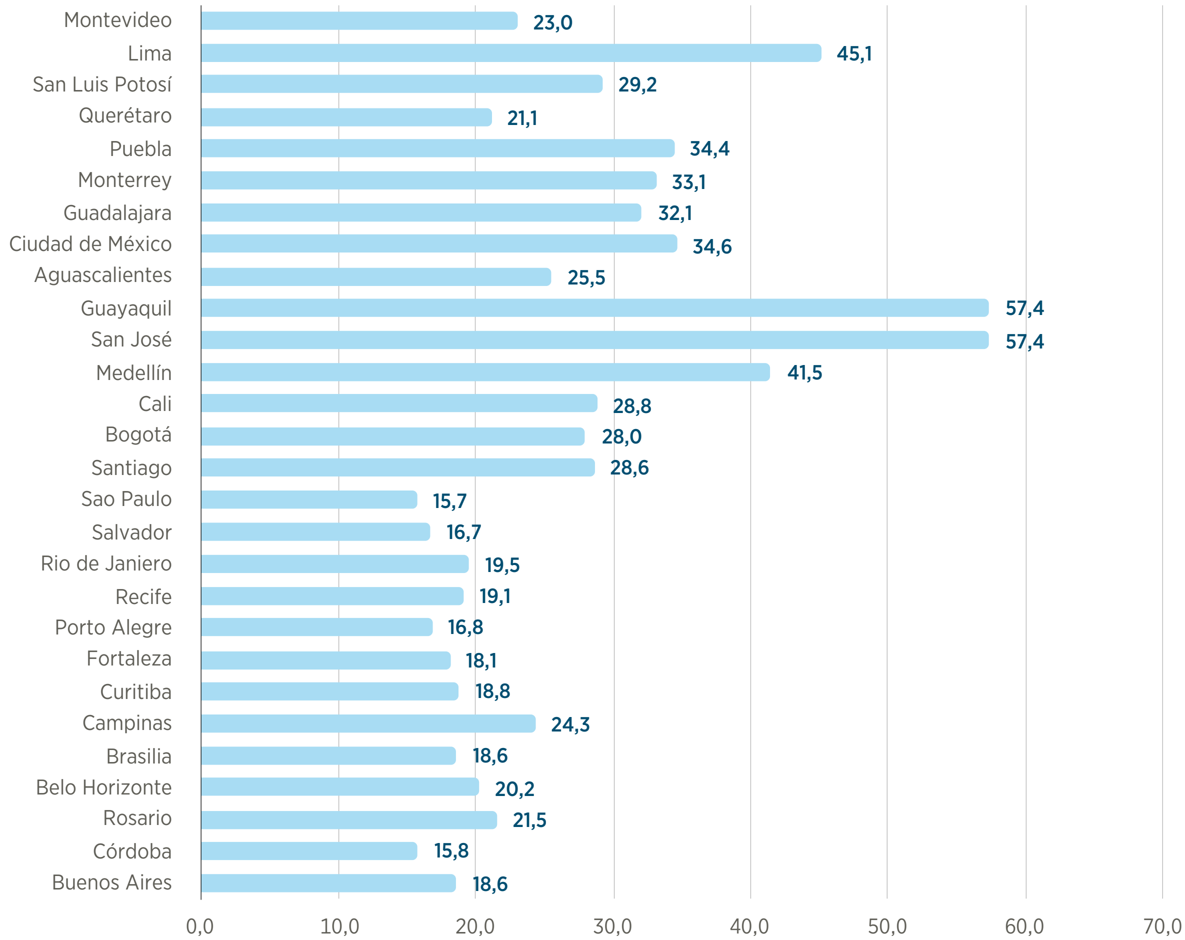
increase fares to compensate for curtailed operating hours and limits on carrying capacity. In the medium to long term, this decline in demand threatens the financial viability of public transportation that poor and marginalized communities are more likely to rely on. Moreover, lower ridership may make it more difficult for transit systems to maintain schedule frequency and make investments to maintain or upgrade infrastructure, and for cities to sustain subsidy programs, which will negatively impact access and affordability for low-income communities.

Even beyond public transportation, COVID-19 has also compromised the affordability and accessibility of shared mobility options. In response to the pandemic, both Uber and Lyft – the most dominant ride-hailing companies by far in most markets – paused their shared ride offerings in March 2020. Understandably, shared rides, which required passengers to split their trip with one or more strangers in exchange for a lower fare, became less appealing with the onset of the pandemic (Zipper 2021). However, the elimination of this relatively low-cost option narrows the already limited set of choices available for poor and marginalized communities that traditionally rely on public transportation and do not have access to private vehicles.

Overall, the burdensome impacts of the COVID-19 pandemic on the transportation sector will fall disproportionately on the poorest and most vulnerable, who are already more exposed to the illness itself, more likely to suffer income losses, and less likely to have coping strategies such as savings and insurance. They will likely face diminished access to employment, education, and healthcare, with little access to alternative means of transportation.

In this context, cashless fare collection holds promise, as it can help reduce the need for physical interaction while providing a mechanism to monitor and manage capacity and accurate, real-time usage data to inform operational changes in response to the COVID-19 pandemic and similar emergency situations. According to survey data from 27 Latin American Cities, 27.3 percent of respondents indicated that they would use public transportation more during the pandemic if they were able to pay using touchless payments systems and/or mobile ticketing (Moovit 2020). Figure 7.5 illustrates the results across the responses by city, which range from 15.7 percent in Sao Paolo to 57.4 percent in San José and Guayaquil.

FIGURE 7.5 The Role Contactless Fare Collection in Encouraging Public Transportation Usage During a Pandemic



Source: Prepared by Author, based on data from the Moovit Global Public Transport Report 2020

In Latin American and Caribbean cities where there was already a well-established cashless payment system for public transportation, governments have relied on these systems to help enforce curfews or lockdowns as part of their overall response to the crisis. Beginning in late August 2020, the Argentine government employed public transportation usage data from the Sistema Único de Boleto Electrónico (SUBE) to monitor adherence to the government-imposed lockdown and as an additional enforcement mechanism by blocking SUBE cards for seven days, following usage patterns that violated executive orders (e.g., usage on two consecutive days by a non-essential worker).

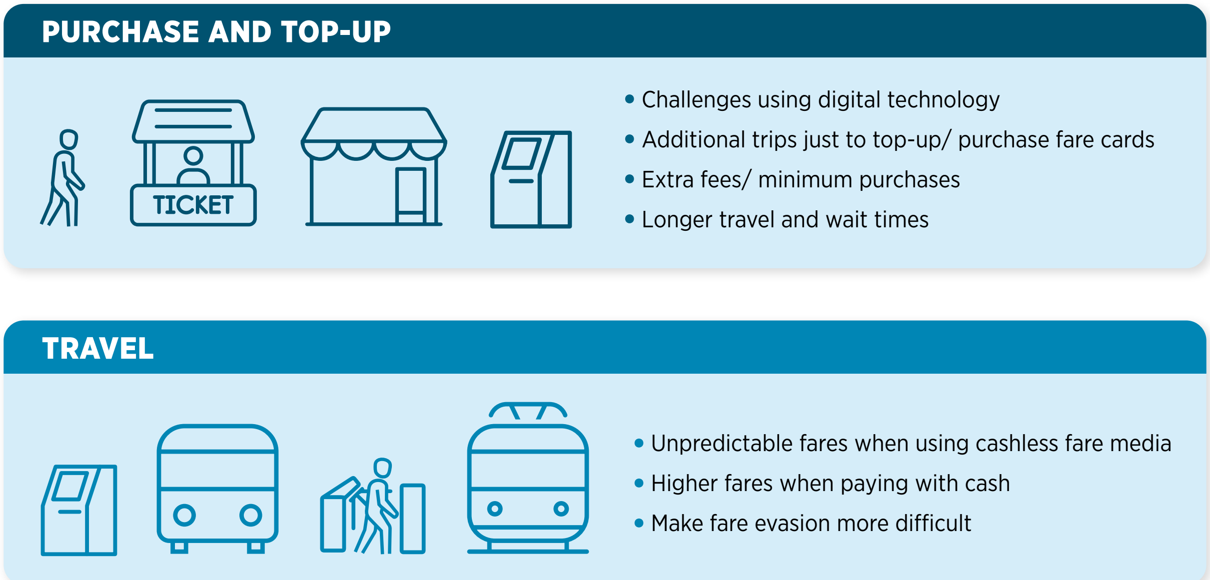
In other countries, where cash payments were still the norm prior to the pandemic, governments view cashless payments as a way to make public transportation safer for those who must continue to use it. In Peru, for example, the Urban Transport Authority for Lima and Callao (ATU) accelerated the adoption of contactless payments (debit, credit, and prepaid cards) for public transportation to avoid the use of cash and help contain the spread of COVID-19 (Ministry of Transport and Communications 2020). By July 2020, contactless payments were accepted on 160 buses across three companies – El Rápido, Palmari, and Santo Cristo de Pachacamilla – in the Association of Urban Transport Concessionaires (ACTU) in alliance with a technology company, Niubiz (formerly VisaNet). This shift to cashless payments in transportation was part of a wider transformation in Peru, where 93 percent of purchases were made using cash in 2019. Card (debit and credit) payments increased from 6 to 50 percent in the first months of the quarantine (Mercado Negro 2020). As an added benefit, implementation of this system also will help the public transit agency collect real-time data on bus location, mileage traveled, and passenger travel data (routes and stops).

As evidenced by the examples of Peru and Argentina, cashless payments can prove useful in helping governments facilitate continued access to safer public transportation services for essential workers and the poor, while more effectively enforcing restrictions on movement to manage the spread of COVID-19. For this reason, many agencies now view rapid implementation at scale of touch-free payment, enabled by contactless payment technology where riders simply tap to pay, as an essential building block of post-pandemic recovery in the transport sector and more broadly y

7.2.2 The Hidden Costs of Going Cashless: Potential Burdens for the Poor, Un(der)banked, and Digitally Excluded

Unless purposefully designed to be pro-poor and socially inclusive, the potential benefits of cashless fare collection systems may not accrue to everyone equally. Commuters are generally considered to be a monolithic group, driven primarily by convenience and cost. In reality, however, the poor, informal workers, and other marginalized communities – including the financially and digitally excluded – have different needs and face different risks. As a result, they may have fewer opportunities to capitalize on the potential benefits associated with cashless fare collection systems. In some cases, they may also suffer adverse consequences, such as higher total transport costs and less access. In these cases, cashless fare collection systems can exacerbate inequality and deepen the divides that drive social exclusion. As summarized in Figure 7.6 and then discussed below, these differential risks can be broadly categorized by the stage of usage – at time of purchase and/or top-up, or during travel – when they most often emerge.

FIGURE 7.6 Risks and Disadvantages of Cashless Fare Collection Systems for the Poor, Un(der)banked, and Digitally Excluded



Source: Prepared by author.

Purchase and Top-up

Transport systems where booking and/or payment is fully digitized can be more challenging to access for the digitally excluded and several factors – age, income and education levels, gender, ethnicity, and residential location – influence the extent of the impact that these digital technologies may have on transport access. Persons with low digital literacy skills, or who lack confidence in using digital technologies, may be discouraged from using highly digitized public transport systems – a phenomenon known as digital exclusion (Durland et al 2022) – and be restricted to less formal means of transport. Furthermore, as urban planning, policy making, and transport service design become more and more data-driven and algorithm-dependent, those persons who are excluded from data collected through sensors, smart cards, mobile applications, or online surveys are largely invisible to those designing systems and services and their needs are less likely to be fully met by the resulting designs and policies (Durland et al 2022).

Many of the intended benefits of smart cards – especially time savings and fare integration – are inextricably linked to having an underlying funding account or credit or debit card to facilitate remote or automatic top-up. These benefits are almost completely lost for users who continue to fund their cards with cash. Poor and informal sector workers who receive small, irregular, or cash-denominated earnings are more likely to load their fare cards with just enough money for one or two trips. This means they have to top-up more frequently, which erodes the benefit of time savings associated with off-board fare collection (Scholl et al. 2016). Similarly, for un(der)banked or digitally excluded transit users, the lack of a bank account, debit, or credit card, or the inability to take advantage of online top-up functionality, means that these commuters must sometimes make specialized trips for the sole purpose of topping up their fare card, since reloading can often only be done at a limited number of centralized locations (Box 7.3). Some efforts have been made to improve the accessibility and equity of fare card purchase and top-up locations, most notably by permitting third-party agents such as shops, convenience stores, and other small businesses offer the service. However, in the absence of proper oversight and effective consumer education, this also leaves low-income populations at risk of abuse. Box 7.3 illustrates these challenges using the examples of the SEPTA Key card in Philadelphia in the United States and the Sistema Único de Boleto Electrónico (SUBE) in Buenos Aires, Argentina.

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BOX 7.3

A Tale of Two Smart Cards: Automated Fare Collection Implementation Challenges in Philadelphia, United States, and Buenos Aires, Argentina

The SEPTA Key card is a proprietary smart card issued by the Southeastern Pennsylvania Transportation Authority (SEPTA) starting in 2016. The card facilitates automated fare collection on buses, trains, trolleys, and regional rails in the Philadelphia metropolitan area (SEPTA 2016). The SEPTA Key card may be reloaded online using a bank account, credit or debit card, or cash by visiting a Key card dispensing kiosk at a SEPTA subway station. For those residents who only use the bus, this requires that they make an additional trip out of their way – which takes time and costs money – for the sole purpose of topping up the fare card (Laughlin 2018a). This additional cost is likely to be burdensome for the 42 percent of SEPTA riders with incomes below US$35,000 per year, who tend to top up more frequently and in smaller amounts, especially if they are among the 12 percent of households with incomes under US$40,000 per year who are unbanked (Laughlin 2018b). Commuters have the choice to pay in cash, but are required to provide exact change, do not benefit from free transfers, and must pay 25 percent higher fares (US$2.50 in cash compared to US$2 using the SEPTA Key card) for a single bus ride (Laughlin 2018a). The transit agency has received reports that those who choose to top-up closer to home at one of the 533 retailers authorized to provide the service have been wrongfully charged additional fees, especially when paying in cash (Laughlin 2018b).

Focus group interviews with residents of informal settlements in Buenos Aires, Argentina unearthed similar challenges with the Sistema Único de Boleto Electrónico (SUBE) that increase the overall cost of usage (Scholl et al., forthcoming). Unlike in Philadelphia, the transit system in Buenos Aires is completely cashless, so all commuters must use the SUBE to pay their fares. Residents in informal settlements reported making specialized trips to top-up their SUBE card at more reliable but distant locations because the machines closer to home were frequently nonfunctional due to network issues or lack of electricity. Card top-up was even cited among the reasons for travel. To compound the additional time and financial costs of making these journeys, residents reported being informally charged additional fees – US$5 for a top-up of US$100, for example – by those providing the service, compounding the crippling cost of transportation when the minimum fare had just increased 117 percent (Scholl et al., forthcoming).

Travel

While contactless smart cards, account-based ticketing, and contactless open-loop payment systems facilitate fare integration can lower fares for consumers, the opaqueness of fare structures is often a concern for the poor. The “convenience” of having the best possible fare automatically calculated during or even after the journey – often lauded as one of the primary benefits of account-based ticketing and contactless open-loop systems – has significant implications for poor people, who often need to know the fare in advance (mostly for stored-value card users) to determine how, when, or even if they will make a trip. Fare integration, which allows for automatic application of governing fare policies and the lowest possible total cost, can be unpredictable to low-income or digitally excluded commuters, especially if fares are time- or distance-based, are only published online, or change frequently.

In those cities where adoption of cashless payment media is voluntary, one of the primary measures implemented to encourage adoption is making cash fares more expensive. So those who choose to forgo the uncertainty and instead purchase pay-as-you-go fares using cash will almost always end up spending more. In the case of Philadelphia, for example, a cash rider making a trip including one transfer will pay 67 percent more – US$5 (US$2.50 for each leg), compared to US$3 – for the same journey than someone using the SEPTA Key card (PEW 2019) (Box 7.3).

This has significant equity implications, as commuters with low-wage jobs are more likely to rely on public transportation and more likely to need one or more transfers to get to work, as they tend to live further from their place of employment and in neighborhoods with lower rates of car ownership and higher rates of poverty. This makes them less able to afford the upfront costs of weekly or monthly passes (PEW 2019). Unlike the paper-based equivalent, SEPTA Key passes also include limits on the number of times passes may be used in a single day, week, or month. This measure was introduced to discourage card sharing, but it undoubtedly has a disproportionate effect on poorer residents who make more transfers during each trip.

Finally, digital fare collection technology can make fare evasion – a common adaptation strategy among users who otherwise cannot afford public transportation – more difficult and thus negatively impact transport access for the poor. Chapter 5, which includes an in-depth discussion of affordability in Latin America and the Caribbean and an overview of the various policy approaches to transport pricing, highlights that user fares in most cities are above the desired 6 percent of the minimum wage. Unfortunately, the tendency to attempt to cover operating costs by user fares, without sufficient consideration of affordability for the poorest, is common throughout Latin America and the Caribbean, and can contribute to fare evasion.

7.2.3 Cashless Fare Collection: A Roadblock or a Pathway to Financial Inclusion for the Un(der)banked?

As explained in Chapter 4, public transportation systems serve an important share of a region's population – 56.9 percent of all motorized trips (Vasconcellos and Mendonca 2016) – and in many cases most users are economically disadvantaged. These individuals are very often also among the millions of un(der)banked and financially excluded people in the region. The dominance of cash in the transport sector, along with the high levels economic and transport informality and low levels of financial inclusion that drive its persistence, are arguably the most significant demand-side challenges hindering the migration towards cashless fare collection systems. On the other hand, it presents an opportunity to use purposefully designed fare collection systems to facilitate and encourage financial inclusion.

In Latin America and the Caribbean, especially among low-income and financially excluded populations, riding public transportation is a critical part of daily life. In this context, transit has the potential to be a compelling use case for digital financial instruments and can be an effective way to achieve broad exposure to and adoption of these technologies. For the poor and un(der)banked, single-purpose, stored-value cards like the ones most prominently used in the region are often a less compelling way to pay than cash because they require that funds be loaded in advance. This can only be done at specific locations and requires riders to devote additional time – and perhaps even additional trips – solely for the purpose of topping up. When riders have small and/or irregular incomes, this additional burden can be prohibitive, as these time and financial costs are compounded by the tendency of these riders to top-up in smaller amounts and more frequently.

This disadvantage is particularly acute if the fare cards are not accepted by all transport modes and service providers and, thus, lack the flexibility, fungibility, and portability of cash. Stored-value card users essentially limit their transportation options if they are unable to access additional funds beyond those "trapped" in the stored-value cards.

BOX 7.4.

The Jamaica Urban Transit Corporation Smarter Card

The Jamaica Urban Transit Corporation (JUTC) first introduced the Smarter Card in 2013, primarily as a measure to reduce pilferage by drivers. In 2014, its usage was made mandatory for all passengers accessing fare concessions, including seniors and children. Usage remains low even today – accounting for only 30 percent of fares – and is predominantly concentrated among concession fare recipients. The low levels of usage among passengers who have the option to continue paying by cash can likely be attributed to two major drawbacks in program design and implementation:

1) *The Smarter Card is only accepted on JUTC buses.* The lack of interoperability with other transport modes, such as taxis and other transport service providers, means that stored value is inaccessible if the commuter needs to use another mode or service provider. In a transportation system such as that of Jamaica – characterized by high levels of informality, congestion, and limited information about routes and schedules – passengers already face long, unpredictable, and unpleasant journeys that are only be made worse by being limited to a single bus provider.

2) *The Smarter Card can only be topped up using cash at selected merchant locations.* For low-income passengers, the limited network of top-up locations – specifically, post offices –is an additional financial and cost burden, as those passengers must make dedicated trips to add value to their card. For banked passengers, this lack of integration with the financial sector is also inconvenient and acts as a disincentive to adoption.

Source: Hollnagel and Fook (2019).

Box 7.4 illustrates the challenges faced by the Jamaica Urban Transit Corporation (JUTC) – the public bus company that operates in the Kingston metropolitan area – in implementing automated fare collection with low-income and often unbanked passengers in an uncoordinated transport market.

While imperfect and particularly ill-suited for the needs of the un(der)banked and digitally excluded, the ubiquitous availability of closed-loop smart cards in transport systems across the region points to potentially strong linkages between transportation and the financial sector. As highlighted in Box 7.4, public transit systems were among the early innovators in the use of smartcard technology and, as a result, introduced many public transit users to their first stored-value cards. Further, while account ownership levels in Latin America and the Caribbean are low compared to other regions, there are encouraging signs that digitizing large-volume, recurrent payment streams – government payments, wages, and remittances – encourages account ownership, and thus has a positive impact on financial inclusion.

For example, among the 56 percent of wage earners who have their salaries deposited into an account, 23 percent opened their first account in order to receive electronically deposited salaries (Demirgüç-Kunt et al. 2018). Similarly, 22.4 percent received a government payment in the last year, 71.3 percent received those payments into an account, and 37.1 percent of government payment recipients opened their first account for their electronic payments (Demirgüç-Kunt et al. 2018).

It is important to note, however, that in these instances, one party to the transaction (the government, an employer, or utility provider) has significant control over the terms and features of the payment instruments accepted (World Bank and BIS 2016). While mandating cashless deposits or payments may spur account ownership among the poor and un(der)banked, it does little to promote usage of digital financial services unless these products are designed to be appealing to and effectively meet users' needs.

The transportation sector becomes an even more compelling use case when other types of mobility-related payments – such as parking, tolls, congestion fees, micro-trans – are considered within the scope of the sector. Acceptance of open-loop payment instruments, which does not require specialized fare media, or storing value for a single purpose, also contribute to the incentives to enter the formal financial system to acquire such payment methods. In this way, acceptance of contactless payments in public transport could be a way to bring about awareness about payment methods. According to a survey by Mastercard (2019), on average, 50 percent of consumers in Latin America and the Caribbean are aware of this method of payment, but awareness varies across countries from 70 percent on the high end – in Brazil, Chile, and Costa Rica – to 30 percent in Argentina and Panama. However, care must be taken to ensure that these tools are widely accessible (and used) before making them the only option to pay for essential services like transport. Otherwise, implementing them runs the risk of compounding financial exclusion with exclusion from transport services, which is likely to exacerbate both poverty and social exclusion.

Even beyond collection of fares and other user fees, the transport sector may also serve as a gateway to financial inclusion for employees and service providers in the sector, such as taxi drivers, persons providing last-mile delivery services, and truck drivers involved in logistics. Transport network companies – a business model that bridges the gap between demand for and supply of transportation services using mobile applications – have primarily focused on the passenger market (ride-hailing and ride-sharing services), but they have also recently made inroads into the cargo segment. Few would doubt the transformative impact of transport network companies on the transportation market, but much less has been said about their potential role in promoting financial inclusion, specifically among drivers. Drawing on examples from Asia and Latin America and the Caribbean, Box 7.5 discusses the potential for transport network companies and transport platforms (discussed in more detail in Chapter 8) to positively influence access to and usage of financial services among drivers.

The cases referenced in Box 7.5 are also indications that a broader trend in the financial sector – embedded finance, where nonfinancial service providers provide access to financial services such as insurance, payments, and credit to their customers through their digital platform – has taken hold in the transportation sector (Dologorukov 2021). For example, globally dominant ridesharing companies Uber and Lyft have begun to build on their successful integration of seamless payments to expand into the insurance space by providing targeted insurance coverage – only applicable while carrying passengers – to their drivers (Barclays 2021).

Based on these nascent initiatives and approaches, a number of potential pathways through which cashless fare collection systems can enable financial inclusion for transport users can be identified; (1) use of any digital payment instruments for fare payment (closed or open loop) may increase digital/financial literacy and potentially lead to greater uptake of digital financial services; (2) use of open-loop cashless fare systems could directly propel uptake of digital payment instruments; and (3) supply-side digitization of fare collection could contribute to a broader digital payment ecosystem (including by encouraging necessary innovations to enable nonbanks to participate in payment infrastructure, incentivizing competition among digital financial services providers, etc.).

BOX 7.5

The Financial Inclusion Potential of Transport Network Companies and Transport Platforms

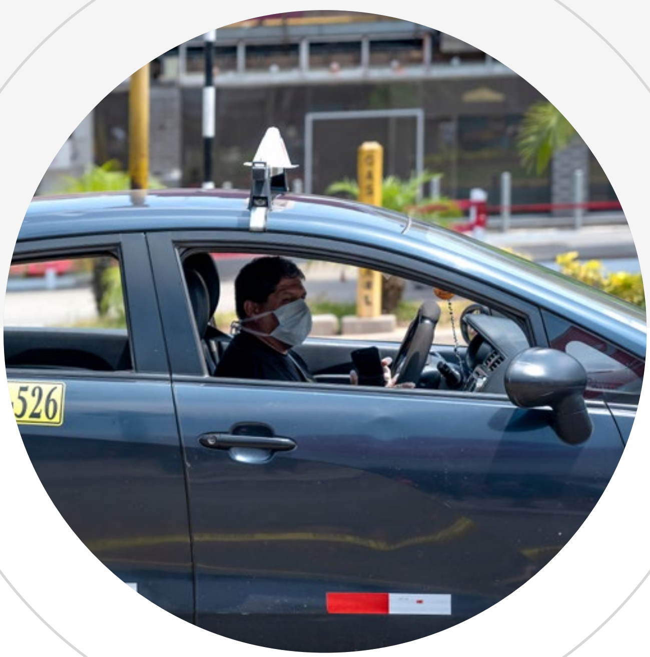
Cashless payment of pre-determined fees is a cornerstone of the transport network company business model, so at the most fundamental level drivers are incentivized and, in most cases, required to access and use at least a basic transaction account. For example, a study on ride-hailing in Latin America and the Caribbean found that 15 percent of Uber drivers with a bank account opened it to receive payments (Azuara, Gonzalez, and Keller 2019). Acknowledging these potential synergies, banks have begun partnering with transport platforms to offer basic financial services to their drivers, as was the case in Mexico, where Mastercard and BBVA bank joined forces to offer debit accounts to Uber drivers.

Moreover, transport platforms can help to increase their drivers' access to more sophisticated financial products and services in several ways. First, increased use of basic financial services offered by banks and other traditional players can increase access to credit by addressing the information asymmetry that typically constrains access for informal workers. Second, the data gathered by transport network companies – income, customer satisfaction ratings, and other behavioral insights – could prove a valuable input for FinTech algorithms and allow them to identify otherwise difficult-to-reach customers and customize financial products to the drivers' needs and profiles (Arraiz et al. 2018; Malik 2019).

In this context, transport network companies and transport platforms are increasingly providing financial services themselves or serving as a conduit to connect their drivers with traditional financial service providers and FinTech companies. For example, Southeast Asian decacorns Gojek and Grab – companies valued at over US$10 billion – now offer small business loans and microinsurance products to their drivers (The Economist 2019), and banks have begun to offer mortgages or saving instruments to Gojek drivers with good performance ratings (Maulia 2018). As of 2021, Grab had raised US$300 million to increase its financial service business (Daga 2021).

In Latin America and the Caribbean, Fretebras – a major player in the Brazilian trucking market – has created a free e-wallet and a proprietary credit engine to offer personal loans to truckers.1 Similarly, LANA – a Madrid-based technology company operating in Latin America and the Caribbean – has developed a financial product marketplace that services an array of transport platforms, including those providing ride-hailing, food delivery, and last-mile transportation services in Mexico and Chile. Based on information from transport platforms, LANA has facilitated the opening of more than 25,000 e-wallets, the provision of more than 3,000 loans to drivers, and the referral of more than 5,000 clients to partner companies offering insurance and savings products.2 While still limited, research suggests that the extent to which transport platforms can benefit financial inclusion is contingent on the socioeconomic characteristics of drivers (Azuara, Gonzalez, and Keller 2019) and the extent of the services offered by the platforms (Budiman 2020). More generally, the role of FinTech is also heavily influenced by the financial capabilities of users and the existence and quality of enabling infrastructure, such as broadband and smartphone access, among other important considerations (Lewis, Villasenor, and West 2017). Still, early successes of these business models in Asia and Latin America and the Caribbean indicate that transport network companies and transport platforms have the potential to improve financial inclusion and access among drivers in the region.

Note: This box was prepared by Paula Castillo Martinez.
[1] IDB Invest interview with officials from Fretebras.
[2] IDB Invest interview with officials from LANA.



7.3 Paving the Way for Poverty Reduction and Social Inclusion: Guiding Principles for Accessible and Inclusive Cashless Fare Collection Systems

In cities the world over, transit agencies are considering or have embarked on the journey to transition their aging fare collection systems from proprietary cash-based or smart-card-based systems to open-loop systems that accept fares from multipurpose payment instruments that their customers already hold, such as debit or credit cards or mobile payments. The rise of automated fare collection holds great promise for public transport users, but designing, financing, and deploying this technology can be complex, especially in developing-country contexts. To be truly inclusive, strategies to automate fare collection and encourage adoption of digital fare media must engage all users of the transportation system and, in Latin America and the Caribbean, must be specifically designed to be accessible and provide benefits to the poor, un(der)banked, and digitally excluded. This will require a number of synchronized efforts to address the supply- and demand-side factors that have hampered the development of digital payment systems in the region.

On the supply side, the high degree of informality in the transport sector poses a challenge to the coordinated effort required to achieve interoperability and fare integration across modes. In addition, the high degree of fragmentation among service providers makes it difficult to align the disparate interests of many small operators that may also lack access to credit and resources to invest in and scale up automated fare collection. Other formal systems may lack the financial soundness to make and sustain large-scale investments.

On the demand side, strategies must be adapted that are suitable for low-income users with small, irregular incomes who may not have accounts with the formal banking sector and may not be digitally literate or enabled. Further, measures to educate and protect consumers must be implemented.

This section presents the policy guidelines, broadly classified into three categories (Figure 7.7), for the design and implementation of an automated fare collection system that can help cities develop inclusive, pro-poor cashless fare collection systems.

FIGURE 7.7 **Policy Guidelines for Inclusive Cashless Fare Collection Systems**

Source: Prepared by author.

7.3.1 Legal and Institutional

Chart a Course: Establish a Vision and a Clear Governance Structure

Prior to embarking on the adoption of automated fare collection, cities must establish a clear vision for what the new system should accomplish and document the reasons for adopting it, such as operational efficiency, or reducing fare evasion or cash leakages. These will be important inputs to inform system design. Specific public policy goals linked to the introduction of automated fare collection – such as improving equitable access to transport, reducing travel costs for the poor, and improving subsidy delivery – should also be clearly articulated in the vision. When identifying the pain points to be addressed, it is important to engage end users, especially marginalized and transport-dependent populations, to ensure that the system's goals reflect the needs of the most vulnerable. Further, a lead institution with a mandate to safeguard and pursue that vision should be identified, and a governance structure should be established that prioritizes transparency and data-driven decision-making.

Define the Institutional Framework and Build Capacity

With the vision in mind, cities should conduct a thorough gap analysis of current fare collection practices, including a complete stakeholder map that outlines current and future stakeholders – including passengers themselves, and especially those who are low-income, un(der)banked, and digitally excluded. Their respective roles in designing, operating, and/or interacting with the system should also be mapped. Stakeholder roles should be clearly identified, and the capacity to carry out those roles assessed, providing opportunities for specific training or knowledge-sharing where necessary. During this stage, the funding of the system should also be established and secured to ensure that investment decisions can be made in a timely and cost-efficient manner and that the automated fare collection strategy is financially feasible. In Paraguay, for example, Law 5230 of 2014 designated the Vice Ministry of Transportation as the authority in charge of the National System of Electronic Ticketing, including monitoring and control of the system, and a specific decree (6912) defined additional responsibilities related to the operation of the automated fare collection system. This included the establishment of a regulatory council where public and private sector entities can be consulted (Gordillo, Sosa, and Benitez 2019). In this regard, when establishing planning periods, the entity in charge of identifying the goals and drafting the fare collection strategy should also consider the need to provide contractual stability to private sector operators and service providers in order to encourage investment in the sector.

Develop a Balanced Legal and Regulatory Framework

Successful development and implementation of an automated fare collection system requires a stable, predictable, and clearly defined institutional, legal, and regulatory framework. It is important that the legal and regulatory system adequately protects all system users, including by ensuring that cybersecurity and data privacy are enshrined both within the law and in operating guidelines. The legal and regulatory system governing the operations of the automated fare collection system should explicitly protect the poor, un(der)banked, and digitally excluded. At the same time, however, the legal and regulatory framework should otherwise be sufficiently agnostic to facilitate and encourage innovation and competition and to accommodate different types of business models that may emerge in less developed and formal transportation markets. For example, laws and regulations should be applied equally based on the type of service being provided – fare collection – rather than the type of service provider providing them (banks, the transit authority, individual drivers), or the specific technology used (mobile, credit or debit card). More developed automated fare collection systems, where there are multiple operators and modal and fare integration, generally operate more successfully under a single transport authority – similar to the structure of Transport for London, for example, which has the responsibility to establish and implement transport strategy, set fare policies, and make other key strategic and operational decisions (EBRD 2017).

7.3.2 Technical and Operational

Consider Equity Implications of Financial and Information and Communications Technology Infrastructure Decisions

Cities should employ a people-centered approach when designing the automated fare collection system and specifically tailor the approach and decision-making to be suitable and appealing to the target audience. In Latin America and the Caribbean, ensuring accessibility to payment methods and top-up locations for poor peri-urban residents, those living in informal settlements, and the un(der)banked and digitally excluded has particular relevance. In the case of the top-up network, for example, guaranteeing accessibility for cash users is critical to ensure system equity. Cities may consider expanding the scope of the system by authorizing purchases and top-ups through agents – such as small shops and other businesses in low-income communities. However, proper oversight of agents is required to make sure consumers are not charged additional fees or required to make purchases to access the services. To accomplish this, cities could use socioeconomic and travel demand data to make informed decisions on the placement of purchase and top-up locations. Furthermore, cities should allow for easy, anonymous reporting of incidents, invest in consumer education, ensure consistent maintenance of electronic top-up machines, and do random mystery shopping to contribute to agent network oversight.

Build in Interoperability from the Start

Countries may wish to follow existing international norms for fare collection. The International Organization for Standards (ISO 2021) outlines a clear, actionable roadmap to ensure that interoperability is established as the technical foundation of a new automated fare collection system. Ensuring acceptance on all modes of transport, integrated fares, and accessible purchase and top-up options for both banked and unbanked riders is essential to drive adoption, especially among low-income, financially excluded populations. In some contexts, continuing to accept cash for a defined period during the roll-out and onboarding, or even in perpetuity, may be desirable to ensure that the fare collection system does not become a hurdle for un(der)banked, digitally excluded populations to access transportation services. In these cases, it is important to ensure that adoption incentives (e.g., access to fare integration, discounts, etc.) do not penalize customers continuing to pay with cash. Collaborating with financial institutions to offer low-frills accounts with simplified know-your-customer requirements could be an effective strategy to drive account ownership among un(der)banked customers, while ensuring access to contactless payment methods for transit. In order to prioritize interoperability in the short term and protect its integrity in the long term, cities should pursue transparent and open city-owned standards to prevent technology capture by private sector operators (Rodríguez Porcel and Gordillo 2018). Box 7.6 summarizes how the fare collection ecosystem of the Dominican Republic has been structured, placing interoperability at the center of the design.

BOX 7.6

The Electronic Fare Collection Ecosystem in the Dominican Republic

The methodology employed in the design of the fare collection system for public transport in the Dominican Republic established interoperability as the main objective. Interoperability is considered from each of the following four perspectives:

i) The individual user perspective, where the goal is a seamless experience at all points of interaction with the fare collection system, including purchasing, recharging, and using payment methods.

ii) The institutional perspective, with challenges such as the governance model, the assignment of roles and responsibilities, and the description of the flow of information between actors.

iii) The commercial perspective, which requires setting clear business rules for remuneration and income distribution among the various entities involved, including transport operators and service providers.

iv) The technological perspective, with challenges in defining the technological architecture, payment methods, security, communication interfaces, and homologation rules.

These considerations are important for unbanked and banked users alike. In the first case, with the system's existing payment methods (Santo Domingo Metro Card and SD-GO), cash payment remains accepted on buses, as does a new payment method (a new SD-GO) that provides more security and functionality, such as making payments with QR codes. For the banked, payments with contactless EMV debit or credit cards and smart devices with near-field communication technology are included.

With this design, the system in the Dominican Republic achieved several objectives: institutional and legal clarity in the ecosystem, a central collection system with leadership and ownership of the government, total ownership of the information by the government, the participation of multiple technology and service providers, and a win-win business model.

Note: This box was prepared by Fabio Gordillo, Sebastian Velazquez, and Manuel Rodríguez Porcel.

Raise Awareness among Consumers

Communicating ease of use, safety, and benefits associated with a new automated fare collection system and fare media to passengers – especially the un(der)banked and digitally included – is essential to drive adoption and usage. Studies show that "effort expectancy" – defined as the extent to which users find it easy to use a new technology (Venkatesh, Thong, and Xu 2012) – has a significant impact on people's intention to use it, especially in the early stages of adoption (Kim, Yon and Han 2016). For instance, Liébana-Cabanillas, Molinillo, and Ruiz-Montañez (2019) show that low effort expectancy has a positive effect on users' intention to use near-field communication technology for public transport payment.

7.3.3 Public Policy

Ensure Alignment with Other National Public Policy Objectives

An effective and efficient fare collection system can support other national public policy priorities such as financial inclusion, increasing public transport usage, managing congestion, and reducing emissions. Account-based fare collection systems generate vast amounts of accurate, real-time, and granular data on time, day, mode of transportation, frequency of travel, origin, and destination. These data may be used to identify and diagnose challenges, inform the crafting of public policy, and support the design and monitoring of targeted initiatives intended to influence behaviors. For example, armed with data on the demand for transportation, cities can offer discounted tickets for travel during off-peak times that can incentivize public transport users to shift their travel patterns to help even out demand throughout the day. In addition, providing additional services – such as free Wifi (Zhang, Fujii, and Managi 2014), or parking at or near bus or train stations – can potentially incentivize drivers to use public transportation for part of their journey. A study by the National Center for Sustainable Transportation suggests that these incentives can even be personalized. The study found that in California, by combining traffic data from highway and arterial loop sensors and bus and train GPS locations, the proposed framework can identify the most optimal route for a driver in real time and potentially lead to a 27 percent decrease in total system-level carbon emissions during rush hour (Ghafelebashi, Razaviyayn, and Dessouky 2021). A thorough understanding of complementarity between public transport operation and national priorities can help inform strategic and operational decisions to yield a more cohesive and successful approach.

Undertake a Review of Public Transport Demand, Supply and Fare Policy

To maximize benefits from the new system for both passengers and transport operators, it is important that the migration to automated fare collection take place within the broader context of public transport reform, rather than simply applying existing fare products to a new fare media. For example, fleet renewal and right-sizing the public transport fleet (i.e., rationalizing bus routes and overhauling taxi licensing policies and procedures) to meet current and latent demand, as well as a thorough review of fare levels and policies, may be required to improve the functioning of the transport system as a whole. The impact of fare policies for low-income, un(der)banked, and digitally excluded riders should be considered with particular care, ensuring equal access.

Use Cashless Fare Collection Systems to Support Pro-poor Transport Policies

Section 7.2.1 of this chapter outlined the potential role for automated fare collection systems in improving the operations of transport subsidy programs. Fare collection data should be maximized to measure usage, assess impact, and improve the targeting and delivery of transport subsidy programs over time and ensure that operational savings contribute to lowering transport costs for those most in need.

7.4 Conclusions

While there are many challenges associated with ensuring that cashless fare collection systems are inclusive and accessible to un(der)banked and digitally excluded populations, the recurrent nature of transport payments, coupled with their pervasive reach across socioeconomic groups, gender, age, and other characteristics, highlights the potentially compelling use case to incentivize and advance financial and digital inclusion in the region, while facilitating access to more efficient mobility services for all. This is especially true if the definition of transport payments is broadened to include tolls, HOV lane access charges, parking fees, bicycle and scooter rentals, and other financial transactions associated with mobility. There are strong indications that cashless fare collection systems have the potential to provide significant benefits for un(der)banked and digitally excluded populations.

Still, there remain many open questions that demand further attention and analysis. Among the evidence gaps, the literature could be bolstered by more empirical data – ideally comparable across countries or regions – on the strength of cashless fare payment options as a motivator for adoption of digital financial instruments, and whether this uptake translates to broader usage outside of mobility needs. Second, more systematic study of existing cashless fare collection systems could help identify some of the essential pre-conditions for successful adoption of cashless systems, as well as help define ways to measure the equity implications of the digitization of fare collection beyond anecdotal evidence provided by city and transport-system-specific case studies. Third, more quantitative data on the benefits accruing to the various stakeholders – commuters, transport service providers, and government regulators and policymakers – would be an essential input for cities as they perform feasibility studies to assess to costs and benefits of implementing cashless fare collection systems. Finally, and more specifically, the academic literature could be expanded and improved by deeper analysis of and data collection on the particular benefits for the poor, such as lower transport costs, expanded transport access, and time savings for previously underserved and marginalized communities.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NO CORRA
Museo Nacional
Carrera Séptima
Taquilla
¡Me cuidas y te cuido!

The Potential for Shared Mobility Services to Promote Equity and Social Inclusion in Latin America and the Caribbean

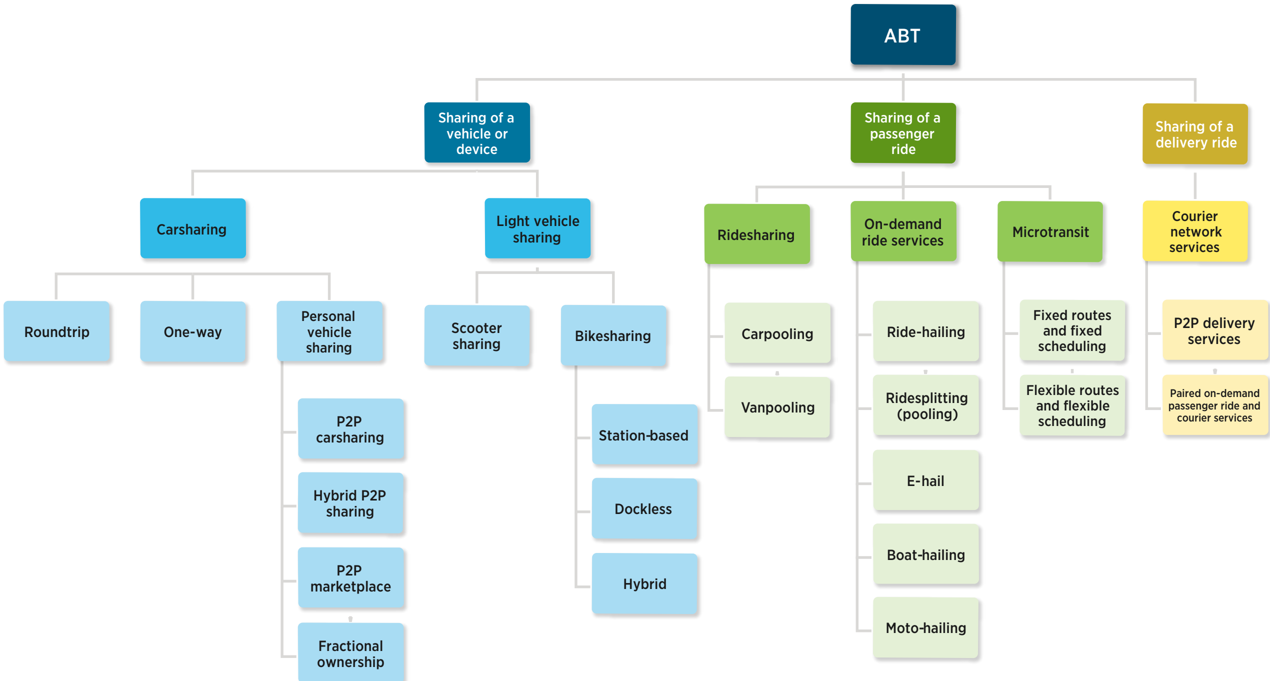
8

Daniel Oviedo
Orlando Sabogal-Cardona
Lynn Scholl
Juan Pablo Bertucci

Emerging transport alternatives based on information and communication technology (ICT) have catalyzed broad transformations in urban mobility at the local neighborhood and city levels (Alemi et al. 2019; Hall, Palsson, and Price 2018; Romanillos et al. 2016). Between 2010 and 2019, the app-based transport industry – understood as digitally enabled transport services that connect spare capacity or idle goods with demand for mobility – received a total disclosed investment of 49 billion U.S. dollars (Holland-Letz et al. 2019). Pre-COVID-19 forecasts projected growth of 25 percent by 2025 for such services, including bike-sharing, e-scooters, ridesharing, car-sharing, and ride-hailing, with the largest investments targeting firms with origins in the United States, China, and Europe (Wolff, Possnig, and Petersen 2019). However, the potential of these services to either alleviate or exacerbate existing social inequalities, as well as their role in the mobility and accessibility of low-income and socially disadvantaged urban populations, has been a topic largely unexplored.

The term "app-based transport" encompasses a broad set of urban mobility alternatives that, under different business models, place smartphones at the core of their operation to both supply and access transport services (Shaheen et al. 2020; Cervero 2017). App-based transport includes services such as ride-hailing and vehicle sharing services, micromobility (e.g., shared bikes or e-scooters), and microtransit (minivans or small buses not attached to fixed routes and schedules, otherwise known as demand-responsive transit). Mobility as a service (MaaS) is often used as an umbrella term to refer to such emerging transport services (Hensher 2017). These innovations have rapidly disrupted transport markets and regulations, brought about changes in individual and collective travel behaviors, and raised concerns about their potential social and environmental externalities.

FIGURE 8.1 **The Landscape of Shared Mobility Made Possible by Technological Advances in Communications and Portability**



Source: Shaheen and Cohen (2019).
Note: ABT: app-based transport; P2P: peer-to-peer.

These new forms of urban mobility have context-specific effects and pose challenges for governance and decision-making (Oviedo, Perez-Jaramillo, and Nieto 2021). Furthermore, in the contexts of rapidly growing cities in Latin America and the Caribbean, shared mobility alternatives have the potential to either positively or negatively influence inequality. Their role in disrupting the travel behavior of citizens with different social identities, socioeconomic characteristics, levels of social and transport (dis)advantage, access to labor, and exposure to health and road-related and environmental risks is still under-researched.

Although there are few studies on app-based transport and transport-related social exclusion in Latin America and the Caribbean, emerging research has examined their impact on spatial and economic accessibility. There is also research on the role of fear, insecurity, and bias in the provision and use of app-based transport. On the positive side, unique features such as panic buttons in ride-hailing and microtransit services have improved safety, especially for women and for people traveling at night. Ride-hailing also provides opportunities for disadvantaged groups to access employment, as in the case of disabled drivers who are prevented by local regulations from working in the traditional taxi industry. The role of transport network companies as a source of economic activity for the unemployed or for people wanting to gain extra income through flexible work is well documented (Azuara, González, and Keller 2019). Furthermore, flexible services such as shared micromobility provide first- and last-mile solutions to access public transit and can improve accessibility for people who cannot walk or cycle. They can also be an attractive alternative for people without cars who can afford these services.

From a perspective of inequality and exclusion, barriers associated with access to app-based transport include issues of affordability, coverage, and access for vulnerable populations. For instance, a lack of adequate infrastructure can make shared micromobility unusable, at least safely, in some parts of a city. Furthermore, ride-hailing services are heavily influenced by perceptions of crime, which can lead to the exclusion of some neighborhoods from their supply. Given the diversity of regulations and approaches to app-based transport services in different contexts, users can also be negatively affected by volatile fares, leading to prohibitive costs for some users. In addition, there is evidence of discrimination against different actors involved in the provision of this type of service, as well discrimination against some users due to context-specific perceptions. Another larger issue that can have both direct and indirect effects on inequality is the potential contribution of new services to congestion, vehicle miles traveled, and safety and pollution.

This chapter discusses the extent to which app-based transport services may either exacerbate or ameliorate transport-related social exclusion and social and transport (dis)advantage, focusing on the implications for (in)accessibility and social (in)equality. Relying on emerging research in Latin America and existing research on the Global North, the chapter focuses on how the services are distributed and used, and on their impact on different social groups. The analysis recognizes that while knowledge generated from research on the Global North is helpful to understand some patterns and shed light on how app-based transport might affect people, the trajectory of app-based transport in Latin America and the Caribbean is expected to be different given the unique context of urban mobility and spatial patterns in the region's cities. In exploring the different forms of inequality and exclusion implicit in the design and provision of app-based urban transport services (Coutard 2008; Kamruzzaman et al. 2020; Oviedo and Dávila 2016), the analysis shows how the range of travel needs and preferences of travelers have a direct bearing on the potential barriers and opportunities created by app-based transport services in terms of (un)equal mobility and accessibility. Furthermore, it discusses avenues for the design of policies and regulations of these mobility innovations in Latin American and Caribbean urban markets to foster socially inclusive and sustainable mobility.[1]

1. While the contents of this chapter touch upon issues that have been identified as relevant in terms of the regulation of transport network company services – such as pricing, liability, employment, and safety, among many other considerations (Azuara, González, and Keller 2019; Oviedo, Perez Jaramillo, and Nieto 2021) – an in-depth discussion of regulations in different countries and their implications is beyond the scope of the chapter.

8.1 App-based Transport Is Here to Stay: Recent Trends and Future Projections for the Region

The landscape of app-based transport is diverse, encompassing different transport services, vehicle technologies, and digital platforms (Figure 8.1). In Latin America, a fertile ecosystem for start-up investments has given rise to home-grown companies seeking to fill gaps in the urban mobility market through data-driven innovations and versions of services in various sectors adapted to local conditions (Oviedo, Perez Jaramillo, and Nieto 2021). The most common forms of app-based transport currently operating in the region include micromobility, microtransit, and ride-hailing (Figure 8.2).

FIGURE 8.2 **Types of App-based Transport in Operation in Latin America and the Caribbean**

MICROMOBILITY | **MICROTRANSIT** | **RIDE-HAILING**

Photo: Urbvan.

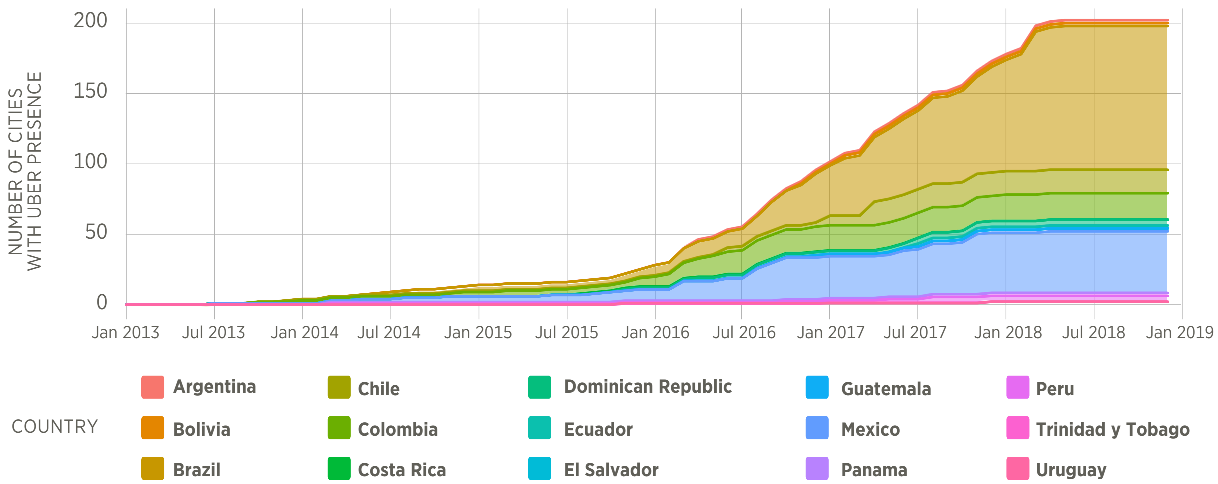
Photo: Jetty.

8.1.1 Ride-hailing and Ridesharing

Ride-hailing services are defined as on-demand mobility services supported by digital platforms and smartphones that enable users to request a personal driver to transport them for a fee to where they want to go. Operated through cell phone apps, the features of ride-hailing include the ability to provide point-to-point service, track and share trip information in real time, know the waiting and travel time and costs before making the trip, use a variety of payment forms, and employ a dynamic pricing mechanism that changes according to traffic conditions and other time-bound demand determinants. Ridesharing or pooled ride-hailing services operate similar to ride-hailing, but riders share vehicles with other passengers with similar origins or destinations at discounted fares.

Latin America is the fastest-growing and one of the most profitable regions for global and local ride-hailing companies seeking to expand their operations. The region has the highest number of simultaneous trips globally, with more than 25 million monthly active riders across 15 countries (Moed 2018). As shown in Figure 8.3, Uber – perhaps the most well-known transport network company in the industry – has grown exponentially in the region. Today, Uber operates in 15 countries in the region: Argentina, Brazil, Bolivia, Chile, Colombia, Costa Rica, the Dominican Republic, Mexico, Panama, Peru, and Uruguay. Brazil is Uber's second-largest market in the world, with 500,000 drivers and, according to Uber's own data, more than 17 million users (Darlington and Londoño 2017). In Central America alone, there were an estimated 1.3 million users in the first semester of 2018.

FIGURE 8.3 Expansion of Uber in Cities of Latin America and the Caribbean (Number of Cities with More than 100,000 Inhabitants, by Country)



Sources: Prepared by the authors based on Azuara, González, and Keller (2019).

Beat, Cabify, Lyft, and DiDi are the main ride-hailing services apart from Uber operating in Latin America and the Caribbean (Figure 8.4).[2] DiDi has followed an expansion pattern similar to that of Uber, entering and competing with both local and global transport network companies for urban markets in the region. DiDi-associated research reported that the ride-hailing and food delivery services covered 200 million users in Latin America in 2019 and was expanding quickly. Rapid expansion and acquisitions of local transport network companies (e.g., Didi acquired local firm "99" for US$1 billion) have contributed to the consolidation of a handful of transport network companies in Latin America, which has added layers of complexity to current regulatory and policy debates across the region (Oviedo, Perez Jaramillo, and Nieto 2021).

FIGURE 8.4 **Presence of Ride-Hailing Operators in Latin America and the Caribbean**

Source: Oviedo, Perez-Jaramillo, and Nieto (2021).

2. Since the merger of Cabify and Easy.

The introduction of these new transport network company services has raised concerns about their impacts on vehicle miles traveled and congestion. A study in San Francisco (Erhardt et al. 2019) shows that ride-hailing services are the main contributor to congestion and estimates a weekly increase of 62 percent in vehicle delays due to the presence of transport network companies. Another study (Schaller 2021) analyzed four urban areas in California and found that ride-hailing increases vehicle miles traveled without this being offset by increased use of ride-hailing as a feeder option for public transit. Nevertheless, these and other studies should be considered with caution since different studies have shown varied results. For example, other research in the United States has found that transport network companies are decreasing congestion (Li, Hong, and Zhang 2016).

One of the few studies in Latin America and the Caribbean (Tirachini and Gomez-Lobo 2019), conducted in Santiago de Chile, concluded that if ride-hailing does not change to a more "shared" service that increases average occupancy per vehicle, total vehicle kilometers traveled can be expected to increase with increasing demand, with negative implications for congestion. In terms of the effects on car ownership, a study on ride-hailing in Colombia found that after such services began operation, there was a decline in taxis and a rise in the registration of small-size cars (often the preferred type of vehicle used by transport network company drivers) but no effect on large or mid-size vehicles (Granada, Perez-Jaramillo, and Uribe-Castro 2019). The results suggest a potential relocation effect in which taxi investors and drivers may be switching towards buying cars and working in the ride-hailing industry.[3]

Regarding public transit, it is possible that ride-hailing either siphons ridership from public transit or complements existing transit services, increasing coverage and access (Hall, Palsson, and Price 2018). Most frequently, ride-hailing can serve as a first-mile and last-mile feeder alternative. In other cases, it can supply transport in areas with a limited presence of public transit (Barajas and Brown 2020) or with schedules when public transit is not operating (Sabogal-Cardona et al. 2021). A study in Canada (Young, Allen, and Farber 2020) compared ride-hailing trips with the simulated public transit alternative and found that 31 percent of such trips had travel times similar to those of their public transit counterpart, and that 27 percent of such trips would take more than 30 additional minutes on public transit. As a policy recommendation, the study suggests taxing ride-hailing trips that occur in the context of substitution. The risk of public transit being replaced by ride-hailing in Latin America and the Caribbean (at least to some extent) is based on the different security features of ride-hailing that are absent in public transit (Oviedo, Granada, and Perez-Jaramillo 2020; Scholl, Oviedo, and Sabogal-Cardona 2021), and on some experiences from the Global North. The most extreme example occurred in Innisfil, Canada, where in 2017 the local government replaced public transit with Uber by providing important fare subsidies (Cecco 2019).

3. The study estimated a 2.7 percent increase in the share of total vehicles three years after Uber, the first transport network company in Colombia, launched operations.

Given the scale and pace of expansion of app-based transport, most available research on and knowledge about it in Latin America and the Caribbean has focused on ride-hailing. Therefore, a large portion of this chapter will focus on this mode of transport in order to illustrate the challenges and opportunities of shared mobility for equality and inclusion.

8.1.2 Microtransit

Microtransit is a form of bus-based, demand-responsive public transport service that incorporates app-based technologies used for ride-hailing services (apps, Wi-Fi, and GPS-enabled smartphones) to provide highly flexible routing or scheduling for minibuses and vehicles shared with other passengers. Passengers can use a digital platform (e.g., a website or a smartphone app) to request and program a shared ride in a small bus or van that may or may not have a fixed route with flexible boarding locations (Westervelt et al. 2018). Also known as demand-responsive transit or dial-a-ride services, microtransit in the Global North is frequently associated with paratransit services.[4] Most experiences with microtransit have been in the United States and Europe, with many recent initiatives still in the pilot stage. Results in these contexts suggest that implementation of microtransit services and integration with larger transport systems is difficult and expensive, and that it is hard to consolidate enough users to make it financially sustainable.

Experiences in Europe have illustrated the potential impact of microtransit on urban mobility. For example, Kutsputlus in Helsinki (Finland), which has been described as the "first fully automated, real-time demand-responsive public transport service" in the world (Rissanen 2016, 1), was designed based on customer time-efficiency and focused on areas where public transport had not been competitive. The Kutsuplus experiment grew in popularity and ridership over time, leading to a decrease in subsidies to the point of being comparable with other public transportation systems. Kutsuplus evaluations demonstrated that the service both competed with private vehicles and complemented public transportation, if integrated with train services (Rissanen 2016). Despite these positive assessments, however, another analysis noted that most trips in Kutsuplus were less than 10 kilometers and lasted no more than 30 minutes, and that the service had a low occupancy rate (1.27 passengers per vehicle) and low load factors (14 percent) (Haglund et al. 2019). Analyses of another experience in the Netherlands (Breng flex) suggested, on the other hand, that microtransit service could eventually compete with cycling and mass transit (Alonso-González et al. 2018).

4. Paratransit is a term commonly used in the Global North to refer to door-to-door, on-demand, collective services designed for the elderly and people with disabilities with vehicles equipped to attend to the specific needs of users. This is not to be confused with the concept of informal paratransit, which refers to traditional conventional public transit services common in cities of the Global South that range from minibuses to shared taxis, rickshaws, and motorcycle taxis.

In Mexico, microtransit is better known as vanpooling and is still a novel but rising service, with at least two microtransit companies now operating. Urbvan started as a pilot in 2016 with only five vehicles.[5] Currently, the company has raised more than US$10 million in investments, and it was estimated have 230 operational buses in 2020. Jetty, another Mexican microtransit competitor also founded in 2016, has recently expanded operations from Mexico City to Puebla. Having tapped into an unsatisfied demand for higher-quality public transport services that can serve as an alternative to semi-formal minibuses known as combis (jitneys), the experience of Jetty points to the potential financial viability of these services (Tirachini et al. 2020).

Although it is premature to assess the long-term effects of microtransit services in Mexico on modal shares in cities, pre-pandemic insights suggest that the use of shared vans (or minibuses) is more attractive to car users (Tirachini et al. 2020). Furthermore, perceived problems of quality and security in traditional public transport systems among people with higher purchasing power are key factors behind the market consolidation of microtransit (Flores-Dewey 2019). Emerging research suggests microtransit services could contribute to a more diverse set of alternatives for collective transport and have the potential to promote sustainable mode shifts (Flores-Dewey 2019; Tirachini et al. 2020). More interestingly, microtransit technology in Mexico might be an avenue to improve the quality of semi-informal services. Other countries in the region with microtransit projects include Chile (where microtransit services have been operating since 2018),[6] Argentina (where most services have focused on corporate trips), and Brazil, which has two successful examples (City 2.0 in Goiana[6] and TopBus in Fortaleza).[7]

8.1.3 Micromobility

Shared micromobility services have been in operation for about a decade or more in the region. Bikesharing was the first service to emerge. Rio de Janeiro and Santiago de Chile launched the first programs in December 2008. More recently, cities in Latin America and the Caribbean have witnessed the introduction of e-scooter sharing services, although these remain novel in the region. Although loosely serving similar purposes in the region, e-scooter services have been dockless since inception, while bikesharing systems initially depended (and in many cases still do) on docking stations. Research in the United States suggests these systems are not used equally by all

5. See "Urbvan, la app que reduce en 25% el tiempo de traslado de los mexicanos," *Expansión,* August 2, 2019 (https://expansion.mx/emprendedores/2019/08/02/urbvan-la-app-que-reduce-en-25-el-tiempo-de-traslado-de-los-mexicanos).

6. See Via, "CityBus 2.0 Celebrates One Year of Service with 80,000 Riders," February 18, 2020 (https://ridewithvia.com/news/citybus-2-0-celebrates-one-year-of-service-with-80-thousand-riders/).

7. See Via, "Sindiônibus and Via Launch New On-demand Public Transportation Service in Fortaleza, Brazil," December 4, 2019 (https://ridewithvia.com/news/sindionibus-and-via-launch-new-on-demand-public-transportation-service-in-fortaleza-brazil/).

socioeconomic groups. In an analysis of the geographic and temporal usage characteristics of Lime e-scooters versus bikeshare systems, McKenzie (2019) found significant differences among the two services. Bikeshare activity had a greater spatial reach and was mainly used for work purposes, while e-scooters were mainly used for leisure, recreation, and tourism. Bikeshare's longer history of operation and trust among users compared to e-scooters may affect the way users' approach and utilize each service.

To date, research on micromobility has been concentrated in the United States and Europe. A study in Zurich (Reck, Martin, and Axhausen 2022) found that the distance of the trip, precipitation, and access to vehicles are the main factors that determine whether people use electric bikes. Different results were found in a study of Catania and Palermo in Italy, where Campisi et al. (2021) pointed to age, job occupation, and perceived safety as the main factors. Aman, Zakhem, and Smith-Colin (2021) showed that disadvantaged communities (low-income populations or racial/ethnic minorities) experience inequalities in access to scooters and bike systems in Austin, Texas. A study of Paris by Krier et al. (2021) showed that the shared e-scooter system is mainly replacing walking and the use of public transportation.

Nascent research on e-scooters and bikesharing in Latin America from an operational perspective (travel times, cost, and accessibility) seeks to understand users' preferences. The debate about the role of e-scooters in urban mobility is divided by the appearance of e-scooter sharing companies (e.g., Lime, Grin, and Movo). Before these companies entered the scene, scooters (both regular and electric) were privately owned, not considered a major component of urban mobility, and often used as a tourism/recreation system (Wang 2008), as an aid for people with reduced mobility, or as an option for the elderly to stay mobile and participate in activities (Thoreau 2015). With the emergence of e-scooter sharing companies, this mode of transport became the center of a business model based on the idea of renting an e-scooter through an app via electronic payment. Users can see the location of scooters in the app and pick up the most convenient one. Such a model has enabled the mass deployment of vehicles in various cities across the globe, including in several Latin American and Caribbean cities. E-scooters are now considered a potential key future player in first- and last-mile access, particularly in the context of socio-technical transitions to electric and sustainable mobility.

In Latin American cities, the introduction and growth of micromobility has been sporadic and faced significant regulatory and operational challenges. Dockless bikesharing systems appeared on Latin American streets in 2017 and e-scooter services started in 2018. By April 2019, the region boasted 73 systems in 31 different cities (most in Brazil). However, by June 2020 a total of only 14 systems remained in service in 12 cities. The combined effect of the COVID-19 pandemic, regulatory restrictions, and higher-than-expected operational costs led to a drastic decline of these services in the region (Vadillo Quesada Moreno et al. 2021). Moreover, as mentioned in Chapter 6, many forms of micro mobility depend on pedestrian and bikeway infrastructure that in many cities is lacking, precarious, or incomplete. Therefore, the lack of appropriate and high-quality infrastructure to ensure the efficient and safe use of these services also poses barriers and slows uptake. Nonetheless, the observed reemergence and consolidation of e-scooter and e-bikesharing services in cities in Europe and North America signals potential growth of these services in Latin America and the Caribbean, so consideration of their potential for inclusion is relevant for future policy and research in the region. A recent study in Bogota by Oviedo and Sabogal-Cardona (2022) highlights that city's potential for cycling by arguing that 80 percent of current car-based trips are less than 10 kilometers (an easily cycled distance) and around half of the trips are less than 6 kilometers. The study also shows that, under different scenarios of modal shifts from car to cycling, different population segments see reductions in travel times and gains in accessibility to employment. The design of a large-scale bikeshare system might be the way to take advantage of the Bogota's cycling potential.

8.2 App-based Transport, (In)Equalities, and Exclusion

The development and adoption of app-based transport may also present an opportunity for cities to overcome dependence on cars, foster innovation, and improve the quality, coverage, and complementarity of public transport alternatives (Cervero 2017; Hensher 2017; Wong, Hensher, and Mulley 2017). These new forms of urban transport also open opportunities for new business ventures and their employment opportunities and innovative labor practices, as well as formal and informal supply-demand interactions. Firms, investors, and a growing number of advocates for app-based transport have deployed similar arguments to justify the rapid growth in both the supply of and demand for these services. For example, to those who can afford them, ride-hailing and car sharing offer convenient and comfortable private mobility services. Additionally, micromobility can potentially serve as a feeder and support for mass transport systems, and microtransit can help increase transport service coverage in places where there are public transport supply gaps.

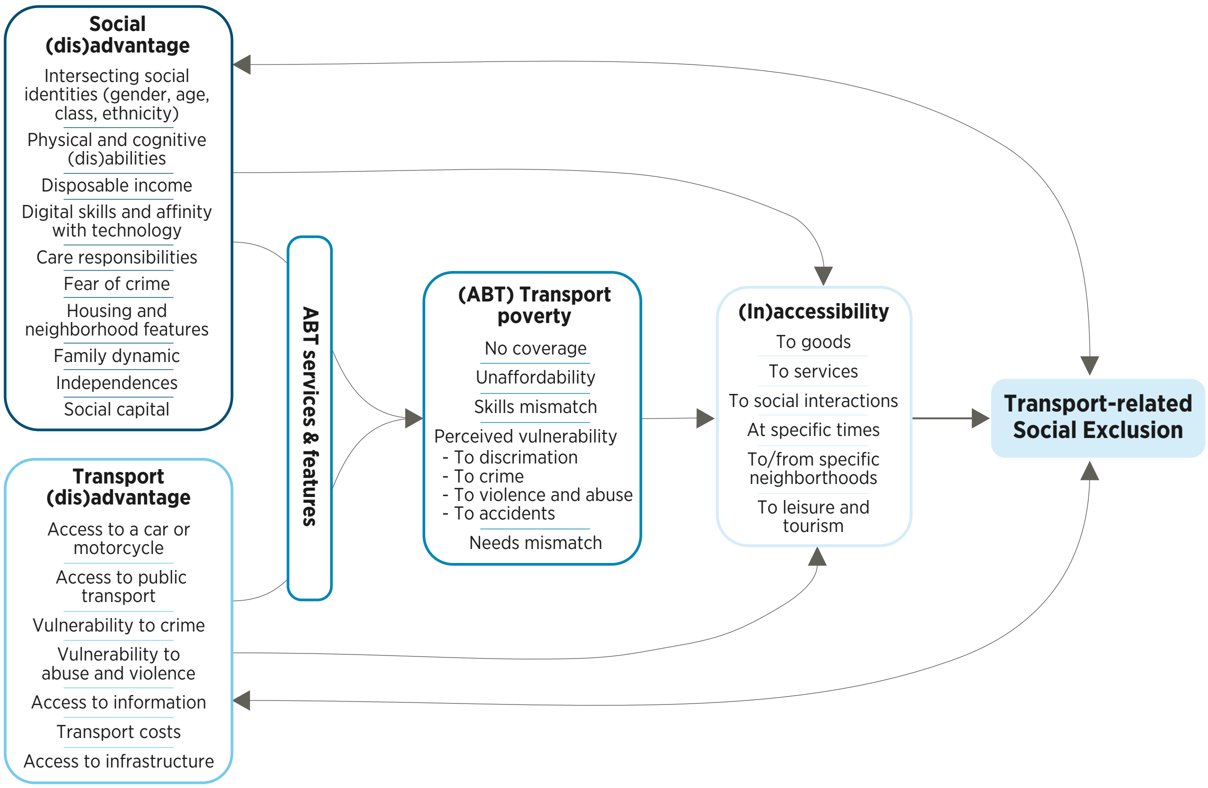
Whether all these benefits can be achieved and at what cost for social equality, health, and the environment remains widely contested (Wong, Hensher, and Mulley 2017), with conflicting research findings adding to the debate. For instance, while some authors argue that ride-hailing services siphon ridership from public transport systems (Bruce Schaller, 2018) others suggest it could act as a feeder for the first or last mile of public transport trips (Hall et al., 2018a). Similarly, while electric scooters have potential to increase sustainable mobility, their effect on reducing cycling and walking trips, which ultimately are preferred by health policy specialists due to their health co-benefits, raises relevant questions about their possible role in increasing health inequalities. An interesting fact regarding micromobility is that electric scooter technology was originally developed to help people with disabilities and the elderly (Thoreau 2015). Such potential remains as a way to improve local mobility for individuals who may have physical impairments that prevent them from walking long distances, effectively expanding their spatial reach and accessibility (Smith, Sochor, and Karlsson 2018).

However, as privately owned and operated enterprises operating in loose to absent regulatory frameworks, app-based transport services offer benefits that are largely limited to those who can access them. Research on ride-hailing adoption has shown variables such as income, race, and ethnicity, as well as the availability of transport options (i.e., car ownership), as salient determinants of adoption and frequency of use. These variables can make such services inaccessible for a considerable share of the population. Educational attainment and digital literacy can also pose barriers. In Pakistan, for example, young girls, elderly persons in rural areas, and illiterate citizens do not use these services because they cannot use a mobile phone (Malik and Wahaj 2019). And in India, demand comes mainly from the middle class due to price and technology barriers (Kameswaran et al. 2018).

On the supply side, operators of app-based transport services in India often belong to working classes or have immigrated from villages and are often the victims of marginalization and discrimination (Kameswaran et al. 2018). Despite emerging evidence from research, app-based transport advocates often promote the transformational potential of these innovations, with limited consideration of the social consequences of the practices that businesses engage in. Emerging studies on micromobility, for example, have found that social equity and subsidies and incentives to include marginalized groups are by and large not considered when designing and implementing micromobility systems (Caulfield, Oeschger, and Carroll 2020).

Figure 8.5 diagrams the potential links between social and transport disadvantage, transport poverty, inaccessibility, and social exclusion. Considering the nature of app-based transport, the discussion frames advantages and disadvantages as a continuum, recognizing that many users of on-demand transport alternatives may be better off socially or have access to a wider set of transport options. Building on the literature on transport (dis)advantage and exclusion and the characteristics of app-based transport services identified in the previous section, the framework also recognizes that not all disadvantaged persons are poor, and that poverty is not the only constraint to accessibility and the (in)ability to use specific transport modes such as app-based transport, a constraint understood in this context as '"app-based transport poverty." Moreover, many of the considerations are general, so as to accommodate considerations that should be independent of the type of service, yet recognize the added complexities brought about by existing digital technologies. The relationships presented in Figure 8.5 reflect the unique features of on-demand transport services assisted by technology while maintaining the core rationale of the relationships between concepts identified in previous research on transport and inequalities. This framework will be used to illustrate the relationships between services such as ride-hailing, micro-transit, and shared micro-mobility, on the one hand, and (dis)advantage, inequality, and transport-related social exclusion, on the other.

FIGURE 8.5 Links between (Dis)advantage, (In)accessibility, and Transport-related Social Exclusion in App-based Transport Services

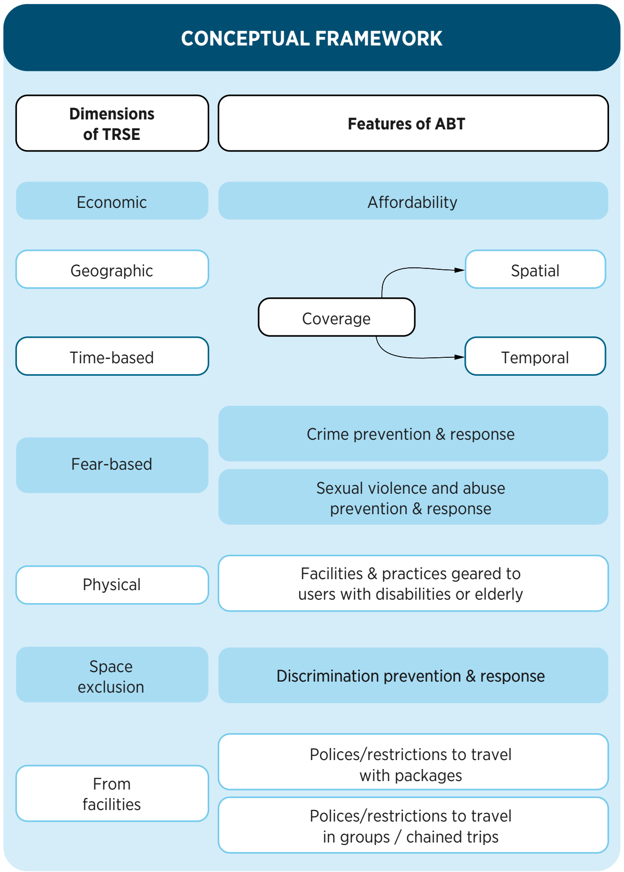


Source: Prepared by the authors.
ABT: app-based transport.

Figure 8.6 extends this framework and illustrates the linkages between the geographic and temporal distribution of costs and benefits of app-based transport and their potential effects on specific population groups that may use such transport, and the dimensions of the transport-related social exclusion. This extension also considers the potential discrimination or exclusion of individuals with specific social identities. This approach can help illustrate the practices, perceptions, and relationships of actors in a rapidly changing industry, and understand changes brought into play by broader external factors such as regulations, social and economic dynamics, and even global disruptions such as the COVID-19 pandemic. Figure 8.6 draws on the seven dimensions of transport-related social exclusion (Church, Frost, and Sullivan 2000) to address specific aspects of transport provision that are relevant for app-based transport. More than providing an exhaustive list of features of app-based transport related to transport-related social exclusion, Figure 8.6 reframes the goals and practices of different actors in transport systems in relation to social exclusion and inequalities.

Research on transport-related social exclusion has historically focused on the demand side of urban transport and on persons affected by transport, rather than on those making the decisions on how that transport is provided. This chapter addresses this gap by engaging directly with available evidence about app-based transport and its contributions to transport-related social exclusion and the mobility of transport-disadvantaged populations. Figure 8.6 shows several service features of app-based transport services such as ride-hailing, micromobility, and microtransit and their relationships with dimensions of transport-related social exclusion.[8]

FIGURE 8.6 Links between Dimensions of Transport-related Social Exclusion and Features of App-based Transportation Services



Source: Prepared by the authors.
Note ABT: app-based transport; TRSE: transport-related social exclusion.

8. Specific aspects that are more concerning in the Latin American and Caribbean context such as crime and gender violence, as well as discrimination, have been explicitly included. They are included in order to inform a more nuanced analysis of topical issues in regional transport policy and practice.

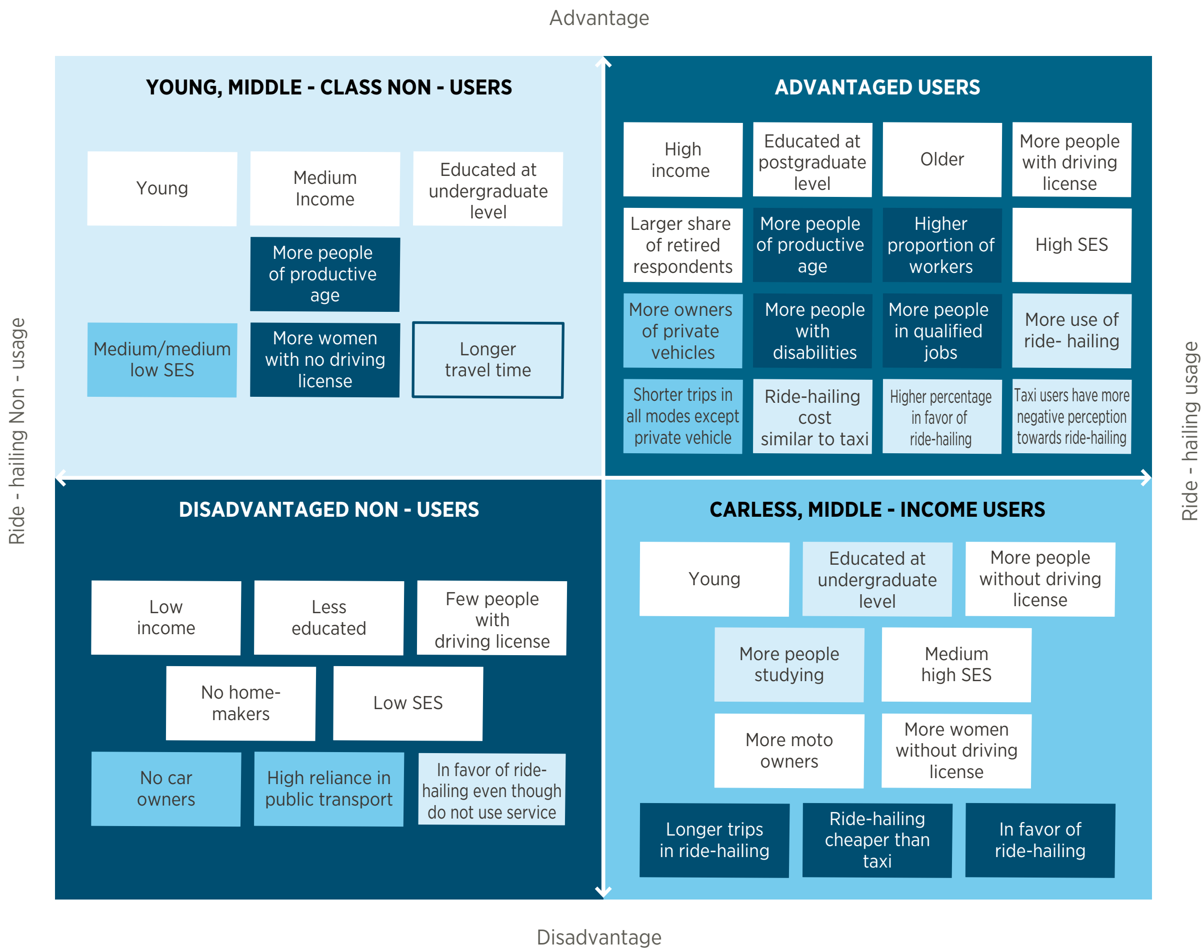
8.3 Who Uses App-based Transport Services?

Understanding the contributions of app-based transport to transport-related (in)equality and degrees of inclusion in Latin American cities requires an examination of who uses those services and the extent to which different population groups enjoy the benefits versus bear the burdens of the distribution of costs and benefits of different types of services.

8.3.1 Insights from Ride-Hailing in Latin American Cities

Research on ride-hailing users and non-users in Latin American cities suggests that those benefiting directly from these on-demand services correspond largely to homogeneous groups defined by specific features of age, income, and travel patterns, among other relevant characteristics. For example, drawing on a 2018 survey, research in Bogota found that users and non-users can be classified according to four representative clusters defined by features related to their levels of transport and social (dis)advantage (Figure 8.7) (Oviedo, Scorcia, and Scholl 2021).

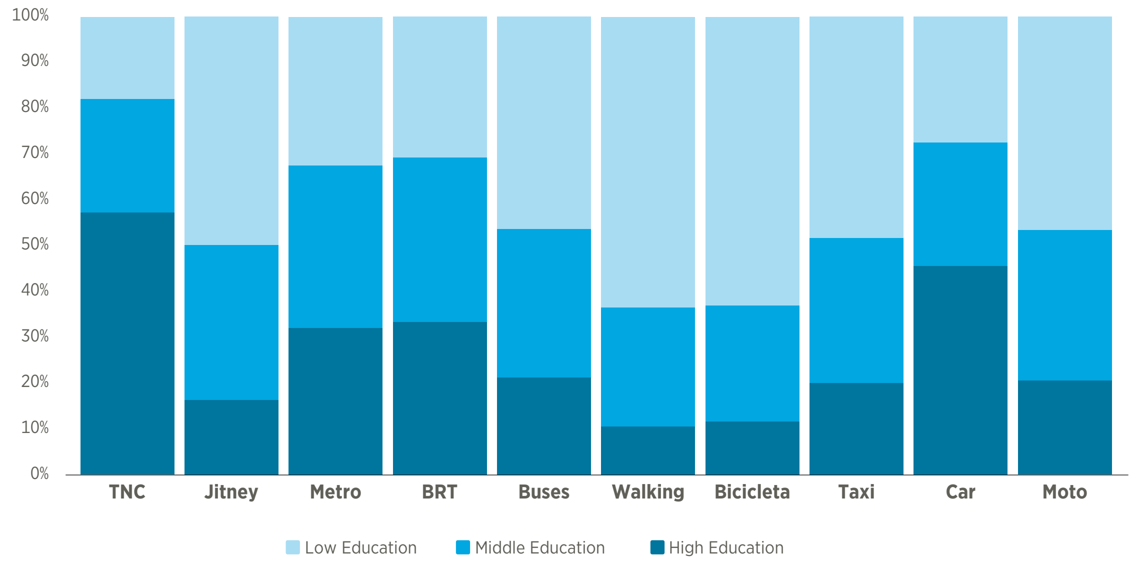
FIGURE 8.7 Ride-Hailing User and Non-User Classification in Bogota, Colombia



Source: Oviedo Scorcia, and Scholl (2021).
Note SES: socioeconomic status.

Socially advantaged ride-hailing users in Bogota tend to belong to high-income and highly educated groups, and that they experience different transport-related advantages such as short trips, high levels of car ownership, and convenient locations relative to the city's main centers of activity. Many of these observations are similar to research findings in Mexico City (Sabogal-Cardona et al. 2021) that individuals with medium and high levels of education are 1.7 and 3.4 times more likely, respectively, to become adopters of ride-hailing services than individuals with low levels of education. Moreover, in Mexico, income was found to be the most important variable explaining ride-hailing adoption. A person with high income is 3.8 times more likely to use the service than someone with low income. The importance of income is also reflected in levels of usage in the larger cities of the region. For example, in Bogota only 21.6 percent of ride-hailing trips are made by low-income persons. Similar levels are found for Mexico City (23.8 percent) and Medellin (30.8 percent). Figure 8.8 illustrates the differences in terms of social (dis)advantage of users of different transport modes in Mexico through the distribution of education levels by transport mode, further supporting the need to account for differences in social (dis)advantages of users and non-users when studying app-based transport.

FIGURE 8.8 Distribution of Trips by Mode and Education Level in Mexico City (percent)



Source: Sabogal-Cardona et al. (2021).
Note: TNCs refer transport network companies, that is, to ride-hailing or other transport services enabled by digital platforms.

While in Bogota the advantaged ride-hailing users cluster boasts higher car ownership than other clusters, more disadvantaged ride-hailing users (see the bottom-right cluster in Figure 8.7) tend to be middle-income, younger adults who are currently studying and have less access to private vehicles, particularly cars (Oviedo, Scorcia, and Scholl 2021). In Mexico City, household car ownership was found to decrease the likelihood of adopting ride-hailing by 79 percent (Sabogal-Cardona et al. 2021). In Medellin, findings suggest that wealthy and highly educated families with low vehicle availability are more likely to use ride-hailing compared to other groups (Bedoya-Maya et al. 2021). These findings from different contexts in the region point to ride-hailing as a possible enabler of car-based mobility for car-less populations (with sufficient income).

From an equality and inclusion perspective, these findings suggest that while ride-hailing may be reinforcing the advantages of already privileged population groups in terms of social, economic, and mobility conditions, it is also serving the mobility needs of users who, although they have the education, access to information and technology, and disposable income to make use of these services, also have a more limited set of transport options available (Oviedo, Scorcia, and Scholl 2021). In other words, while social advantage seems to be a precondition for ride-hailing use, these services are addressing specific transport disadvantages for some population groups.

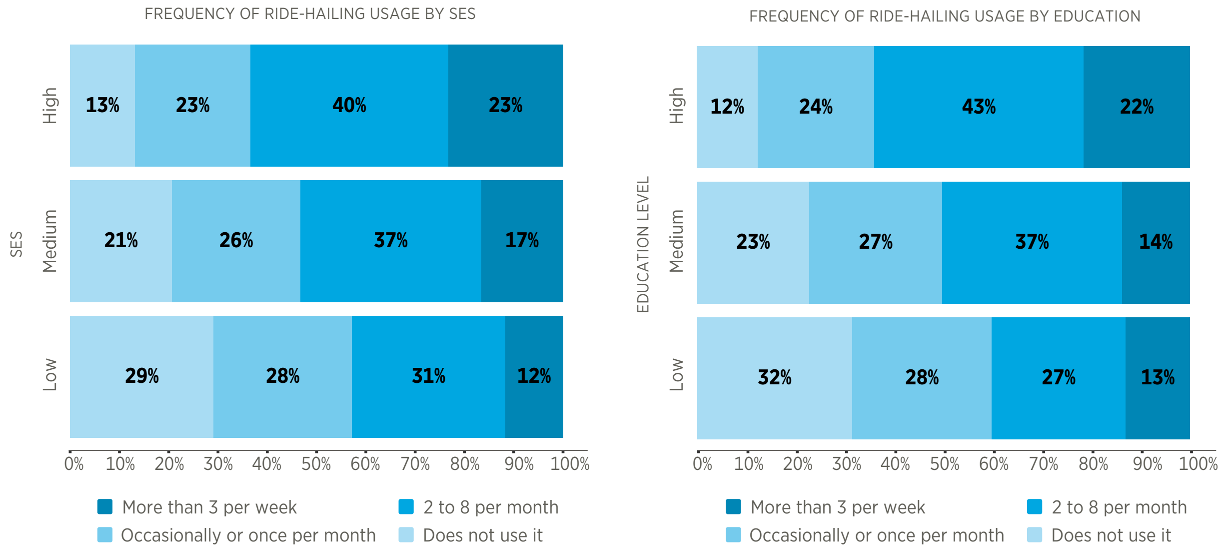
The disadvantaged ride-hailing users cluster in Figure 8.7 also reflects differences in transport advantages by gender, with more women without driving licenses and access to private vehicles using this mode. Findings from Mexico City suggest that gender has an influence on the likelihood of ride-hailing adoption, with women having a 35 percent higher likelihood than men. From a perspective of social disadvantage, this may be related to power relations and the distribution of care responsibilities in the household, which has implications for transport disadvantages to which ride-hailing could be responding (Gamble and Dávalos 2019; Levy 2013). Findings from these studies in Latin America and the Caribbean contrast with literature on cities in the Global North (Lavieri and Bhat 2019; Mitra, Bae, and Ritchie 2019; Rayle et al. 2016), which suggests that gender is not a determinant of ride-hailing demand.. For example, in the United States men were 16 percent more likely than women to adopt ride-hailing (Mitra, Bae, and Ritchie 2019). This difference constitutes one of the main particularities of the ride-hailing phenomenon in Mexico City and other cities in Latin America and the Caribbean.

Characteristics associated with social advantage, such as higher income and familiarity and engagement with technology, are more likely to correspond to increased levels of ride-hailing adoption in Mexico City, Medellin, and Bogota. It was also found that less frequent users have a greater willingness to make more trips if their purchasing power improves. The analysis of IDB survey data for over 6,000 ride-hailing users and non-users collected during 2020 found that higher socioeconomic status (SES) and educational attainment (both of which are positively correlated with income) are two of the most important predictors of frequency of use of ride-hailing services.[9] Specifically, 29 percent of people in the low SES group are not users of ride-hailing (i.e., people who never use the service), a proportion that declines to 21 percent in the medium SES group and to only 13 percent in the highest SES group (Figure 8.9). Furthermore, only 12 percent of people in the lower SES group use ride-hailing more than three times per week, while the proportion of such frequent users increases to 17 percent in the medium SES group and to 23 percent in the higher SES group. Similar patterns are observed for level of education (IDB and Steer 2020).[10]

9. Each country has a different system for socioeconomic stratification.

10. Authors' analysis based upon survey data collected by the IDB and Steer (2020) on ride-hailing users and non-users. All mentions to the reference indicate that we are referring to this data.

FIGURE 8.9 Frequency of Use of Ride-Hailing Services by Socioeconomic Status (left) and Level of Education (right) (percent)

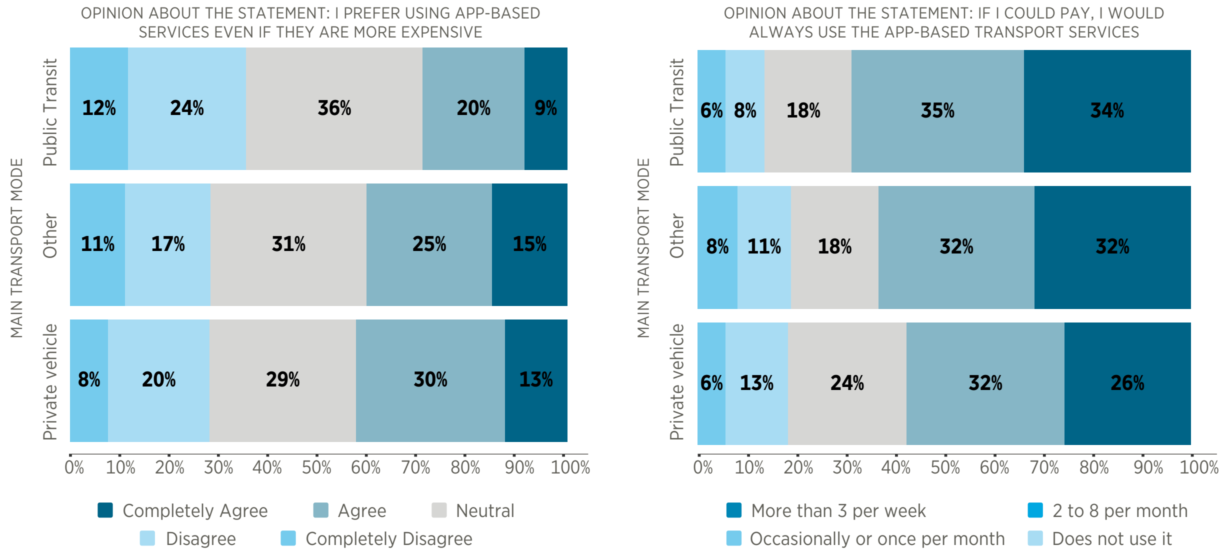


Source: Prepared by the authors based on IDB and Steer (2020).
Note SES: socioeconomic status.

Findings from the IDB survey also illustrate ride-hailing users' degrees of transport (dis)advantage in Bogota, Medellin, and Mexico City. For instance, regular public transit use appears to have no effect on the frequency of use of ride-hailing services when controlling for key demographics and perceptions. Furthermore, across the board, frequent transit users are less willing to make more ride-hailing trips in scenarios in which transport fares increase. In other words, the demand curve is less price elastic for higher and lower SES groups. Social disadvantages intersect with transport disadvantages, leading to a potential reduction of mobility, or at least preventing growth in the travel capacity of transit-dependent individuals in contexts where transport is poor or inadequate or there is a narrow set of affordable service alternatives. However, the same transit users in the survey reported that they were willing to become ride-hailing users in scenarios in which their purchasing power increased.

Those who rely on public transit as their primary mode express less willingness to pay for ride-hailing services. As can be seen in the left panel of Figure 8.10, only 29 percent of current public transit users reported that they would continue to use ride-hailing services as a complementary mode if ride-hailing fares were to increase. On the other hand, those who primarily travel in private vehicles such as autos or motorcycles tend to be less sensitive to prices (suggesting a lower price elasticity of demand for ride-hailing), with 43 percent stating that they would continue to use the services if there were a fare increase. Conversely, a substantial share of public transit respondents would be willing to switch to ride-hailing if their purchasing power were not a restriction (69 percent), which suggests that ride-hailing is also an attractive transport alternative for individuals experiencing transport disadvantage (Figure 8.10). This suggests a potential risk of losing transit ridership should income increase, transit fares increase, or transport network companies develop more affordable services.

FIGURE 8.10 Responses to the Two Variables Related to Willingness to Pay according to the Main Transport Mode People Use for Their Regular Trips (percent)



Source: Prepared by the authors based on IDB and Steer (2020)

8.3.2 Users and Non-users of Micromobility and App-based Public Transport Service (Microtransit) in Latin American Cities: Who Benefits?

While there has been increasing research on ride-hailing in the region in recent years, services such as micromobility or microtransit remain under-researched. Despite this, recent work regarding their adoption and use suggests that factors such as income, car ownership, access to adequate public transit services, and propensity to adopt technology are all likely to mediate how people benefit from or are negatively affected by other app-based transport services (see Figures 8.5 and 8.6 earlier in the chapter). For example, data from Goiana, Brazil collected by the National University of Brasilia in June 2019 found that 80 percent of riders of the new demand-responsive app-based bus service, CityBus 2.0, would have used private single-occupancy vehicles (including taxis and ride-hailing apps) (62 percent) and personal vehicles (18 percent) for trips for which they now use microtransit service. In other words, 80 percent of on-demand passengers were not using public transit for their journeys but had started doing so when an app-based on-demand option was available (Via Transit 2020). Additionally, prior use of app-based transport services appears to influence adoption.

As in the case of ride-hailing adoption, the use of microtransit and demand-responsive transit services require some technological literacy and access to digital banking, potentially presenting barriers for low-income users and suggesting that disadvantaged populations may become excluded from the use of vanpooling services, e-bicycles, or e-scooters. Moreover, less than 70 percent of homes in Latin America and the Caribbean have access to an Internet connection (OECD 2021) and only about 50 percent of the population in large cities in the region has a formal account with a financial institution (García, Grifoni, and López 2013). Among the large cities in Latin America and the Caribbean, the highest percentages of non-access to banking services are for Montevideo (55.6 percent), Lima (49.4 percent), and Medellin (44.5 percent), with percentages for other cities not much lower. On average, not having enough money (65.8 percent) is the main reason for not having a bank account.

In Montevideo, mechanisms for collecting and distributing e-scooters throughout the city as well as the lack of widespread availability of secure spaces for parking and charging suggest that most of the supply of e-scooters is concentrated in high-income neighborhoods close to the city center (i.e., areas with high social and transport advantage) (Hipogrosso and Nesmachnow 2020). Research from other regions suggests that micromobility users tend to be young, well-educated, and affluent males. For example, in Zurich (Reck and Axhausen 2021) and in the United States, e-scooter users are mostly younger, educated males, who use the service almost twice as much as women (in the case of the United States) (Krizek and McGuckin 2019). The same trend was observed in Vienna (Laa and Leth 2020), New Zealand (Curl and Fitt 2020), and France (Christoforou et al. 2021). In the Sicily region of Italy, a gender imbalance between men and women was identified regarding engagement with e-scooters, suggesting that social disadvantages such as occupation and perceived levels of safety can prevent people from using the services (Campisi et al. 2021). Research on the observed differences in the use of micromobility services suggests that these differences can be explained by gender differences in risk perceptions, trip patterns and purposes (i.e., care trips often made by women are difficult to perform reliably on an e-bicycle or e-scooter), and restrictions for changing clothing after a cycling commute. Overall, the user base for app-based transport services has been found to be generally well-educated younger adults, usually from childless households, and from middle-upper-income households in very urban environments with one or less cars and a tendency to use multimodal transit (Shaheen et al. 2020).

8.3.3 Service Providers as Beneficiaries of App-based Transport

A major dimension of social inclusion in app-based transport is its role as an enabler of employment opportunities. Ride-hailing services have positively impacted the labor market of marginalized groups in various international contexts, employing young people out of work and providing economic and social stability (Malik and Wahaj 2019). In France, it has enabled minorities and other disadvantaged groups to work (Defossez 2017). In Colombia, it has become a way to either earn extra income or an opportunity for the unemployed (Reilly and Lozano-Paredes, 2019). This creates satisfaction and induces loyalty from the drivers to transport network companies (Malik and Wahaj 2019). Beyond drivers, ride-hailing companies make fixed investments that have a positive impact in their respective countries. For example, Uber has two regional offices: an Andean, Central America, and Caribbean office in Costa Rica, and a Southern Cone office in Buenos Aires. Additionally, the firm has created excellence centers in San José and São Paulo and planned one for Bogota with a project investment of US$40 million in the next five years that is expected to create 600 new jobs by the end of 2023. This shows that ride-hailing companies are contributing to a growing economy that employs many people with various levels of skills across the region.

A survey of 5,251 Uber drivers in Brazil, Chile, Colombia, and Mexico sheds additional light on the main characteristics of ride-hailing providers in the region, Table 8.1 summarizes the main features of the Uber drivers in the study (Azuara, González, and Keller 2019). The survey reveals the reality of working with a ride-hailing application in the region, detailing both the advantages and disadvantages among drivers. It is built around questions about demographics, life before working with Uber, drivers' experiences, satisfaction with Uber, financial conditions, and drivers' health. Understanding the characteristics and conditions of drivers of ride-hailing applications from a (dis) advantage perspective adds depth to the contributions of app-based transport to the social and economic opportunities of those delivering or enabling these services. Examining ride-hailing drivers through a lens of social and transport (dis)advantages can also help inform a frequent debate surrounding these applications in the region: the definition of employment regulations (Oviedo, Pérez-Jaramillo, and Nieto 2021). To work in ride-hailing services, it is necessary to have access to a car, a valid driver's license, and the physical and cognitive skills necessary to drive the vehicle, which suggest relative levels of social and transport advantages as preconditions to engage in this economic activity.

TABLE 8.1 Main Features of Uber Drivers in Latin America

	Percent	Average	Median
Demographic Data			
Sex: Male	93.5	–	–
Age (in years)	–	37.7	36.3
Married/Cohabitating	64	–	–
Household members	–	3.6	4
10 to 12 years of education	35	–	–
Tertiary education or more	55	–	–
Internal migrant	8.3	–	–
International migrant	3.7	–	–
Time working on the platform			
Time working on the platform (hours per week)	–	–	19
Use the platform less than 10 hours per week	36	–	–
Use the platform between 10 and 30 hours per week	42	–	–
Use the platform between 30 and 50 hours per week	22	–	–
Other economic activity			
Uber drivers having a job (different from Uber)	50	–	–
Uber drivers who drive Uber as their main economic activity	25	–	–
Uber drivers who consider themselves as unemployed and looking for a job	20	–	–
Financial security of the drivers			
Hourly income of Uber drivers	–	US$11.60	–
Uber drivers who would stop driving Uber if they were offered full-time salaried work with the same income	40	–	–
Uber drivers who use also other ride-hailing application	28	–	–
Uber drivers contributing to a pension system	33	–	–
Uber drivers contributing to a healthcare system	<50	–	–
Uber drivers who own the car used to drive on the platform	50	–	–
Uber drivers who do not have household savings	53	–	–
Uber drivers who are in debt	74	–	–

Source: Prepared by the authors based on Azuara, González, and Keller (2019).

There is a marked gender gap in the industry, with female drivers accounting for a small share of Uber drivers: men account for 95 percent of drivers in Brazil, 91 percent in Chile, 94 percent in Colombia, and 94 percent in Mexico. The gender gap has also been documented in research outside Latin America and the Caribbean. In the United States data from more than 1 million Uber drivers showed a 7 percent earnings gap between women and men and suggest that there is no reason to expect that the so-called gig economy has the potential to overcome gender gaps in employment (Cook et al. 2018). On the other hand, in other contexts with more marked gender inequalities, such as Cairo, Egypt, ride-hailing services have provided women with an opportunity to work in an industry historically dominated by men (Rizk, Salem, and Weheba 2018). Motivations to work in ride-hailing include the need to supplement family income or become the household's primary source of income while maintaining the flexibility to fulfill other family obligations and meet social expectations (Rizk, Salem, and Weheba 2018).

In terms of schooling, 55 percent of drivers in the survey reported having more than 12 years of education, which suggests that most drivers are more socially advantaged than workers in unskilled labor sectors. However, using education as a proxy for social advantage (i.e., income and ability to work in well-paid employment), the findings suggest that, depending on the context, although the share of drivers with postgraduate degrees varies, it remains small. For example, 5.8 percent of drivers have postgraduate degrees in Brazil, 3 percent in Chile, 7.6 percent in Colombia, and 2.8 percent in Mexico (Azura, González, and Keller 2019). Uber drivers in the survey are mainly married or cohabitating with a partner (64 percent of the full sample) and are also often the main breadwinners of their households, which are most frequently composed of four members. Results from the survey also show that most drivers (73.5 percent) were economically active in the month before they joined the platform, which suggests that ride-hailing might be complementing regular income. This suggestion is bolstered when examining drivers' reported workload. The mean number of working hours in the Uber application was 19 hours per week, with most drivers working less than 30 hours per week (with the Uber application). The survey found that 36 percent of Uber drivers reported using the platform less than 10 hours per week and 42 percent between 10 and 30 hours a week. Only 22 percent use it more than 30 hours per week. Mexican drivers are the exception, with one-third using the platform in excess of 30 hours during the week. There are also gender disparities in this area. Women work in the Uber application 14 hours per week on average, five ours less than the overall mean (Azura, González, and Keller 2019).

Although Uber might complement income for many drivers, ride-hailing is the main source of employment for 25 percent of the drivers surveyed (Azura, González, and Keller 2019). Twenty percent of participants see themselves as unemployed and are actively looking for a job. More importantly, work through the Uber app is not enough to cover living expenses. Most drivers report facing financial struggles and lack of social security (only 50 percent make contributions to health insurance), and only one-third of the sample contributes to a pension system (Azura, González, and Keller 2019).

These circumstances put drivers in a precarious situation, evident in their non-contribution to a pension plan or maternity or sick leave, and their lack of accident/liability insurance (Reilly and Lozano-Paredes 2019). The implications of such circumstances for employment are more severe for young drivers and those close to retirement, who face more severe social disadvantages – the first group because they do not see the need to contribute to social security, and the latter group because they believe it is too late for them (Reilly and Lozano-Paredes 2019). Debates about drivers' status as independent workers have ramifications for policy and regulation and imply recognizing social vulnerability due to lack of adequate protections (Reilly and Lozano-Paredes 2019).

Other forms of app-based transport also influence employment opportunities and conditions for both advantaged and disadvantaged citizens. Microtransit improves working conditions for drivers in the traditional collective transport sector. In 2019, for example, Jetty (Mexico) won the MIT Inclusive Innovation Challenge Regional Income Growth and Job Creation Award because of its role in improving working conditions for drivers and safety and comfort for passengers (MIT Initiative on the Digital Economy 2019). Unlike traditional jitney services, Jetty incorporates aspects such as employment contracts for drivers, adequate insurance policies, comfortable vehicles, and the option to have contracts with other transport operators (Flores-Dewey 2019; Tirachini, Abouelela, and Antoniou 2020).

In shared micromobility, key functions for the operation of e-bike and e-scooter systems, such as active rebalancing and recharging of bicycles and scooters (NACTO 2019), also create employment opportunities for disadvantaged populations. This is because these activities can be performed by low-skilled labor, which can provide labor market opportunities for marginalized sectors of society. However, it is necessary to set up mechanisms to avoid poor working conditions, child labor, potentially risky nighttime shifts (Vadillo Quesada et al. 2021), and discrimination in hiring (Shaheen, Cohen, and Zohdy 2016).

Another employment opportunity related to the app-based mobility sector may be associated with the domestic production of vehicles. Although no data exist to date on possible generation of employment from manufacturing scooters and bicycles in the region, the manufacturing sector is one of the most relevant employers of low-skilled labor in Latin America and the Caribbean, employing between 8 and 13 percent of the population with 0 to 3 years of total education in Bolivia, Colombia, Guatemala, Honduras, and Nicaragua (Weller 2009). It remains to be seen if the domestic production of such vehicles could prove to be a source of high-quality formal jobs for the region.

8.4 Benefits and Barriers of App-based Transport from the Perspective of (In)equality, Inclusion, and Social Exclusion

This section discusses the benefits and barriers to accessing app-based transport services for disadvantaged groups, using the framework shown in Section 8.2. Analyzing the linkages between seven dimensions of transport-related social exclusion and service features of app-based transportation services illustrates several challenges in equitable provision of these services, including issues of coverage, affordability, safety, and discrimination, among others.

8.4.1 Spatial and Temporal Coverage Costs and Benefits: Geographic and Time-based Dimensions

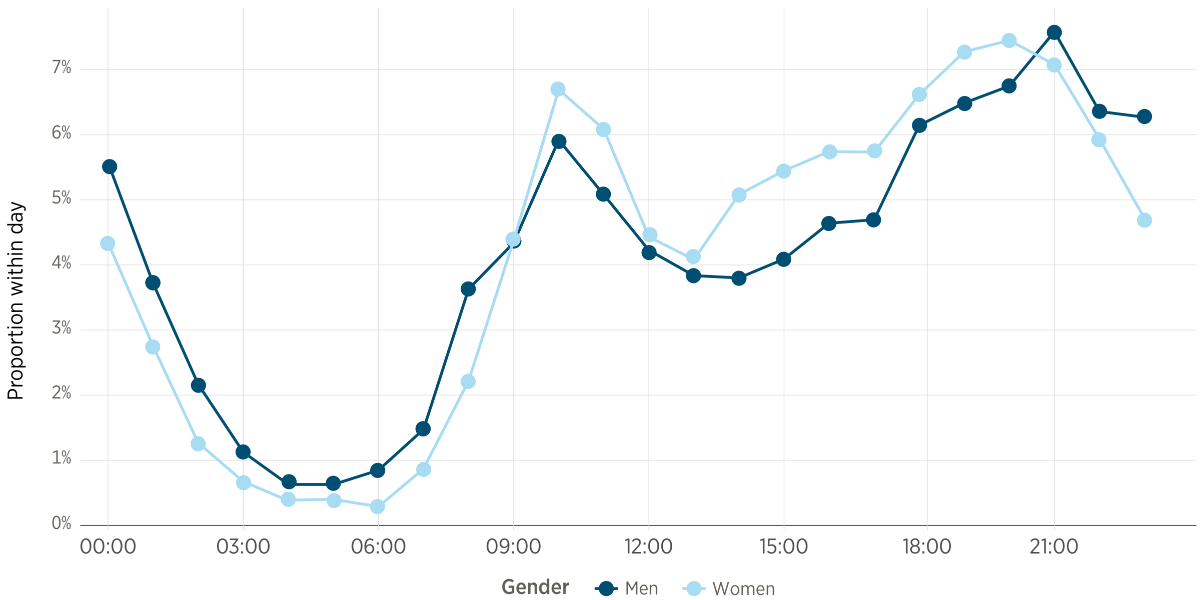
It is argued that ride-hailing services can potentially fill spatial and temporal gaps in public transit systems in poor areas and potentially increase access from outlying areas to mass transit stations. For example, in San Francisco, California ride-hailing services were found to provide trips to and from low-density areas (Rayle et al. 2016). Moreover, such services may bridge temporal gaps by providing needed service during off-peak, weekend, and nighttime hours when public transit is scarce (Khavarian-Garmsir, Sharifi, and Hossein Abadi 2021).

Coverage or service provision is largely shaped by dynamic pricing models that, through real-time variable pricing, are designed to meet the demand for rides by providing incentives for drivers in areas and times with higher demand. In other words, prices for trips increase in areas and times of high demand. While these pricing mechanisms have been found to reduce wait times and increase consumer surplus for riders by directing drivers to higher-demand areas, this implies that such services may be unaffordable to lower-income groups during these peak times, as demonstrated by the often-uneven spatial demand for ride-hailing trips within urban areas. During peak hours prices can surge by up to 200 percent of the flat/base fare in order to provide economic incentives to drivers to serve higher-density, central areas of the city with higher demand. This may leave gaps in coverage in peripheral areas and make trips unaffordable for low-income populations. Moreover, studies on mobility resilience have found that while upper-income socioeconomic groups turned to ride-hailing during transit disruptions, lower-income and minority groups were less likely to do so due to affordability barriers (Borowski et al. 2020). Drivers' responses to surge pricing can be explained party by their increase in revenue. A study by Castillo (2020) highlights that surge pricing (compared to no changes in the fare) increases gross revenue by 1.59 percent and benefits platforms and drivers (Castillo 2020).

Ride-hailing can also contribute to temporal accessibility in the afternoon and evening, serving specific travel needs that are often non-mandatory activities, and adjusting better to the needs of care-related trips and other travel purposes often needed by women. Trip data for ride-hailing users in Mexico City between October and December 2020 provided by DiDi Mexico shows most trips happen between 7:00 pm and 10:00 pm (DiDi 2021) (Figure 8.11).[11] Although patterns for men and women are similar, women make proportionally more trips in the afternoon. The boxplots in Figure 8.12 show travel time in ride-hailing services by gender in the same database. Despite some outliers with relatively long travel times (above 40 minutes), most trips are under 20 minutes (with average travel time being 18 minutes), and there are no large differences between genders. Findings in Figures 8.11 and 8.12 can be interpreted considering the advantages and disadvantages of users, who often have sufficient disposable income to engage in non-mandatory travel using more comfortable alternatives such as ride-hailing. From a perspective of inclusion, the larger share of women traveling in the evening shows that the features of this service can adapt better to their needs and perceptions. This adds to transport-related inclusion of women, as on-demand services can address travel needs at times when the family car is not available for women or at times and places when public transport is not available. While the benefits for women are limited to those with sufficient purchasing power, the evidence suggests that women benefit from the added flexibility and responsive nature of services such as ride-hailing.

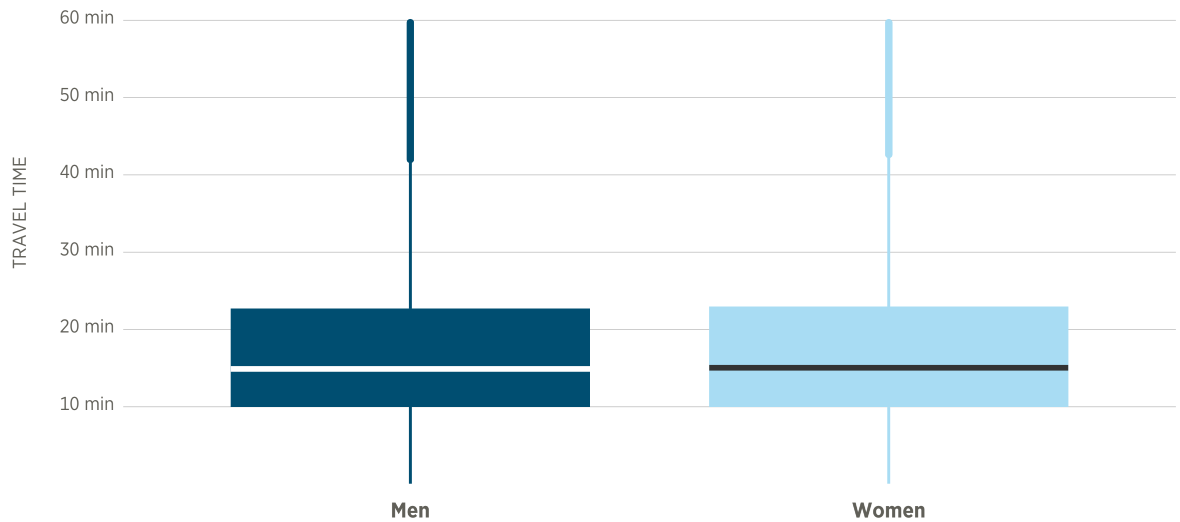
11. Data were gathered in the middle of the coronavirus pandemic before vaccines were available. Therefore, results should be considered with caution.

FIGURE 8.11 Distribution of Trips by Time of Day and Gender (percent)



Source: Prepared by the authors based on Scholl, Oviedo, and Sabogal-Cardona (2021) and DiDi (2021).

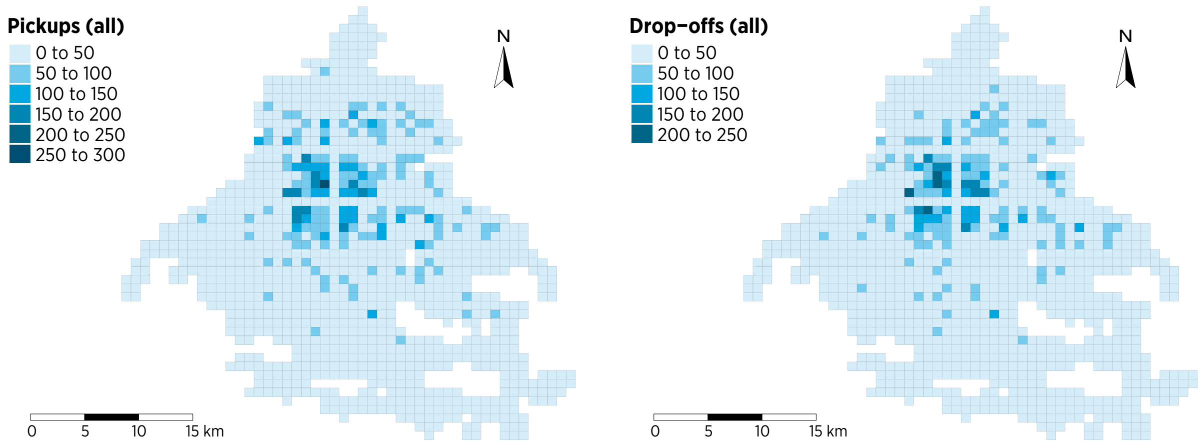
FIGURE 8.12 Travel Time Distribution of Ride-Hailing Trips by Gender



Source: Prepared by the authors based on Scholl, Oviedo, and Sabogal-Cardona (2021) and DiDi (2021).

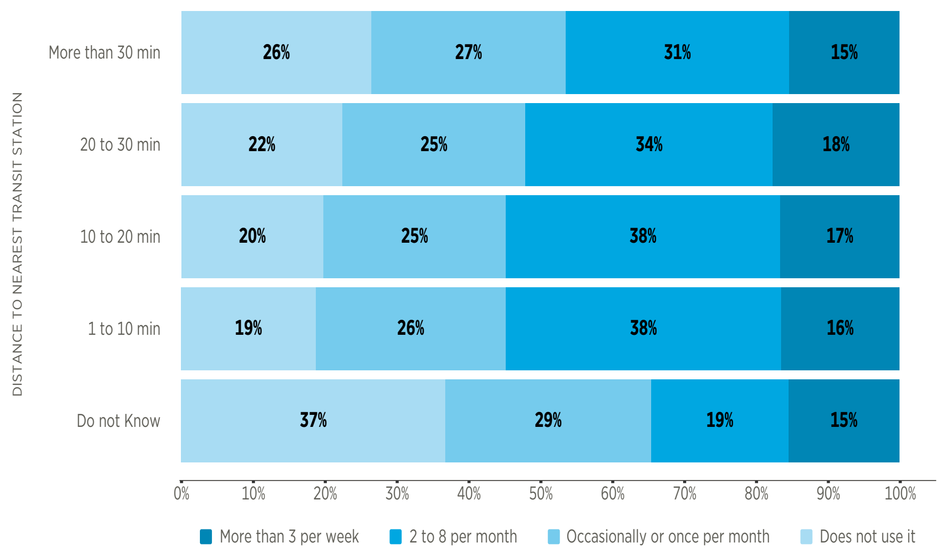
As shown in Figure 8.13, ride-hailing trips are concentrated in the central area of Mexico City, which is also the hub of employment and economic activity. Analysis of Uber data in the context of Bogota, Colombia suggests that the potential for transfers from public transit towards ride-hailing is higher in areas already within coverage of public transit in middle-income and wealthy neighborhoods (Oviedo, Granada, and Perez-Jaramillo 2020). People who do not know how far away they live from the nearest transit station are proportionally the group that least engages with ride-hailing (37 percent do not use the service) (Figure 8.14) (IDB and Steer 2020). This variable can be interpreted as a proxy for users unfamiliar with transit or infrequent users, which suggests that they have other choices against which ride-hailing is not a competitive alternative. Moreover, Figure 8.14 supports findings from Bogota suggesting that being closer to transit stations might be associated with more use of ride-hailing. For example, 81 percent of people living within a 10-minute threshold to the nearest transit station said they use the service. The percentage decreases to 78 percent for people living within 20 to 30 minutes and to 74 percent for people living more than 30 minutes away. Considering that adequate access to public transit is a form of transport advantage, the provision of ride-hailing may be bridging spatial and transport-supply-related disadvantages for users with sufficient purchasing power.

FIGURE 8.13 Numbers of Drop-offs and Pickups of Ride-Hailing Trips (All Genders) in Mexico City



Source: Prepared by the authors based on Scholl, Oviedo, and Sabogal-Cardona (2021) and DiDi (2021).

FIGURE 8.14 **Frequency of Ride-Hailing Trips and Walking Distance to Nearest Transit Station**



Source: Prepared by the authors based on IDB and Steer (2020).

Micromobility systems have been found to focus on high-demand areas due to the need for increased profitability, leaving out people and areas that might already be excluded (Deka 2018; Qian and Niemeier 2019). Dockless e-scooters and bicycles tend to be picked up from and be supplied more in high-demand areas. For instance, research reviewing nine bikeshare systems in Europe and the United States (Médard de Chardon 2019) shows that rebalancing of the systems is often influenced by contrasting goals (maximizing utility versus enabling trips throughout the city) and that bikeshare stations located close to transit stations are more balanced than those located further away from public transit. If not adequately rebalanced, micromobility vehicles might be less available for some lower-income neighborhoods. In Latin American cities, given high levels of social and spatial segregation, highly attractive areas tend also to be wealthier, as observed in cities like Bogota, Mexico, Santiago de Chile, and Buenos Aires (Blanco and Apaolaza 2018; Oviedo 2021). This concentration of demand with higher purchasing power tends to be targeted at implementing micromobility schemes such as shared e-scooters and e-bikes, which also have higher fares than other services. These strategies carry an implicit risk of spatial exclusion as they can add to the connectivity gap between richer and poorer neighborhoods.

Similarly, absent government partnerships or regulations mandating full coverage of disadvantaged areas, microtransit companies may provide more coverage where it is profitable for drivers, coinciding with higher-demand sectors (which are higher-income areas). Supply patterns might therefore lead to inequalities in access to services that are still left with no regulation in many contexts in Latin America and the Caribbean. It is important to differentiate between docked and dockless systems in the case of bicycles, and free-floating and enforced parking systems in the case of scooters. Although free-floating systems require less infrastructure and are easier to implement, the distribution of the vehicles during the day is left to users. In the case of station- or hub-based systems, their initial distribution determines the origin and locations of the trips, thus filtering which geographic areas will take advantage of the system. Including minority and low-income neighborhoods in service areas and actively rebalancing equipment to ensure service availability can help overcome service availability concerns (Shaheen and Cohen 2019).

App-based collective transport has the potential to either complement or compete with public transit (Hall, Palsson, and Price 2018; Rissanen 2016), as well as to enhance equity by providing mobility for socially excluded groups (Brown 2019). For short trips, for example, walking and cycling could be replaced by microtransit (app-based collective transit) or micromobility (app-based scooters and electric bikesharing systems). Although these services may have the effect of reducing active transport, they can save time and alleviate time poverty for lower-income groups, particularly for people who rely on walking as a primary mode of transit. However, research to date is limited and has resulted in contradictory findings, suggesting that the effect of microtransit on the poor depends on contextual factors such as the quality of transport infrastructure, availability of public transit systems, and the way microtransit systems are implemented (Alonso-González et al. 2018).

Upgrades to transit vehicles, payment systems, routing, and attention to customer service, micro-transit, and app-based commuter shuttles appear to improve public transit quality in some cities and, in so doing, may even increase ridership. For example, a study of microtransit services in Mexico City found that a central factor in their success was the lack of availability of high-quality and reliable public transit. Service improvements included seamless access to information about timetables and frequencies, the ability to reserve seats, a cleaner and modern fleet, and comfortable vehicles. Ease of connectivity with mass transit facilitates the ability of microtransit services to improve temporal and spatial access. These services emerge as a response to informal public transit or jitneys in Mexico City (which account for 11.5 million trips every day) and seek to integrate with the Bus Rapid Transit and subway systems, which account for 1.1 million and 4.5 riders million per day, respectively (Flores-Dewey 2019). According to Urbvan, a microtransit operator in Mexico, 52 percent of users have stopped using the car and 38 percent of passengers use it as a last-mile solution. The company also argues that customers prefer its service over traditional transit despite higher costs because its vans offer a better experience with more comfortable trips (Wi-Fi and air conditioning are included) and shorter travel times.

8.4.2 Affordability Barriers and Enablers: The Economic Dimension

Recent research has shown that through the application of ICT in widely available smartphones and apps, ride-hailing is able to more cost-effectively provide services compared to traditional taxi services (Oviedo, Perez Jaramillo, and Nieto 2021). For example, a U.S.-based survey found that a 68 percent of ride-hailing users agree that these services are less expensive than taking a taxi (Smith 2016). Nevertheless, relative to other transit modes, ride-hailing prices can be inaccessible for some groups.

In Bogota, transport network companies have adapted their offer of services to respond to different market segments, although mainly high and middle-income groups. On the one hand, ride-hailing platforms have maintained a middle-range service aimed at more affluent populations. On the other, they have begun to implement strategies to reach market segments with lower purchasing power by offering differentiated services and prices (Oviedo, Scorcia, and Scholl 2021). Some of these strategies involve offering discounts during non-peak hours, creating "basic" service lines that drivers with older vehicles can provide, and making other modifications in the service features that can make the trip cheaper for the user, such as sharing trips with other passengers (ride splitting or pooling) (de Souza Silva, de Andrade, and Alves Maia 2018).

The only documented case of a ride-hailing service targeting lower-income users as its core demand segment was the Bogota company Picap (Oviedo, Scorcia, and Scholl 2021). Picap was a motorcycle-based ride-hailing service that, due to lower operational and capital costs of motorcycles relative to automobiles, offered a flat fare that was as low as 70 percent of the basic fare of other car-based ride-hailing competitors. Picap took advantage of the flexibility of motorcycles to navigate congestion and provide an attractive alternative in terms of travel time in areas underserved by public transit, mostly low-income neighborhoods. However, the company faced significant pushback from the local administration due to pronounced road safety risks associated with the services and a national government policy in Colombia that public transport should not be provided using motorcycles. This led to government sanctions on the company, which has now moved to delivery services. The emergence of lower-cost service alternatives for app-based transport can contribute to attracting more demand from socially disadvantaged and transport-disadvantaged segments of the population

Affordability challenges aside, there may be positive externalities related to traffic safety issues and crime that are not currently accounted for as a result of app-based transport services. For example, a study in Brazil concluded that the introduction of Uber caused a reduction of traffic fatalities and hospitalizations (Barreto, Silveiro Neto and Carazza 2021). A similar study in Chile concluded that the entry of Uber reduced drunk-driving accidents and deaths (Lagos, Muñoz, and Zulehner 2019).

Despite efforts by transport network companies to reduce prices for users, and despite the positive effects of market competition regarding lower fares, the predominant share of the population using these services continues to be higher-income groups that either voluntarily or circumstantially do not use their car. Although transport network companies have offered discounts for users at specific times to encourage people from lower-income neighborhoods to use the service, surveyed drivers in Bogota said they prefer to switch between apps and avoid discounted trips to maximize their revenue and, as a consequence, these discounts might not reach low-income populations. For example, in Costa Rica, almost a third of the population uses the service between two and five times a week to commute, go out at night, visit family and friends, or go to the doctor, or they use it on the day they cannot use their own vehicle because of circulation restrictions (Oviedo, Pérez-Jaramillo and Nieto 2021). A small but considerable share of commuters is willing to stop using private vehicles and switch to an integrated system (transit plus ride-hailing) with relatively low fare increases. The same applies to current transit users. Using data from IDB and Steer (2020), it can be estimated that if ride-hailing costs are reduced by 25 percent and integrated into massive transit systems, transit ridership could increase by 0.9 percent in Bogota, 1.4 percent in Medellin, and 0.5 percent in Mexico City. Regular transit users have lower rates of ride-hailing usage than regular private vehicle commuters. The survey by IDB and Steer (2020) shows that 14.9 percent of regular car users versus 24.4 percent of regular public transit users have never used ride-hailing services. Moreover, 42 percent of car users take more than one ride-hailing trip per week compared to just 34 percent of transit users. Also, transit users are not willing to keep using ride-hailing if prices increase, though they are willing to make more ride-hailing trips if their financial capacity improves. Although this is expressed in terms of the primary mode of transport of respondents, there is a strong correlation with income, with private car users coming largely from higher-income groups and transit users coming primarily from middle- and low-income groups. A similar problem could arise for under-banked and lower-income groups, which may find the service inaccessible and unaffordable.

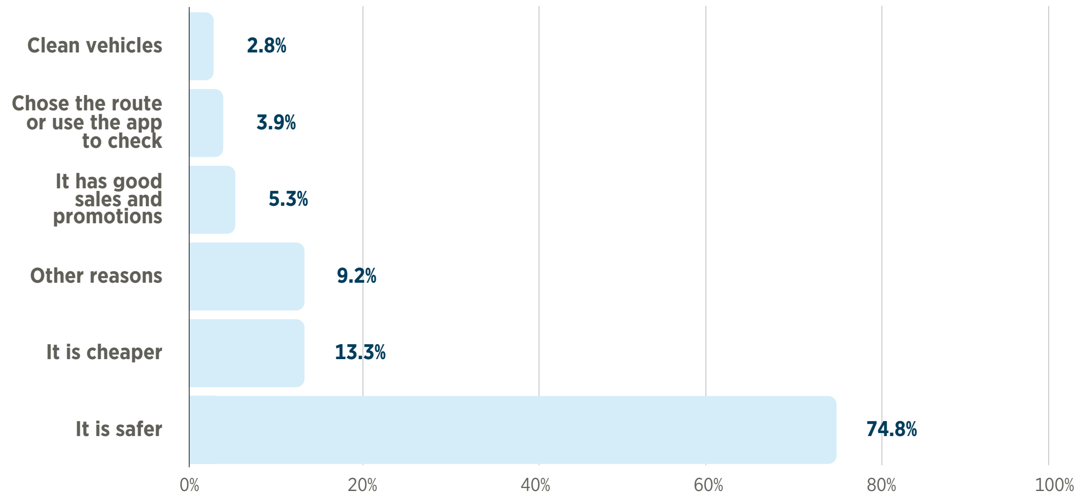
From an affordability perspective, ride-hailing users are willing to pay the higher prices compared with other services in exchange for better quality and security (Oviedo, Scorcia, and Scholl 2021). Some transit users, especially those who depend on semi-informal services such as jitneys in Mexico City, are also willing to pay a higher fare for better service. In this context, collective forms of app-based transport services such as the van pooling companies Jetty and Urbvan (microtransit) have the potential to address the needs of a larger target segment of demand than they are currently serving, as they can offer a middle range that is both cheaper than ride-hailing and appealing to transit users with more disposable income. Microtransit can also reduce the dependency on cars in areas with low transit supply by offering an attractive and comfortable choice of public transit to private vehicle users (Haglund et al. 2018).

Finally, e-scooters also may not be affordable to disadvantaged groups. For example, in Montevideo, Uruguay, the prices of e-scooters are not affordable for low-income residents, signaling a link between social disadvantage and e-scooter use (Hipogrosso and Nesmachnow 2020). However, shared micromobility potentially could contribute to reduce costs of shorter trips for users of private transit modes (Oviedo and Sabogal-Cardona 2022) and other car-based services such as ride-hailing. Shared micromobility also has the potential to improve last-mile affordability for public transit if adequately integrated in terms of the fare.

8.4.3 Crime, Gender, Safety, and Security: The Fear Dimension

As was shown in Figure 8.6, two of the main factors that can influence people's mobility and access to opportunities are insecurity and fear of crime. Both are salient factors determining transit mode choice and travel behavior, and they have even higher relevance in the context of mobility in Latin American and Caribbean cities. Fear of crime and sexual violence and abuse can mediate the adoption of on-demand service by specific users, under specific temporal or spatial conditions (e.g., late at night or in certain areas with high crime levels), and for specific trip purposes. In Peru, for example, safety is the most frequent reason people reported using ride-hailing services in 2016 (74.8 percent) (Figure 8.15).

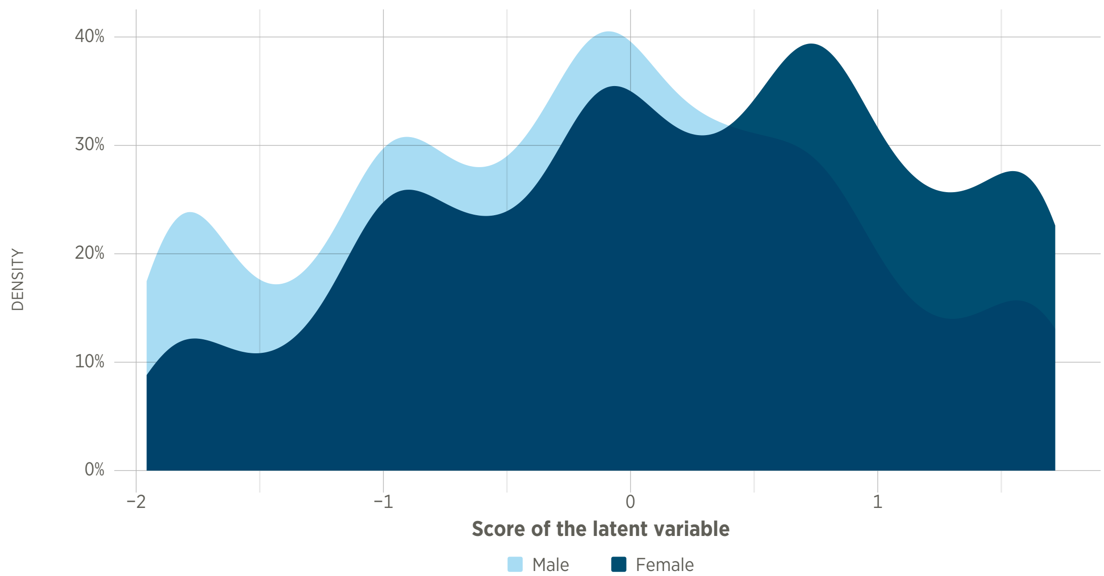
FIGURE 8.15 Reasons Why People Chose to Use Ride-Hailing Services in Lima, Peru, 2016 (Percent)



Source: Prepared by the authors based on information from the Compañía Peruana de Investigación de Mercados.

Research in Mexico City, Medellin, and Bogota found that, controlling for other factors, high levels of perceived vulnerability on public transit (i.e., feeling fear or insecure while using public transit) are strongly associated with more ride-hailing use and higher willingness to pay for ride-hailing services. Women in these cities reported experiencing more vulnerability on public transit (Figure 8.16). Moreover, they are more likely to adopt ride-hailing due to heightened perceptions of insecurity on public transit. The results also indicate that there is an association between the willingness to walk to the nearest transit station to start a trip and feeling less vulnerability (when compared to not being willing to walk), and that living further away from transit stations leads to experiencing more vulnerability. These findings are also relevant for app-based transport services such as shared micromobility, which can improve the speed and sense of security perceived while accessing public transit, both on routes that are perceived as unsafe, and at times often associated with higher incidence of crime.

FIGURE 8.16 Distribution of the Latent Variable Vulnerability on Public Transit by Gender (Percent)



Source: Prepared by the authors based on IDB and Steer (2020).

Personal security in ride-hailing influences frequency of use, leading some users to use ride-hailing more and to continue using the service even if prices rise (IDB and Steer 2020). Data from surveys of DiDi users in November 2020 in Mexico City explored general perceptions of fear of crime, security features associated with ride-hailing, and the different strategies used to feel safer when traveling in ride-hailing services. The findings support the relevance of fear of crime for the use of app-based transport services. More information helps to uncover and discourage unwanted behavior on the user and driver side. The additional information included in ride-hailing apps discourages drivers from charging more, taking longer/unexpected routes, or even demonstrating inappropriate behavior towards passengers (Aarhaug and Olsen 2018). Results show that women are moderately more likely than men to value information available on ride-hailing trips that could improve personal security (e.g., knowing your location, pick-up time) and on the presence of a panic button in the app. More interestingly, being a woman reduces by 65.1 percent the likelihood of pooling (travelling with unknown people to feel safer), increases by 2.14 times the odds of sharing trip details from the app as a strategy to improve personal security, and is negatively associated (80.5 percent) with cancelling service due to the characteristics of the vehicle (Scholl, Oviedo, and Sabogal-Cardona 2021). Furthermore, as shown in Scholl, Oviedo, and Sabogal-Cardona (2021), all else being equal, women are 64.4 percent less likely to use pooling services than men but are 2.14 times more likely to share the details of their ride-hailing trips using their phones.

From a perspective of personal security, microtransit can play a role similar to that played by ride-hailing. Microtransit's service features such as real-time location and virtual booking have the potential to improve perceptions of safety among users. More reliable service schedules and higher-quality stops than in traditional transit are likely to reinforce these perceptions, particularly in cities with high levels of crime and perceived vulnerability on public transit, such as Mexico City, as shown earlier. Considering the willingness of users, and particularly women, to trade off higher costs for better perceived levels of security (Scholl, Oviedo, and Sabogal-Cardona 2021), microtransit can provide an affordable alternative for users who do not the necessary purchasing power to make regular use of ride-hailing, but who feel vulnerable using traditional transit services.

Going back to ride-hailing, interviews from Bogota also reveal that while users may use ride-hailing due to perceived improvements in their personal security compared to walking or transit in some contexts, relatively lower protections for drivers may lead to a perception of lowered security or more vulnerability compared to riders. A participant from a transport network company added that given the available mechanisms to protect users, "the most vulnerable actor in the provision of ride-hailing services is the driver." This is because drivers are required to pass background checks before being allowed to work for ride-hailing companies, while users have lower entry barriers and of course are not required to undergo background checks in order to use the service. Over time, transport network companies have implemented prevention and reaction mechanisms for both drivers and users aimed at improving safety and reducing vulnerability to crime and sexual harassment. However, these remain focused on user safety. Examples include in-app panic buttons, real-time location tracing, identity filters (drivers), driver information access (users), 24/7 support, route tracing (drivers) and route sharing (users) (Oviedo, Scorcia, and Scholl 2021).

Drivers in Bogota believe they face high risks of becoming victims of crime, a perception that is higher among women drivers who feel more vulnerable than their male counterparts (Oviedo, Scorcia, and Scholl 2021). To further the sense of security and create some sort of community, drivers use other applications such as WhatsApp or Facebook to share locations and be able to ask for help from other drivers (Oviedo, Scorcia, and Scholl 2021; Rizk, Salem, and Weheba 2018). In Bogota, drivers have also created support groups using applications such as WhatsApp and Zello (Walkie-Talkie), through which they send alerts to groups when they perceive themselves as being in a vulnerable situation, either in terms of crime or abuse. The groups also act as a first response when there is an incident (Oviedo, Scorcia, and Scholl 2021). While such groups are formed by both men and women who have had similar experiences and are looking for support and advice, for women the groups are essential to ensure their physical safety. Women drivers perceive these groups are critical for their safety, as they believe concerns about user safety from ride-hailing companies have put them at a disadvantage in this dimension (Rizk, Salem, and Weheba 2018).

8.4.4 Discriminatory and Spatial Dimensions

The space dimension of social exclusion in app-based transport is associated with restricted spaces and opportunities not accessible due to discrimination against people with specific social identities (i.e., gender, ethnicity, age, etc.). It is possible to understand how the design of app-based transport services can either prevent or open spaces for the inclusion or exclusion of specific individuals. Technology enables the exchange of more information between parties involved in the delivery of the service, which improves agent decision-making as well as resource allocation. While in principle this is a positive contribution of technology to improving the service, it also leaves room for autonomy in decision-making that can lead to discrimination. For example, the collection of decentralized information from clients enables a "reputation" system that creates a form of accountability both for passengers and drivers, and both parties can access specific information about the other to address security concerns. However, this can also lead to users preemptively rejecting specific drivers because of their characteristics or those of their vehicle, and to drivers refusing to provide the service to specific users.

Interviews with stakeholders such as government officials, ride-hailing companies, drivers, and civil society organizations in Bogota suggests that there are various forms of discrimination that can occur in ride-hailing environments in the Latin American context. Findings from interviews are consistent with documented accounts in local media. For instance, drivers in Colombia report discriminatory practices against riders who are Venezuelan immigrants due to perceptions of their associations with crime. Although interviewees explained at length that this is not related with xenophobia, but rather a common association based on rumors and some drivers' personal experiences, the result is that immigrants are occasionally denied ride-hailing services due to discrimination (Oviedo, Scorcia, and Scholl 2021).

Other forms of app-based transport can exclude residents by not allocating sufficient supply to specific areas of the city. This is the case for shared micromobility. Depending on local regulations, those deciding on the distribution of supply may decide not to allocate vehicles to areas with low-income populations, high crime rates, or lower demand. In microtransit, both drivers and users can discriminate. Given the positioning of new microtransit as a "premium" public transit service, its provision may also be targeted towards areas frequented by individuals with higher purchasing power, making it less available for other potential users. At present, there are no studies in the Latin American and Caribbean context concerning discrimination in ride-hailing or microtransit. However, it is necessary to explore whether there have been instances of discrimination, intended or unintended, in emerging microtransit and micromobility services in the region.

8.4.5 The Elderly and Disabled: The Physical Dimension

App-based transport services can have either positive or negative effects in enabling independent mobility for people with physical and cognitive impairments and the elderly. Independence is a critical area where research has found positive effects of ride-hailing services on physical exclusion. People with visual impairments perceive higher degrees of autonomy, control, and self-reliance in ride-hailing services. These perceptions are associated with the ability to book, pay, and track their routes through an app, allowing them to take a taxi by themselves (Kameswaran et al. 2018). Self-reliance is another reason users with disabilities may prefer ride-hailing services, since using them does not require assistance from family, friends, or strangers. Users with disabilities perceive it as acceptable to ask for help from drivers, since this is part of the driver's job (Kameswaran et al. 2018).

In Latin America, interviews with ride-hailing suppliers revealed that transport network companies do not have mechanisms that target or protect users with disabilities or the elderly. However, from the perspective of ride-hailing companies, the diversity of services they provide responds to different needs by offering to users a selection of different vehicles and options for shared trips (Oviedo, Scorcia, and Scholl 2021). An interviewee from a transport network company argued "there are no requirements for universal accessibility in the platform…[T]his is the responsibility of the regulator." This suggests that although transport network companies have made efforts to diversify their services, they have not yet explicitly extended them to populations at risk of physical exclusion. The same interviews suggest that ride-hailing drivers informally engage in some practices to support these users, but this is not standardized. These practices include helping users get into the vehicle, assisting with packages and enabling spaces for wheelchairs in the vehicle. However, as argued by one of the ride-hailing drivers interviewed, the willingness to do this "… depends on your moral compass," which suggests that these practices are not ubiquitous.

One additional potential positive effect of ride-hailing in this dimension in the case of Bogota is that it has provided an option for drivers with disabilities who are not allowed by law to drive taxis, as they can operate adapted vehicles with their private licenses (Oviedo, Scorcia, and Scholl 2021).

In microtransit, prebooking services, seat reservations, and dedicated stops and support staff onboard vehicles can help make trips more accommodating for users at risk of physical exclusion. However, as in the case of ride-hailing, there is no evidence of standardized practices to support these population groups, nor are there local regulations that enforce support for disabled populations where microtransit has been introduced. In some instances, on-demand vanpooling can provide exclusive services for the elderly and people with disabilities, but these often do not serve other users.

For micromobility, assisted electric vehicles such as e-scooters and e-bikes can facilitate short-distance travel for elderly users (Christoforou et al. 2021). However, users with visual impairments or physical disabilities are usually not able to make use of these services due to the implicit physical requirements to ride either bicycles or scooters. Recent developments in the Global North suggest that although companies have taken little action to make micromobility vehicles accessible to people with disabilities or the elderly, this landscape may change in the short term. Innovations in vehicle design such as adjustable height, changes in weight, and inclusion of chairs could make e-scooters more accessible in the near future. There is also scope for privately owned micromobility vehicles that can better adapt to the needs of persons with disabilities and the elderly, which requires adequate regulations and built environment conditions for their safe operation.

One of the biggest discussions regarding micromobility is about safety (International Transport Forum 2021). Elderly and other physically vulnerable users can face more negative impacts in collisions and accidents and be more prone to serious injury or death. Furthermore, recent debates about micromobility have raised awareness about the need to improve safety for both users and non-users, and to improve enforcement and regulations so that electric micromobility vehicles do not operate on sidewalks or other areas where they expose people with disabilities or vulnerable pedestrians to potential accidents (Campisi et al. 2021). Furthermore, it is necessary to provide additional street space for these modes of transit so that they do not encroach on pedestrians' right of way or endanger vulnerable users of public spaces such as the elderly, children, or people with disabilities. There is currently no indication that these considerations have been taken into account in Latin American and Caribbean cities where new micromobility services have been introduced. More policy is needed to address this dimension of transport-related social exclusion as new app-based transport services are introduced in the region.

8.4.6 Gender and Care Relations and Restrictions: The Facilities Dimension

The final dimension of the benefits and barriers of app-based transport from the perspective of (in)equality, inclusion, and social exclusion relates to services that are not adapted to the needs or abilities of specific populations. App-based transport services are often not sufficiently adapted to specific travel needs such as traveling with dependents or packages, or serving chained trips, such as those associated with mobility of care. Women tend to be more responsible than men for care trips. Evidence from the region in fact shows that woman are using ride-hailing for trips related to caring for children and the elderly, as well as chained trips, in cities like Bogota, Medellin, and Mexico City (Sabogal-Cardona et al. 2021). The distribution of ride-hailing use is relatively balanced by gender. Data from a survey of users and non-users shows that 51 percent of ride-hailing trips are made by women in Bogota, 46 percent in Medellin, and 58 percent in Mexico City (IDB and Steer

2020). Some service features offered by transport network companies are particularly helpful for women, including ease of traveling with bags and sharing trips with children and the elderly. However, these have not been standardized across platforms or promoted with this specific purpose to women and caretakers. As the use of private cars in households leans towards working males, women with the economic capacity to afford ride-hailing are increasingly seeing it as a viable option. Research in Mexico City shows that women are 35 percent more likely to use ride-hailing than men, and that if there is an elderly person in the household, women are more likely to use ride-hailing than any other transit mode, as reflected by the odds ratio of a regression model run in the study by Sabogal-Cardona et al. (2021).

Interviews from Bogota show that gender is very relevant in ride-hailing services. From the perspective of transport network companies, some ride-hailing platforms have marketing campaigns and certain incentives targeted at specific user segments such as students and single mothers, promising services better adapted to their travel needs (Oviedo, Scorcia, and Scholl 2021). However, transport network company respondents perceive that since catering to the needs of women is not included in public regulations, most practices to accommodate such needs are market driven. The case of the ride-hailing app SaraLT, which began operating in Argentina in 2019 and then later in Colombia in 2020, seeks to provide services exclusively by and for women, suggests growing recognition in the region of gender considerations in the provision of app-based transport. The company's slogan, *Juntas llegamos mas lejos* ("Together We Go Farther"), reflected interest in empowering women in the sector and better serving their needs. However, the COVID-19 pandemic set the company back and it has now halted operations.

Ride-hailing drivers interviewed suggest that women request more services for others, such as children, partners, and the elderly (Oviedo, Scorcia, and Scholl 2021). This points to the use of service features by women in novel ways to address the needs for care mobility and reduce the burden it entails for their time availability. However, it must be recognized that this is only possible in households with sufficient purchasing power.

In micromobility, emerging research suggests there are large gender gaps in e-scooter users by gender, with young adult men being the most frequent users of this mode (Campisi et al. 2021). Hypotheses as to why these patterns seem to replicate across different contexts are related to affinity for technology, risk aversion, and lack of equipment on e-scooters for women's travel needs (e.g., there is no space to travel with bags or packages). In Latin America, this is still an emerging area of research, although it is important to incorporate a gender lens into the design and provision of micromobility services if they are to address the complex mobility needs of women in the region.

8.5 Conclusions and Ways Forward

The adoption of app-based transport services in Latin American and Caribbean cities is driven by needs and motivations that are unique to the region and often in contrast with those of users of ride-hailing, micromobility, and microtransit in other world regions. Analysis of the features of app-based transport based on the dimensions of transport-related social exclusion shows where app-based transport can make significant differences in the ability of specific population groups (e.g., women, car-less populations, the elderly) to overcome barriers such as fear of crime or forms of transport disadvantage such as the limited spatial or temporal coverage of conventional transit services.

This chapter has applied a tailored framework of (dis)advantage and social exclusion applicable to different forms of app-based transport and tested three types of app-based transport currently operating to different extents in Latin America and the Caribbean. It has illustrated that the diversity of characteristics and levels of (dis)advantage of both users and non-users of app-based transport can widen existing gaps in mobility and access already experienced by different social groups. The different dimensions of social exclusion applied to app-based transport help reveal specific concerns and the ways in which ride-hailing, microtransit, and micromobility can address them, leading to specific insights about issues such as coverage, affordability, safety, and discrimination, among other relevant concerns from an equality and inclusion perspective.

The use of a transport-related social exclusion framework also helps identify unique conditions and characteristics of the operation of app-based transport in Latin American and Caribbean cities, which could spark discussion on new policies and regulations across the region. Given the wide range of local regulatory environments and policies surrounding app-based transport in different countries, it is not possible to provide specific regulation or policy recommendations for individual countries or cities. Rather, this chapter points to considerations that are more pressing in any context from an inclusion perspective.

Some of the findings from the analysis of different dimensions of (dis)advantage and social exclusion reflect the unique challenges that app-based transport services pose for addressing urban transport inequalities in Latin American and Caribbean cities. Fear of crime in public areas and when using public transit is one of the strongest factors influencing both how app-based transport services operate and how different user segments engage with them. The technology incorporated in many of these services, as identified in ride-hailing-focused research – such as knowing your location in real time, sharing details of your trips, knowing who your driver is, having the opportunity to make electronic payments, and having access to a panic button – enhances perceptions of security. This is an important aspect of women's mobility, particularly under specific travel circumstances such as late-night travel or after consuming alcohol. On-demand services are also addressing temporal and geographic dimensions of social exclusion by filling structural gaps in public transit systems and becoming a viable alternative for people with enough purchasing power to afford app-based transport-based trips. Affordability, however, remains one of the main challenges for these services. There is evidence of exclusion associated with pricing, particularly at high-demand times. The incentives and disincentives for drivers linked with higher or lower revenues for trips made at specific times of the day, or that either target or avoid specific areas, can adversely contribute to conditions of transport disadvantage.

Furthermore, app-based transport trips are often not regular work or study trips, but often serve purposes like health, mobility of care, or leisure. The occasional nature of the use of app-based transport by most users is linked with the distribution of the benefits of such services being skewed towards the higher end of the socioeconomic spectrum, while the distribution of burdens leans towards the lower end of the spectrum. Population groups that use these services remain limited to those that are educated, higher-income, and tech-savvy. In the right policy context, however, drivers and workers from all income groups can benefit from the contributions this new industry makes to both formal and informal economies. Although working as a ride-hailing driver is a form of semi-formal employment, and notwithstanding much of the regulatory debate as to whether transport network companies should treat drivers as employees, ride-hailing is a clear mechanism to produce income.

8.5.1 Policy Considerations

Shared mobility can potentially either alleviate or reinforce specific dimensions of social exclusion in urban areas across Latin America and the Caribbean. Different practices of private providers, public sector agencies, users, and non-users have been shown to have both positive and negative effects on the degree to which different dimensions of app-based transport are influenced. A thorough understanding of such practices and the incentives and disincentives that can lead to more inclusive, equitable, and sustainable behaviors associated with on-demand transport that can inform policy and regulation is a priority for transport planning research and practice in Latin America and the Caribbean. In general terms, but more so from a perspective of equality and inclusion, regulating app-based transport services to shape their evolution instead of just responding to it becomes more pressing as companies expand rapidly in the region. Ad hoc approaches, such as banning operations by one company only to spark the expansion of another, are ineffective. Promoting discussions on inclusive app-based mobility services that inform decision-making are needed. Opening spaces for more structural conversations on governance and regulation to maximize their positive effects is paramount and time-sensitive.

Two policy challenges in particular need to be addressed in Latin America and the Caribbean. On the one hand, it is necessary to reduce crime on public transit, make women feel safer, and facilitate the transition from public transport to app-based transport. As issues of sexual harassment and gender violence on public transit remain unsolved in the region, app-based transport is rapidly becoming seen as an alternative. On the other hand, it is important to explore how technology similar to that used by transport network companies can be exported and adapted to public transit so that people can commute safer. At present, most micromobility and ride-hailing customers are occasional users who make a small number of trips per month and otherwise use other transport modes for their regular commutes. However, there is concern that ride-hailing and microtransit could eventually directly compete with public transit. A limited amount of evidence suggests that there may be complementarity and substitution effects, depending on the context.

Finally, there is demand for micromobility services and other quality, on-demand, last-mile services that can be quickly summoned with a cell phone by existing users and young adopters. This suggests that a shift towards these modes is possible, and it falls to the regulators to ensure that these services are equitable and desirable. The supply of these services is often confined to attractive areas and demand segments with higher purchasing power, which opens the possibility that services such as shared electric scooters and bicycles could contribute to the exclusion of specific areas and populations. It is the role of the public sector to set clear policy stances and regulations that make supply distribution more inclusive both spatially and economically. Furthermore, leveraging these transit modes to harness new data and improve efficiency and equity beyond that guaranteed by traditional systems is well worth the research.

From an affordability perspective, people are willing to engage more in ride-hailing if their income increases. Thus, ride-hailing can increase congestion at peak hours, adversely affecting users of other modes of transport, which suggests the need for policy responses. New regulations should consider additional taxes for ride-hailing trips that were do-able by walking, cycling, or public transit (Young, Allen, and Farber 2019). That is, when travel times are comparable, then ride-hailing trips should be considered as direct competition to other (more sustainable) transport modes, in which case a tax make sense. On the other hand, services with schedules when public transit is not operating, in areas with no coverage of public transit, or in high-crime-rate areas (where walking and cycling might be considered dangerous) should not be affected by price increases associated with taxes and levies on this type of transport.

8.5.2 Need for Further Research

Ride-hailing services have been on the Latin American and Caribbean mobility landscape for almost a decade now, and in many cities, they have already consolidated market share. That is not the case for most micromobility services and certainly is not yet the case for microtransit, which is limited to Mexico and Chile and has a comparatively small market share. From a perspective of social inclusion, it is relevant to examine these services further to ensure that they provide access to key opportunities at an affordable fare and with extended geographic coverage. More pilot programs are needed to create common knowledge on how these services should be implemented and regulated, as well as how to move from a pilot to a large-scale functional system.

More research is needed to fill gaps in knowledge about users and non-users, understand the impact of shared mobility partnerships, and identify existing policy barriers to piloting and implementing equitable shared mobility services. Under the assumption of complementarity, all these services are useful for mobility and even for public transit. However, their actual impact on sustainability and inclusion depends in part on how these services interact with other transit modes. This requires further research to determine which transit modes are most effective in different circumstances.

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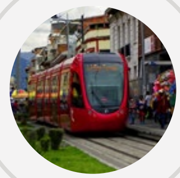
The Toll of COVID-19 on Inequality: Reshaping Transport for an Inclusive Recovery



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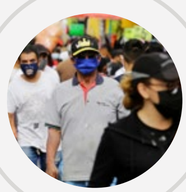

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The COVID-19 pandemic has significantly altered lives across the globe and has been characterized as one of the worse health crises the world has faced in a century (Jones, Palumbo, and Brown 2020). Since March 11, 2020, when the World Health Organization (WHO) declared the pandemic a global emergency, there have been more than 470 million cases, and over 6.25 million people have officially died from the virus[1]. More recently, WHO reports that between January 1, 2020, and December 31, 2021, nearly 15 million may have died indirectly or directly from the virus.[2] Due to measures implemented to contain the pandemic, including the closing of schools and non-essential businesses, as well as the imposition of mandatory stay-at-home orders, many people around the world have lost their jobs, seen reductions in remittances, and suffered from shortages in food and basic goods (Sanchez-Paramo 2020). At the macro level, the pandemic has slowed economic activity, halted travel and international trade, and disrupted supply chains and tourism. Additionally, it has reduced mobility and access to education and has had negative impacts on mental and physical wellbeing. The pandemic is also estimated to have pushed an unprecedented number of people into poverty, with estimates of "new poor" due to the pandemic ranging from 119 million to 124 million globally in 2020 (Lakner et al. 2021).

While the pandemic has had a widespread global impact on health, well-being, and economies, it has disproportionately impacted Latin America and the Caribbean. In particular, it has affected vulnerable and lower-income groups that are exposed to more precarious living conditions, have limited accessibility to healthcare, are more susceptible to job losses, and tend to have limited savings and access to insurance (Sanchez-Paramo 2020). In May 2020, WHO declared Latin America the epicenter of the pandemic, stating that the region accounted for approximately 40 percent of COVID-19-related deaths worldwide (OECD 2020). Vulnerable and poor populations are often more exposed to the disease and to the economic and social consequences of the pandemic. People who live in poorer neighborhoods, for example, are often less able to isolate in their homes and tend to rely on crowded and informal public transport systems where health measures to protect against the virus may be less present or enforced (Castro Furtado et al. 2020; Han et al. 2020).

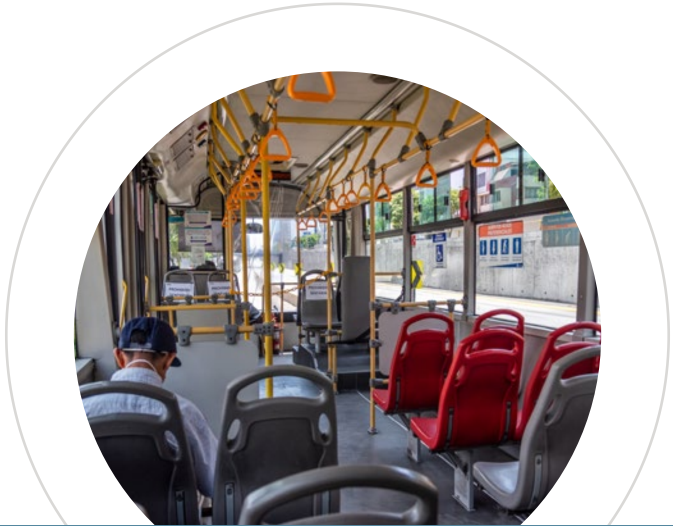
Moreover, the pandemic has disproportionately affected those living in informal settlements who lack suitable housing, running water, and adequate waste management systems, travel on over-

1. As of May 2022. See the WHO Coronavirus Dashboard, available at https://covid19.who.int/ last accessed 5/16/2022.

2. Accounting for excess deaths that may not have been reported as coronavirus cases but would not have occurred under normal circumstances. https://www.who.int/news/item/05-05-2022-14.9-million-excess-deaths-were-associated-with-the-covid-19-pandemic-in-2020-and-2021

crowded public transport, and have limited access to formal healthcare facilities (Oviedo Hernandez and Titheridge 2016). Many of these populations work in the informal sector and have continued to work outside the home or as essential workers even during lockdowns (Pinto 2020). In addition, they have often traveled under worse conditions, resulting in greater exposure to the virus both for themselves and their families (CIPPEC 2021). The impact on the poor is, therefore, multifold: they are more exposed, more vulnerable in terms of health and finances, and have less resources (Patel 2020).

Regarding the transport sector, the outbreak of the virus brought public transportation and private car trips to a near standstill in most cities around the world. Latin American and Caribbean cities have been no exception. According to Google community mobility reports, by the first week of May 2020, mobility trends for public transit stations showed declines in activity of 66 percent in Argentina, 85 percent in the Bahamas, 52 percent in Brazil, and 58 percent in Chile, and most other countries in the region had similar trends (Ritchie 2020).[3] This negatively impacted mobility for all, but particularly for lower-income and vulnerable populations that tend to continue to work outside the home even during lockdowns and pandemic-related restrictions, and that rely on public transit and walking for most trips. Lower-income groups were more likely to keep using transit even during the peaks in transmission rates and subsequent lockdowns because of their relatively higher reliance on income from jobs that require them to work in person and their more limited access to social safety nets. Upper socioeconomic groups, on the other hand, were more able to stay indoors with a secure source of income by teleworking. This was reflected in modal shifts of daily commutes and may have a long-lasting effect on urban mobility patterns. Therefore, the sustainability of traditional public transit systems will also need to be re-addressed regionally.

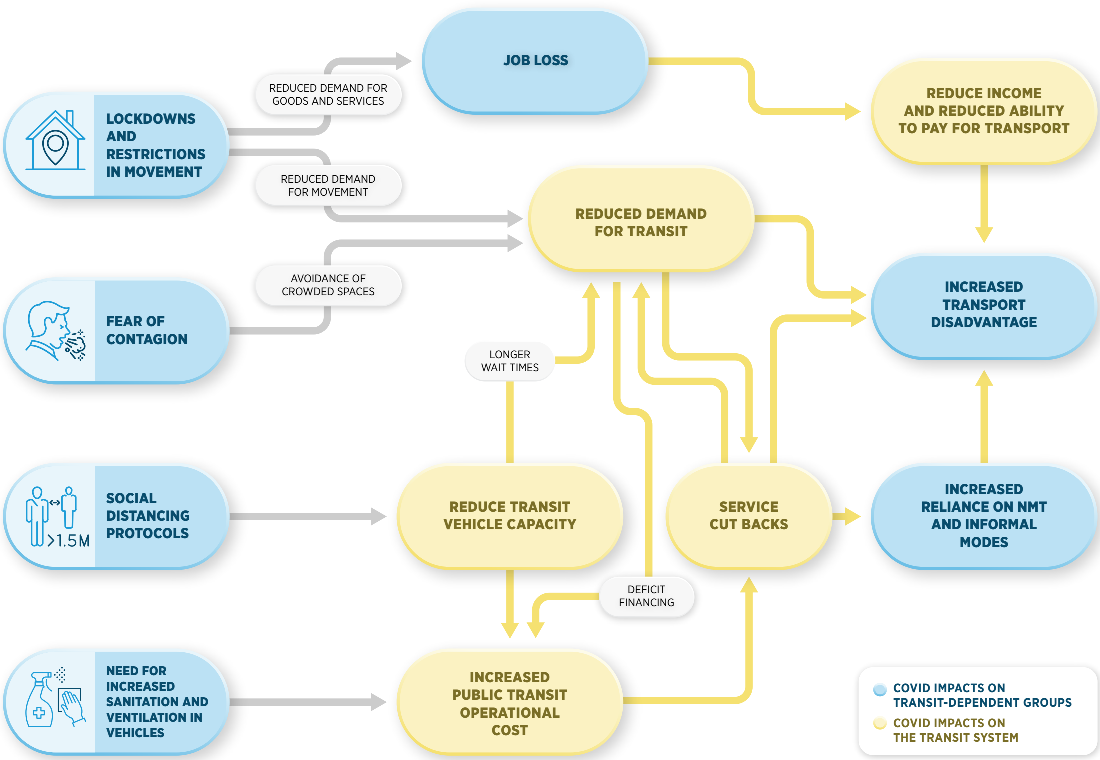


3. Similar statistics can be found at https://citymapper.com/cmi, Moovit, Apple mobility reports, etc.

9.1 Conceptual Framework for Understanding How the COVID-19 Pandemic Has Impacted Transport-related Disadvantage and Exclusion

As presented in Chapter 1, accessibility at the individual level is influenced by several interrelated factors, including (i) residential location relative to available opportunities, (ii) accessibility to and coverage of transportation systems, and (iii) socioeconomic factors such as gender, income, vehicle availability, and household size. Figure 9.1 illustrates how the pandemic affected the varying components of accessibility and transport disadvantage for the poor. On top of the unequal socioeconomic conditions that existed prior to the pandemic, these factors are expected to further increase disparities in terms of opportunities, drawing more people into disadvantage and poverty and further degrading the situation for those who were previously poor.

FIGURE 9.1 Theoretical Effects of COVID-19 on Accessibility and Social Exclusion

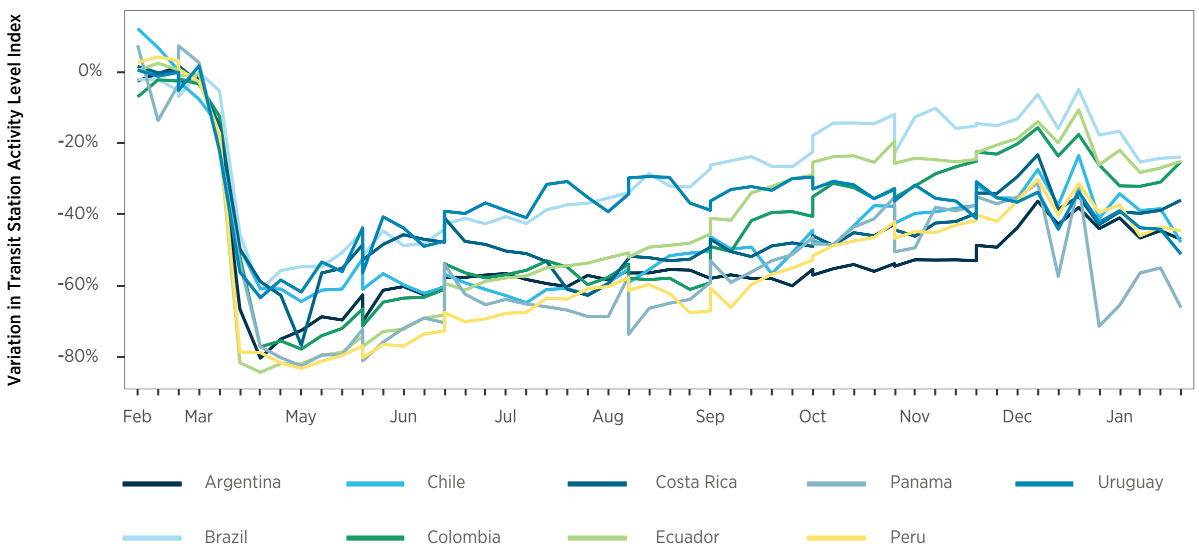


Source: Prepared by the authors.
Note: NMT: non-motorized transit.

Public transit systems are critical to providing equitable access to opportunities in the region (Vasconcellos 2015). Given that the pandemic considerably altered and restricted public transit operations in most countries, this resulted in cuts and/or elimination of public transit services for many dependent communities (Arellana, Márquez, and Cantillo 2020) and disproportionately affected lower-income, car-less, and transit-dependent populations, many of which did not have the option of teleworking (DeWeese et al. 2020).

In addition, transit ridership plummeted dramatically in response to lockdown orders and, subsequently, contracting economies (Figure 9.2), resulting in severe financial strain on transit operators that rely primarily on fare revenues to cover operational expenses. According to Medimorec et al. (2020), public transit ridership in Latin America and the Caribbean declined more (in percentage terms), and for a more prolonged period of time, than in any other region of the world. The associated decline in fare revenue has strained a system that was already characterized by underinvestment, and now poses a substantial threat to the longer-term financial sustainability of transit systems in the region.

FIGURE 9.2 Evolution of the Google Mobility Public Transit Stations Activity Index, February 2020 to 2021 (percent)



Source: Google Mobility Reports, available at https://data.humdata.org/dataset/google-mobility-report (accessed February 2021).
Note: The baseline value of the Transit Station Activity Level Index is the median for the five-week period from January 3 to February 6, 2020.

Before the pandemic, public transit systems in the region were already strained by rapid population growth and underinvestment (Yañez-Pagans et al. 2019). Overcrowding in peak hours, high levels of informality, poor service quality, and safety concerns (Cervero and Golub 2007) were among the chronic problems associated with several public transit systems in the region. In Brazil, the National Association of Urban Transportation (NTU) reported that approximately 50 out of 550 companies were expecting to close by 2017 due to financial concerns (IREE 2020). In Argentina, the bus system reported a 5 percent decline in vehicle kilometers before 2020 (LEDS-LAC 2020). While the pandemic sparked precipitous declines in public transit ridership, agencies also faced rising operational costs associated with health and safety protocols designed to minimize the risk of transit as a vector for the virus.

Given the key role of transit in enabling urban dwellers to access opportunities and thus economic development, the design and implementation of effective policies to mitigate the negative impact of the pandemic on urban mobility is salient to reducing poverty, inequality, and social exclusion and therefore in aiding the region's recovery from the pandemic.

9.2. The Pandemic Affected Mobility Unequally

Precipitous declines in ridership and the need for increased sanitary measures took a financial toll on transit operators and also reduced the supply of service coverage for transit dependent groups.

The pandemic forced most countries to take measures to slow contagion of the virus by closing schools and non-essential businesses and imposing mandatory stay-at-home orders, greatly restricting people's mobility. Moreover, fear of contracting the virus and perceptions of health safety in transport modes altered people's travel patterns and choices (Andara et al. 2021). Since countries have applied these strategies and travelers have adapted their travel strategies in response to the pandemic, understanding their impact on the urban mobility and accessibility of disadvantaged groups to transit is paramount to the design of effective policies to reduce transport-related exclusion and poverty..

9.2.1 The Explosion of Teleworking and Increased Reliance on Delivery Services – Among Those Who Are Able

The pandemic catalyzed a large shift towards teleworking among those who were able to do so. While city planners have long advocated teleworking as a measure to reduce congestion, pollution, and pressures of traffic in urban areas, the practice gained little traction until the COVID-19 pandemic quickly transformed the way in which many people work across the globe. However, given that working from home often requires specialized computer literacy, access to technology, and telecommunications quality standards that are not available equally to everyone or everywhere in Latin America and the Caribbean, a large part of the workforce lacks the means to switch to telecommuting (Hirschfeld et al. 2020).[4] Moreover, several occupations cannot reasonably be conducted via telework, particularly those that do not require using a laptop, and those that would be considered essential services. Many of these occupations tend to be concentrated in the lower-wage or informal sectors.

Delaporte, Escobar, and Pena (2021) estimate that the average share of individuals able to work from home in Latin America and the Caribbean is 12 percent, with a range from 7.5 to 15.8 percent across countries. Barbados has the highest share, and Nicaragua the lowest. The feasibility of telework is highly correlated with high-skilled jobs and clerical work. Men are also less likely than women to be able to work from home (10 vs. 15 percent). In addition, those in the top level of the income distribution (21 percent), and those working in the formal sector (18 percent) were more able to work from home.

A variety of studies in North America and Europe have shown the distinct impact of the pandemic on transit riders. Parker et al. (2021) found transit riders were more impacted in terms of trips made and distances traveled. These results were also linked to groups experiencing transport poverty and social disadvantage. Similarly, Jenelius and Cebecauer (2020)Västra Götaland and Skåne found sharp decreases in transit ridership, with migrations to bicycle and private cars. (Wilbur et al. 2020) the novel coronavirus disease COVID-19 and associated social restrictions has radically transformed ridership behavior in urban areas. Perhaps the most concerning aspect of the COVID-19 pandemic is that low-income and historically marginalized groups are not only the most susceptible to economic shifts but are also most reliant on public transportation. As revenue decreases, transit agencies are tasked with providing adequate public transportation services in an increasingly hostile economic environment. Transit agencies therefore have two primary concerns. First, how has COVID-19 impacted ridership and what is the new post-COVID normal? Second, how

4. As stated by Elisabeth Reynolds, Executive Director of the Task Force on the Work of the Future at the Massachusetts Institute of Technology, "The greatest challenge that we face regarding work is what happens to the 60 percent of workers who can't work from home."

has ridership varied spatio-temporally and between socio-economic groups? In this work we provide a data-driven analysis of COVID-19's affect on public transit operations and identify temporal variation in ridership change. We then combine spatial distributions of ridership decline with local economic data to identify variation between socio-economic groups. We find that in Nashville and Chattanooga, TN, fixed-line bus ridership dropped by 66.9% and 65.1% from 2019 baselines before stabilizing at 48.4% and 42.8% declines respectively. The largest declines were during morning and evening commute time. Additionally, there was a significant difference in ridership decline between the highest-income areas and lowest-income areas (77% vs 58% found that transit ridership declined 77 percent for higher-income sectors compared to 58 percent for lower-income sectors in Nashville in the United States, highlighting a greater dependence on such transit among this latter group. Brough, Freedman, and Phillips (2020) found that trips declined considerably less among less-educated and lower-income individuals, even after accounting for transit mode substitution and variation across neighborhoods in terms of the impact of public transit service reductions. Hu and Chen (2021) reached a similar conclusion for Chicago's metro system when looking at the most affected stations in terms of passenger volumes and the characteristics of the surrounding neighborhood.

In addition to the health crisis brought on by the pandemic, lockdowns and widespread restrictions put in place to contain it have deepened already acute conditions of poverty and deprivation in many Latin American and Caribbean countries. During the initial stages of the pandemic, low-income and socially vulnerable households and individuals suddenly found themselves in a disadvantaged position, working in occupations that did not lend themselves to telework yet unable to work outside the home or securely access goods and services without using transport modes that could increase exposure to contagion. Even in the early days of lockdowns, a large share of people was struggling economically. For example, Brodeur et al. (2021)and to synthetize the insights emerging from a very large number of studies. This survey: (i found unemployment increases, reduction of work hours, and reduction of job vacancies in terms of measures of well-being. Lesser and Nienhuis (2020) found reductions in time spent on sports activities and leisure, increases in time spent on domestic tasks, and detrimental impacts on measures of well-being.. Eidman and Arbizu (2020) found clear negative psychological and mental health impacts. Furthermore, they found that mostly middle- and upper-income respondents had the ability to comply with lockdown mandates and stay-at-home orders to reduce contagion. Income, working from home, and job retention showed positive correlations (Brodeur et al. 2021)and to synthetize the insights emerging from a very large number of studies. This survey: (i, revealing one of the most marked inequality effects of the pandemic.

To understand the early effects of the health crisis on mobility patterns and activities, researchers from the International Network for Transport and Accessibility in Low-Income Communities in Latin America and the Caribbean (INTALInC-LAC) conducted Internet-based surveys across Brazil, Colombia, Ecuador, Mexico, Paraguay, and Uruguay during the second week of April 2020.[5] The survey analysis illustrates clear inequality patterns, with people with less financial resources and education levels being more disadvantaged in terms of their mobility options because of the pandemic.

TABLE 9.1 Percentage of INTALInC-LAC Respondents Who Reported Teleworking, by Country and Income Group, 2020

Country	High	Medium	Low	Total	Total
	(Percent)				(Number)
Brazil	81.63	65.26	65.25	73.45	663
Colombia	87.44	70.44	34.73	62.35	2,863
Mexico	80.00	72.22	70.00	76.47	68
Paraguay	60.56	47.92	55.56	57.72	246
Uruguay	92.50	72.34	52.83	74.89	227
Total	81.26	69.46	40.26	64.81	4,067

Source: Survey in 2020 by the International Network for Transport and Accessibility in Low-Income Communities in Latin America and the Caribbean (INTALInC-LAC).

Using the INTALInC-LAC survey data, and based on rates of teleworking, Table 9.1 shows the percentage of survey respondents by country that report having been able to stay at home, or at least have guaranteed employment, during the quarantine restrictions. Survey respondents in Uruguay, Mexico, and Brazil had the highest rates of people teleworking at the time of the surveys (74.89 percent, 76.47 percent, and 73.45 percent on average, respectively). In contrast, only 62.35 percent and 57.72 percent of respondents in Colombia and Paraguay, respectively, said they were teleworking. The results also show patterns of inequality when analyzed by income group. Brazil, Mexico, and Paraguay have similar percentages of people per income group with access to telework, whereas Colombia and Uruguay show clear tendencies for more teleworking at higher income levels. The differences in these figures compared to the estimates by Delaporte, Escobar, and Pena (2021) may reflect an over-representation in the online survey of higher-educated populations in upper-income and formal occupations with access to the Internet.

5. Local INTALInC-LAC partners in several countries helped design the survey and disseminate it. Each questionnaire was designed to have a common general structure so that the surveys could be compared, yet each questionnaire was also tailored to the specific context. The IDB partnered with INTALInC-LAC-LAC to analyze the information.

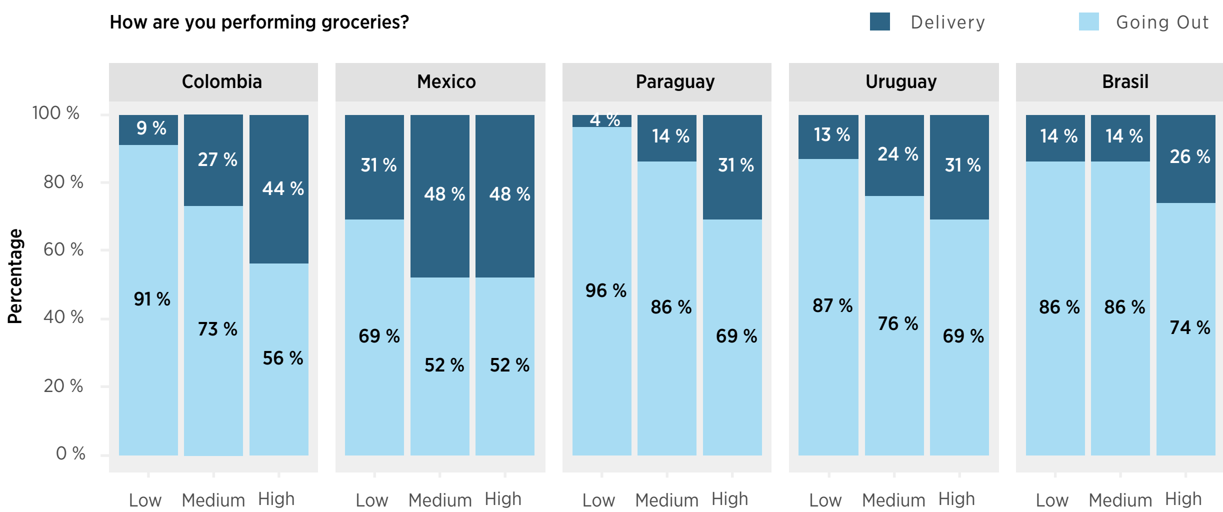
The differences between income groups among the respondents are also demonstrated in the way respondents carried out shopping activities. As shown in Figure 9.3, the share of people that continued going out to buy groceries and food is systematically above 74 percent for all the countries except Mexico (56 percent). Using delivery services, which reduces the need to go outside the home and thus may reduce the risk of exposure to the virus, requires resources and skills. Individuals must be able to use a smartphone, install applications on it, and use the application by selecting the shop and products, enter the location of the household, and track the order. Although this is a common skill among young people with a certain level of technology savviness, it might not be the case for people with less access to education and reduced exposure to technology. Moreover, using delivery service requires having access to a credit card, being able to afford an Internet connection and pay a premium for delivery, and having coverage in the domicile – requirements that are often difficult to meet in contexts of poverty.

Stark differences are observed in the frequency of delivery service usage between lower- income and wealthier respondents. Lower-income respondents were more likely to conduct shopping physically, while higher-income respondents relied more heavily on delivery services. Once again, the starkest case is Colombia, where only 9 percent of poorer respondents used home delivery services, compared to 27 percent of people in the medium-income group and 44 percent in the higher-income segment. Paraguay follows a similar pattern with 4 percent, 14 percent, and 31 percent for low-, medium-, and high-income groups, respectively, using home delivery services. In the other three countries, the spread is more balanced but clearly skewed towards more use of home delivery services by higher-income groups.[6]

Lower-income groups overall were also less likely to be able to isolate at home during the initial stages of the pandemic, increasing their exposure to the virus, particularly given that less was known at the time about effective preventive measures (masks and the role of ventilation).

6. Respondents in Bogota were asked about their social strata, while income ranges were established for the rest of the cities. Given that the survey was Internet-based, a very significant skew towards technologically literate populations exists, and urban dwellers at the lowest end of the distribution were probably less represented.

FIGURE 9.3 Who Is Using Delivery Services and Who Keeps Going to Physical Locations for Shopping? (percent)



Source: Survey in 2020 by the International Network for Transport and Accessibility in Low-Income Communities in Latin America and the Caribbean (INTALInC-LAC).
Note: A comparison across countries shows a general tendency for higher social strata to pay the extra costs of delivery services.

Latin America's trends during the pandemic exhibit similar patterns. Examining transport mode distributions across income groups points again to a gap between income groups in their ability to stay at home during lockdown phases. For each surveyed country, Figure 9.4 shows the main transport mode share for respondents' primary activity by income level. A comparison between before and during lockdowns shows the large role played by teleworking. Most commuters who switched to teleworking are those who used public transit or private cars, both modes whose shares more than halved in volume, especially among medium- and high-income groups (although private car use saw a less precipitous decline compared to transit). Active transport modes, although their initial share was lower, retained either a sizable or increased share of commuter trips.

The shift away from public transit in favor of telework is common across all groups but is more prevalent among the higher-income group. For example, among the highest-income group in the data, public transit use declined by between 11 and 38 percent, depending on the country. Use declined even more among the medium-income group, with drops ranging from 21 to 39 percent among the five countries surveyed (Table 9.2).

FIGURE 9.4 Transport Mode Shifts in Response to COVID-19: Primary Transport Mode Shares by Income Group Before and During the Pandemic (percent)

Source: Prepared by the authors based on data from the 2020 survey by the International Network for Transport and Accessibility in Low-Income Communities in Latin America and the Caribbean (INTALInC-LAC). Number = 3,999.

TABLE 9.2 Change in Transport Mode Share during the COVID-19 Pandemic Lockdown (percent change from stated pre-pandemic primary transport mode by income group)

Mode	Brazil	Colombia	Mexico	Paraguay	Uruguay
A. High-income Group					
Walk/Cycle	-5	-17	-3	-3	-15
Car	-50	-38	-38	-26	-25
Motorbike	-2	-1	0	-1	-1
Taxi	-4	-7	-8	-2	1
Public transport	-11	-18	-13	-11	-38
Other	3	-3	3	1	-3
Teleworking	70	84	58	42	81
B. Medium-income Group					
Walk/Cycle	-6	-8	12	-4	-16
Car	-22	-15	-35	-15	-12
Motorbike	-2	-2	-6	-2	0
Taxi	-1	-2	0	0	0
Public transport	-31	-39	-29	-21	-39
Other	2	-1	0	0	-1
Teleworking	59	67	59	42	68
C. Low-income Group					
Walk/Cycle	-10	-2	0	-11	-4
Car	-12	-1	-27	-17	6
Motorbike	-2	-3	0	0	4
Taxi	0	1	0	0	-2
Public transport	-51	-26	-18	-17	-48
Other	1	0	0	0	2
Teleworking	74	32	45	44	42
Total number	646	2,816	68	244	225

Source: Survey in 2020 by the International Network for Transport and Accessibility in Low-Income Communities in Latin America and the Caribbean (INTALInC-LAC).

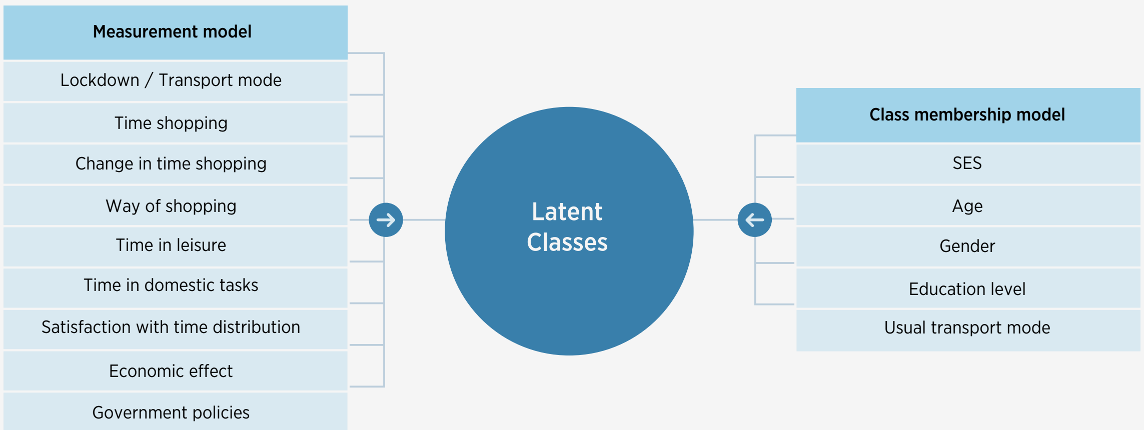
Shifts in the reported primary transport mode prior to and during the pandemic varied considerably across countries. In all cases, however, a common trend can be observed across income groups. The largest declines in transit ridership occurred in Brazil, where transit use declined sharply for all income groups, followed by Paraguay and Uruguay. In contrast, private car use in Colombia fell more than public transit, but maintained a relevant share in Paraguay and Uruguay. It is unclear to what extent these choices have been shaped by government recommendations, changes in the provision of transit services, and changes in the structure of workplaces and offices due to contagion concerns. Using the same dataset to zoom in on effects in Colombia reveals that pandemic-related restrictions on movement had negative effects on the poor and compounded existing conditions of deprivation and inequality (Box 9.1) (Guzman et al. 2021).

BOX 9.1

Mobility and Access Inequalities Stemming from COVID-19 in Urban Colombia[1]

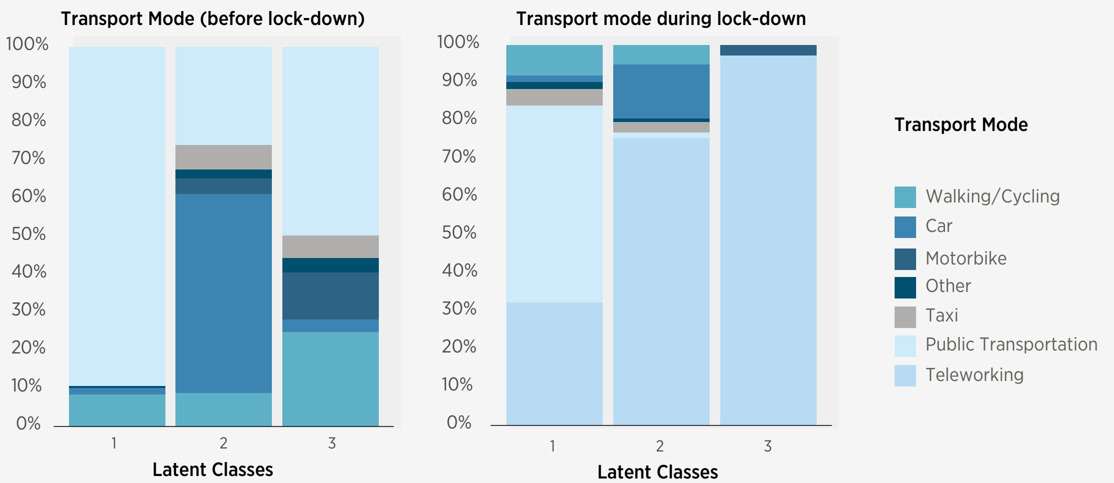
Using a dataset of 3,900 questionnaires collected via a web-based survey during the national lockdown in Colombia in April 2020, researchers at the International Network for Transport and Accessibility in Low-Income Communities in Latin America and the Caribbean (INTALInC-LAC) and the Inter-American Development Bank (IDB) used Latent Class Analysis (LTA) techniques to explore how class, gender, ethnicity, age, and other relevant socioeconomic characteristics affected the ability of individuals to adapt to the challenges posed by the COVID-19 crisis. The analysis examined the ability of survey respondents to travel and carry out everyday activities during lockdowns (Guzman et al. 2021). The analysis presents a picture of the impacts and perceptions in the early days of the lockdown, when the government mandated the strict closure of educational institutions, shops, and commercial businesses, except for essential workers and delivery services. In terms of who could telework during the lockdown, low-income respondents were the least likely to do so (35 percent). By comparison, middle- and high-income respondents reported teleworking at much higher rates, 70 percent and 87 percent, respectively (see Table 9.2 in the main text). The LCA model included two main components (Figure 9.1.1). The first, class status, predicts the probability of an individual belonging to a particular group or class, and the second, the measurement model, helps to explain the variation in activity and mobility patterns.

FIGURE 9.1.1 Latent Class Analysis Model Components



Source: Oviedo, Daniel, Luis A. Guzman, Julian Arellana, Orlando Sabogal-Cardona, Carlos Moncada, and Lynn Scholl. 2022. Cities under lockdown: mobility and access inequalities stemming from COVID-19 in urban Colombia. In Transport and Pandemic Experiencies, edited by M. Attard and C. Mulley. Emerald.
Note: The model tests and verifies the correlation between impacts on transport disadvantage and socioeconomic conditions of vulnerability. Three groups/clusters were identified: (1) lower-income public transit users who did not quarantine and had little time for leisure; (2) older (40 years+), educated car users who quarantined and had little free time; and (3) young (31.5 years on average), multi-modal "quarantiners" with more time for leisure. SES: socioeconomic status.

FIGURE 9.1.2 Transport Modes Before and During the COVID-19 Lockdown by Clusters Identified in the Latent Class Analysis Assessment Model (percent)



Source: Oviedo et al. (2022).

Findings from the LCA model highlight the ways in which forms of social advantage and disadvantage, availability of transport choices, and access to assets and resources affect the ability of individuals to adapt to the changes imposed by the lockdown (Figure 9.2.2). Despite the mandatory lockdown measures, 53 percent of those surveyed who declared traveling to carry out their main activity changed their mode of transport. Lower-income individuals dependent on public transit (respondents in Class 1) were less likely to change transport modes, as their public transport share decreased far less than the other groups, from 90 to about 50 percent. This is likely because of increased levels of transport disadvantage, fewer alternatives at their disposal, and a higher proportion of the respondents being employed in informal or unskilled occupations in this cluster. A large share of respondents in Classes 2 and 3 engaged in teleworking. The two other classes replaced public transit and cars with walking and cycling, especially in class 3, the younger, multi-modal group. This latter result is hypothesized to be a result of local government policy responses in Colombia. For example, in March and April 2020, the city of Bogota installed an additional 84 kilometers of cycle paths, and in so doing substantially reduced the available space for the circulation of motorized vehicles.2

1. This box was prepared by Orlando Sabogal, Daniel Oviedo, and Lynn Scholl.
2. See: https://bogota.gov.co/mi-ciudad/movilidad/el-uso-de-la-bicicleta-durante-la-pandemia

9.2.2 Worse Public Transit Conditions for Those Needing Public Transit the Most, and the Search for Alternatives

During the pandemic, many public transit users in the region reported experiencing a deterioration in service levels and longer travel times. A survey conducted from April 24-28, 2020 of 33,000 public transit users by the public transit app company Moovit in collaboration with the Inter-American Development Bank (IDB) provides a snapshot of both public transit usage and riders' perceptions during the pandemic (Mojica et al. 2020).

The survey was conducted in nine cities (Bogota, Buenos Aires, Mexico City, Guadalajara, Guayaquil, Montevideo, Río de Janeiro, Santiago de Chile, and São Paulo) when many lockdowns were still in place. Analysis of the survey shows that public transit usage dropped by 78 percent compared to the same week in previous years; nevertheless, of those who continued using transit, a substantial portion were lower-income persons who stated that they still used public transit despite the travel restrictions and perceptions on potential health risks (Mojica et al. 2020). More than half (57.2 percent) of the respondents reported having used public transit at least once in the week before the survey, and over 60 percent of these users came from lower-income groups (Table 9.3).

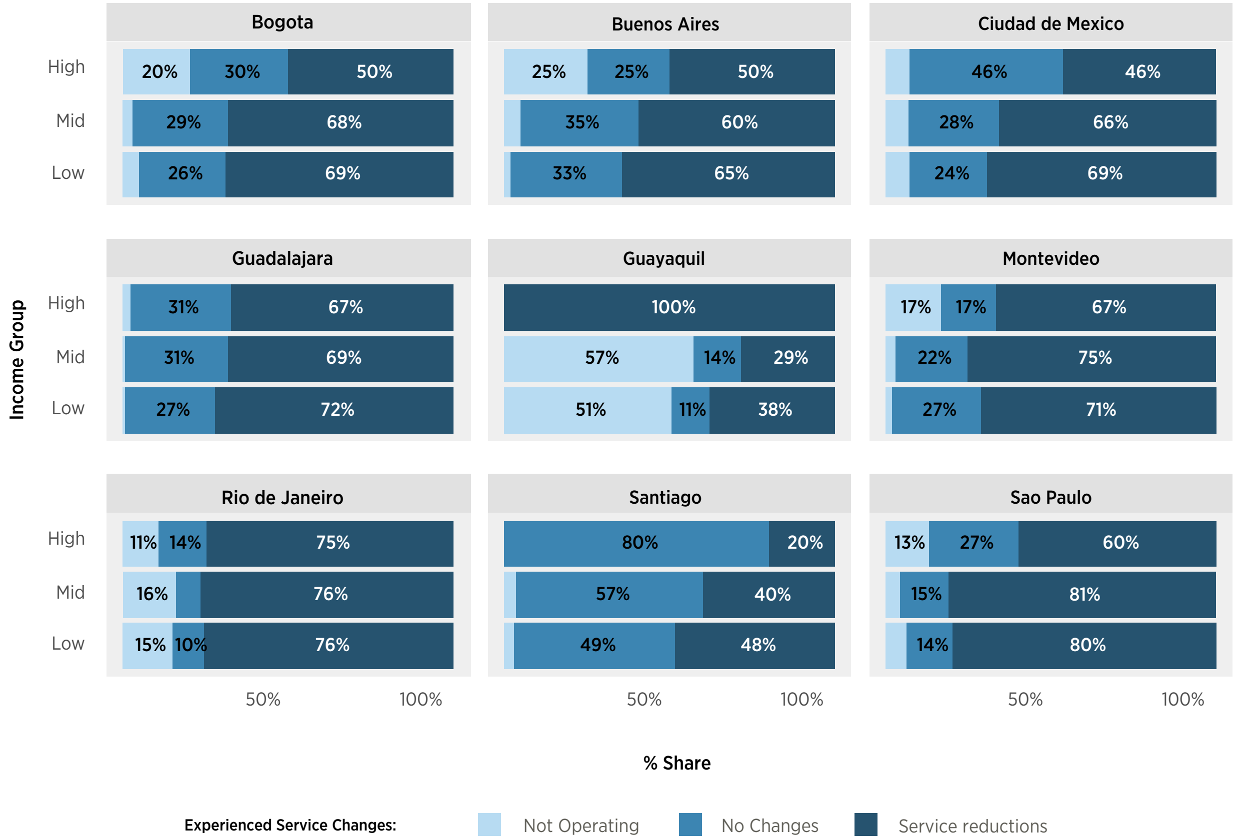
TABLE 9.3 Percentage of Respondents to the Moovit–Inter-American Development Bank Survey Declaring Having Used Public Transit in the Last Week, by City and Income Group (percent)

City	Low-income	Middle-income	High-income	Total
Bogota	45.9	25.6	8.7	36.0
Buenos Aires	56.9	50.4	21.1	55.2
Mexico City	47.2	39.0	17.2	38.1
Guadalajara	52.7	53.0	21.2	50.9
Guayaquil	13.1	11.6	12.5	12.8
Montevideo	70.8	55.3	40.0	66.9
Rio de Janeiro	75.5	54.8	26.2	71.5
Santiago de Chile	51.0	33.0	13.6	44.4
São Paulo	78.1	59.3	34.6	74.5
Total	63.9	45.7	20.6	57.2

Source: Moovit-IDB 2020 survey.

This highlights the relevance of transit in the region for lower-income groups that have continued to rely on public transit and walking as key modes of transport even during the pandemic lockdowns. However, while many public transit users have continued to rely on public transit services during the pandemic, around three-quarters have experienced a deterioration in service levels during their usual route. Over 50 percent of respondents reported some type of change or even elimination of their public transit services (Figure 9.5). Most respondents (54.2 percent on average for the entire sample) reported a decline in the frequency of service, and a very substantial proportion saw a complete cease of operations in their area, particularly in the case of Guayaquil, where 51 percent of low-income riders and 57 percent of middle-income riders reported that they saw services cut. The changes varied by country but were almost always more marked among lower-income levels.

FIGURE 9.5 Most Transit Users Saw a Decline in Transit Service Quality: Reported Changes in Experiences with Public Transit Service by Income Group (percent)



Source: Prepared by the authors based on the 2020 Moovit-IDB Survey.

Similarly, among public transit users between 2019 and 2020, Moovit (2020) reports an increase in average commute times of people with very long commutes (over two hours one way). Given that lower-income groups are more likely to continue using public transit, the pandemic appears to not only be costing these groups in terms of lost opportunities or health impacts, but also in terms of time and access via public transit. This could further erode public transit shares if commuters begin to move towards private transport modes, such as motorcycles and cars (for those who can afford them) in response to higher travel-time costs. In contrast, car commuters, who tend to have higher incomes on average, likely benefited from less congestion levels and faster commutes during the earlier stage of the pandemic and during city-wide lockdowns (Andara et al. 2021).

In the early stages of the pandemic, the IDB and IDB Invest launched the Coronavirus Impact Dashboard to track multiple indicators expected to be affected. Analysis of congestion indices generated by this tracking effort shows that the unprecedented shock of COVID-19 did not affect everyone equally (Box 9.2).

Widely regarded as a positive shift resulting from the pandemic was the unprecedented increase in bicycle trips in many regions of the world. Buehler and Pucher (2021) found an overall 8 percent average increase in cycling over 11 European Union countries, but with a much larger increase on weekends (+23 percent) than on weekdays (+3 percent). Similarly, the United States averaged 16 percent growth overall, with higher growth on weekends (+29 percent) than on weekdays (+10 percent). The number of bicycles sold during 2019–2020 also increased by almost 40 percent. This effect was replicated in Latin America: Bicycle trips increased 110 percent in Buenos Aires (CNN 2020), 80 percent in Bogota (Infobae 2021b), and 132 percent in Mexico City (Infobae 2021a) during 2019–2020. Governments had a key role in propelling this change. Buehler and Pucher (2021) found that new or expanded bike lanes and paths were built by 32 of 42 large European cities surveyed and by 102 of 200 U.S. cities surveyed, with the largest increases detected in New York (102 km), London (100 km), Montreal (88 km), and Paris (80 km). Combs and Pardo (2021) examined the variety of global measures taken to reconfigure street space previously used for private vehicles to accommodate new non-motorized mobility. As discussed in Chapter 6, kilometers of pop-up bicycle infrastructure appeared on major Latin American urban avenues to cater to increasing cycling flows. Nevertheless, this new infrastructure tends to connect higher-income regions in busy areas of high political relevance rather than peripheries and lower-income communities. To what extent low-income groups were able to benefit from this requires further research.

The use of motorcycles has also surged during the pandemic. Despite an initial drop in motorcycle sales in the region in 2020 associated with the economic shock, sales rebounded rapidly and rose to their highest levels in a decade, increasing by 36.6 percent in 2021 relative to 2020 and 10.9 percent relative to 2019 (Motorcycles Data 2021). In line with studies in other developing countries on motorcycle use during the COVID-19 pandemic (Zafri et al. 2021), this trend may be associated with a perception of lower risk of COVID-19 contagion compared to public transit and with lower cost relative to cars. Also, the augmented demand for delivery services pushed many to purchase motorcycles in order to be able to provide that service. Given the predominance of younger lower-income groups in motorcycle use (Hagen, Pardo, and Valente 2016; Estupiñan et al. 2015), the design of policies to curb the environmental and safety externalities associated with their use is more salient than before the pandemic.

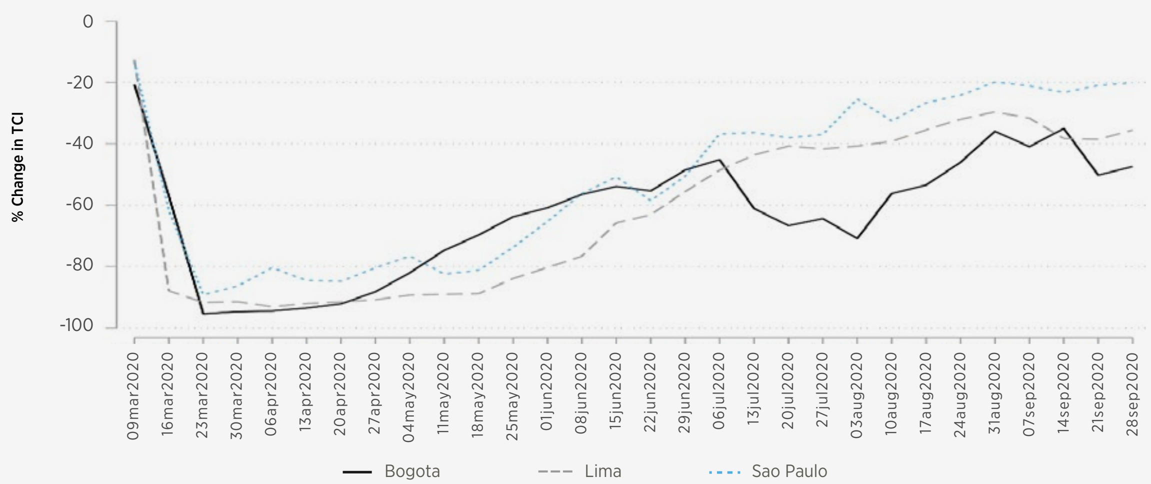
BOX 9.2

The (Unequal) Impact of COVID-19 on Traffic Congestion: The cases of Bogota, Lima, and São Paulo[1]

In the early days of the COVID-19 pandemic, the Inter-American Development Bank (IDB) and IDB Invest launched the Coronavirus Impact Dashboard to track multiple indicators expected to be affected by the crisis.2 Among the measures included in the dashboard, the Traffic Congestion Intensity (TCI) Index is constructed using aggregated high-frequency data from the community-based driving directions app Waze (IDB and IDB Invest 2020). The TCI Index is a consolidated congestion measure that captures both the extent of traffic jams in a specific area and their duration, with that information available on the dashboard for 19 countries and more than 60 metropolitan areas. After the World Health Organization (WHO) declaration of the pandemic, all cities analyzed in the dashboard experienced an immediate decrease in mobility as measured by the TCI Index, declining by more than 80 percent compared to the levels observed in the first week of March 2020 (Coronavirus Impact Dashboard Team 2020).

These patterns are presented in Figure 9.2.1 for Bogota, Lima, and São Paulo as case studies of the changes in the TCI Index in the first six months of the pandemic. Similar patterns are found using other measures of mobility (Aromi, Cristiá, and Izquierdo 2020). Moreover, as cities were slowly reopening and allowing more activities, mobility started increasing, creating a U-shaped pattern. However, the question arises whether this U-shape pattern applies to all income levels in these cities. Since a large majority of low-skill jobs are less do-able at home or by teleworking (Delaporte, Escobar, and Pena 2021; Yasenov 2020)on average, 1 worker out of 2 is able to work under the lockdown in the LAC region. We document considerable variation in the share of individuals able to work under the lockdown across countries and within countries across occupations, economic activities and specific population groups. Based on the LWA index, we then estimate individual's potential labour income losses and examine changes in poverty and labour income inequality. We find an increase in poverty and labour income inequality in the majority of the LAC countries due to social distancing. At the national level, the highest increase in the headcount poverty index is 1.4 pp and the highest increase in the Gini coefficient is 2 pp. Decomposing overall labour income inequality in the LAC region, we find that social distancing has lead to a small decrease (-0.1 pp, measuring the heterogenous effects on mobility behavior across income groups is relevant and provides evidence of exacerbating inequalities caused by the pandemic that need to be addressed.

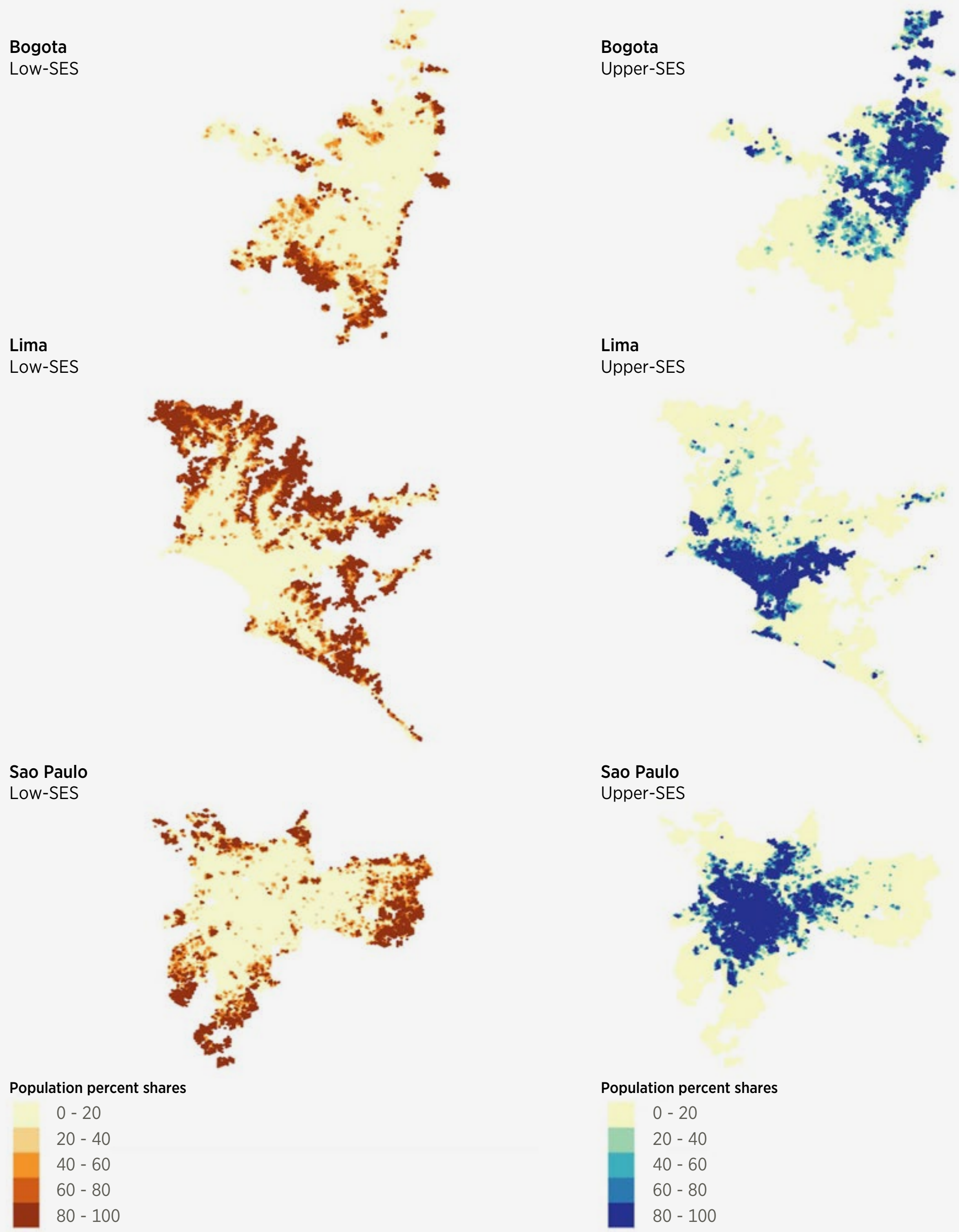
FIGURE 9.2.1 Percent Change in the Traffic Congestion Intensity Index from March to September 28, 2020



Source: IDB and IDB Invest Coronavirus Impact Dashboard.
Note: TCI: Traffic Congestion Intensity Index. The index measures both the extent and duration of congestion.

The differential impacts on mobility in the same metropolitan areas shown in Figure 9.2.2 are explored during the first six months of the pandemic by Carabetta et al. (2020)"title":"The (Un-equal. To quantify the mobility impacts of the pandemic associated with differences in socio-eeconomic status (SES), the authors use highly geographically detailed data from population censuses and machine learning to classify city blocks in the metropolitan areas of interest into three SES categories (low, middle, and upper).3 The maps on the left side of Figure 9.2.2 show the shares of the population living in various parts of the cities that are classified as low-SES, while the maps on the right show the shares of the population classified as upper-SES. While all three cities present a clear SES-based segregation pattern, with lower-SES people living on the periphery of Lima and São Paulo and mainly in the south region of Bogota, the intensity of segregation varies between cities. For example, in Bogota, there are areas with considerable shares of upper-SES persons relatively close to regions characterized by a low-SES population, a pattern that is less clear in the other two cities.

FIGURE 9.2.2 **Population Segregation by Socioeconomic Status Levels in Bogota, Lima, and São Paulo**

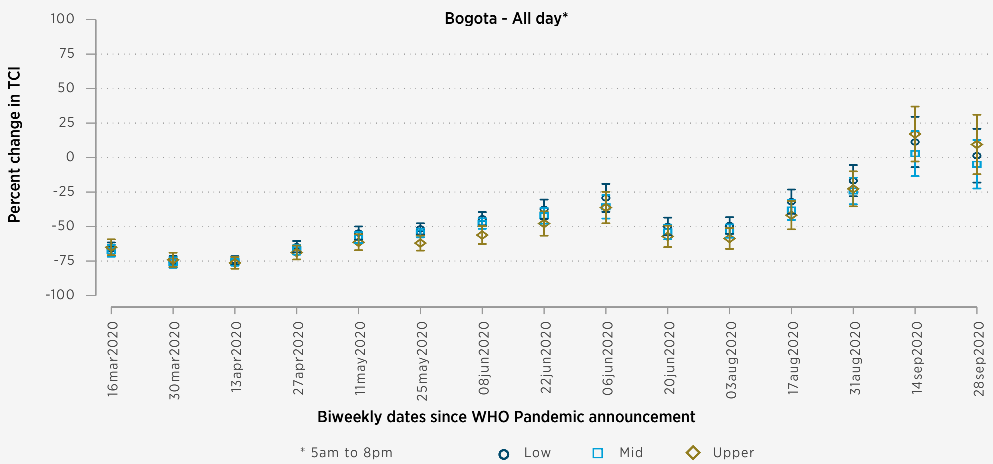


Source: Carabetta et al. (2020).

To understand how the impact of the pandemic and the mobility behavior changes caused by it have evolved over time for areas with different concentrations of each socioeconomic category, the study analyzed the changes in congestion (the TCI Index) in each city over time, comparing trends both before and during the pandemic (from early 2019 to September 2020). Specifically, the analysis estimated changes in the TCI Index from the week of March 9, 2020, when the WHO issued the official pandemic declaration, assuming it as week 0. That is the moment from when the effects of the COVID-19 pandemic on mobility should become apparent.4

Figures 9.2.3 to 9.2.5 present the results of this analysis for Lima, Bogota, and São Paulo, respectively. Each figure shows the estimated percentage change in traffic congestion intensity associated with a 10 percent increase in the share of each socioeconomic category for biweekly periods from when the pandemic started. All three figures show that, initially, the decreases in mobility were similar across socioeconomic categories. However, once congestion indices (the TCI Index) start to recover (compared to the pre-pandemic period) from the initial pandemic shock, it can be observed that areas in the low- and middle-SES category returned more quickly to pre-pandemic congestion levels, particularly in the cases of Lima and São Paulo (Figures 9.2.4 and 9.2.5).

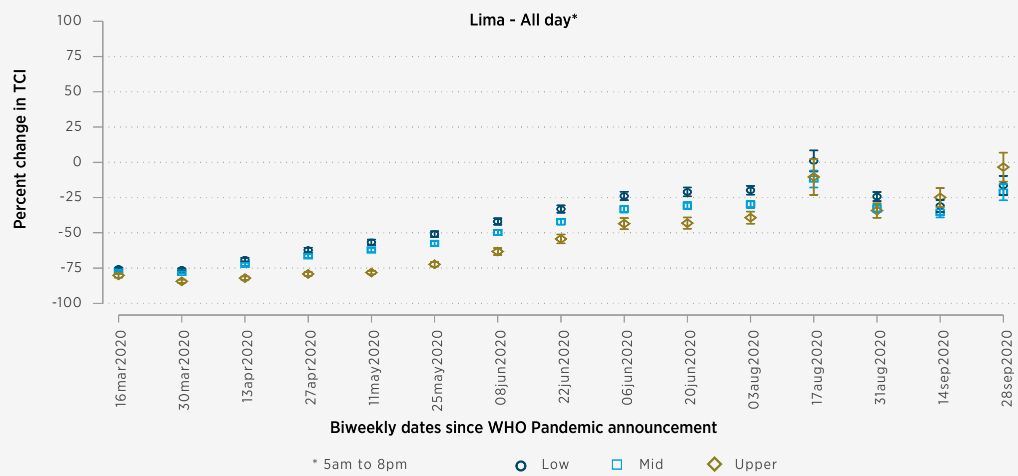
FIGURE 9.2.3 Bogota: Percent Change in the Traffic Congestion Intensity Index versus the Baseline Period Considering a 10 Percent Increase in the Average Share of Each Socioeconomic Status Category



Source: Carabetta et al. (2020).
Note: Vertical lines indicate 95 percent confidence intervals. TCI: Traffic Congestion Intensity Index.

The speed of the return to pre-pandemic congestion levels, and the eventual convergence of all the SES groups, differs across cities. In Bogota (Figure 9.2.3), the differences between SES groups are never statistically significant (although they follow the monotonic pattern of the other cities), and by the end of August 2020 congestion levels were back to baseline levels, and even surpassed them in September. In Lima (Figure 9.2.4), there are clear differences between the upper-SES group and the other two SES groups that disappear by the end of August 2020, and congestion never quite bounces back to the pre-pandemic level. In São Paulo (Figure 9.2.5), the initial impacts are smaller than those in the other two cities, and like Lima the differences are clear between the upper-SES areas and the other areas until September 2020. The lower- and middle-SES areas in São Paulo surpassed pre-pandemic congestion levels faster starting in early July.

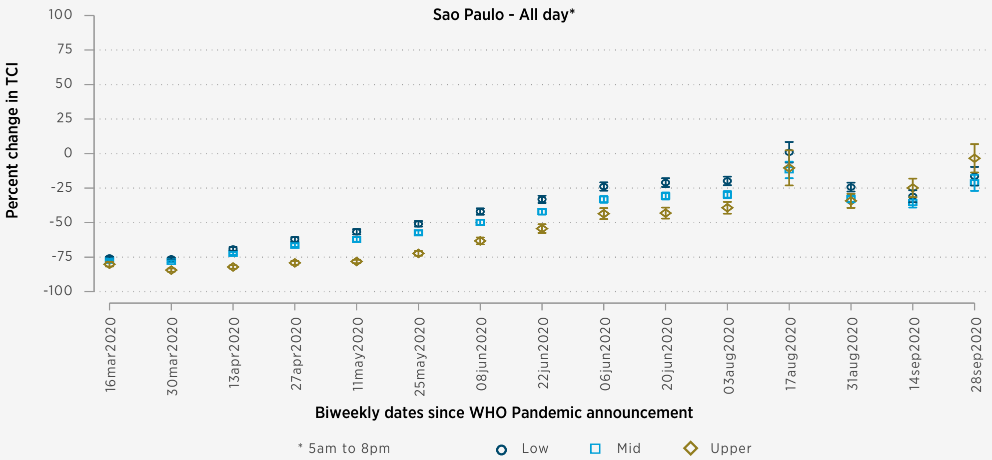
FIGURE 9.2.4 Lima: Percent Change in the Traffic Congestion Intensity Index versus the Baseline Period Considering a 10 Percent Increase in the Average Share of Each Socioeconomic Status Category



Source: Carabetta et al. (2020).
Note: Vertical lines indicate 95 percent confidence intervals. TCI: Traffic Congestion Intensity Index.

What explains these differences in patterns across cities? One probable explanation is that the cities implemented different strategies to slow the spread of the pandemic, and that there were ensuing differences in the intensity of response and enforcement mechanisms. Another possible explanation may be related to the level of economic segregation in each city, that is, the degree to which people with different SES levels live mostly among other people of their group. For example, as shown in Figure 9.2.3, Bogota appears less geographically segregated than Lima and São Paulo, which may be a factor influencing the smaller differences in congestion responses by areas of different SES levels.

FIGURE 9.2.5 São Paulo: Percent Change in the Traffic Congestion Intensity Index versus the Baseline Period Considering a 10 Percent Increase in the Average Share of Each Socioeconomic Status Category



Source: Carabetta et al. (2020).
Note: Vertical lines indicate 95 percent confidence intervals. TCI: Traffic Congestion Intensity Index.

The results make clear that the most disadvantaged populations were less able to reduce their mobility over time in response to the pandemic and the mobility restrictions, given their realities and necessities. Both low- and middle-SES areas reverted more quickly to pre-pandemic congestion levels than did high-SES areas. These results are consistent with the findings of Delaporte, Escobar, and Pena (2021) and Yasenov (2020)on average, 1 worker out of 2 is able to work under the lockdown in the LAC region. We document considerable variation in the share of individuals able to work under the lockdown across countries and within countries across occupations, economic activities and specific population groups. Based on the LWA index, we then estimate individual's potential labour income losses and examine changes in poverty and labour income inequality. We find an increase in poverty and labour income inequality in the majority of the LAC countries due to social distancing. At the national level, the highest increase in the headcount poverty index is 1.4 pp and the highest increase in the Gini coefficient is 2 pp. Decomposing overall labour income inequality in the LAC region, we find that social distancing has lead to a small decrease (-0.1 pp, who present evidence on the types of jobs that are plausible to be continued via teleworking under stay-at-home orders in the United States and in Latin America and Caribbean countries, respectively, versus jobs associated with lower wages that are less likely to be telework-feasible. The results are also consistent with findings on the heterogeneous impacts of the pandemic for the United States (Valentino-Devries, Lu, and Dance 2020) and Latin America (Aromi et al. 2021), based on data on mobility reductions by location-based measures of income distribution. Those studies find that high-income individuals reduced their mobility the most. These patterns have important policy implications. Anticipating and including the differentiated behavioral response of the population to restriction measures can improve the effectiveness of policies targeting the response to future waves of the pandemic.

1. This box was prepared by María Paula Gerardino, Oscar A. Mitnik, Edgar Salgado, Patricia Yañez-Pagans, and Beatrice Zimmermann.
2. The dashboard is available at www.iadb.org/en/topics-effectiveness-improving-lives/coronavirus-impact-dashboard
3. For details, see Carabetta et al. (2020)"title":"The (Unequal. Blocks are first grouped using unsupervised machine learning (k-means clustering). Then, based on educational attainment, blocks are rank-ordered into three SES categories (low, middle, and upper) based on percentile thresholds in the metropolitan-area-wide distribution (25 percent, 50 percent and 75 percent, respectively), and the share of individuals in each SES group in small hexagonal grids is obtained. The grids are H3 cells of resolution 9, of approximately 175 meters length per side, and an area of around 0.10 km2. H3 cells are a hexagonal hierarchical geospatial grid system developed by Uber to analyze sub-areas of the world. This grid system has the advantage of quickly splitting areas into grids and allowing for efficiently assigning points to those grids worldwide, at different grid sizes ("resolutions"). For more details on H3 cells, see https://eng.uber.com/h3/.
4. The econometric analysis used an interrupted time series methodology, estimating changes in the TCI Index by SES level using a panel of H3 cells and interacting a series of declarations during the pandemic by the WHO biweekly dummies with the SES-level shares in the cell. See Carabetta et al. (2020)"title":"The (Unequal for details.

In contrast to the rise in the use of some new transport modes that substituted for other existing private modes, public transit remains a lifeline for many low-income people in Latin America and the Caribbean. However, the economic shocks and declines in ridership during the recurring lock-downs in many countries have brought transit to a critical turning point. With an uncertain future ridership and ongoing changes in land use patterns and transport mode shares, understanding the service provider point of view becomes critical to understanding the region's future.

9.2.3 Public Transit Systems in Jeopardy: The Impact of the COVID-19 Pandemic on Public Transit Provision

The pandemic has also raised concerns about the resulting financial strain on and sustainability of transport systems around the world and in Latin American and the Caribbean (APTA 2021) Public transit is a key enabler of mobility: it as an impact on access to opportunities and has the potential to ameliorate social inequalities (Bocarejo S. and Oviedo H. 2012; Lucas 2006). Lower-income populations tend to rely more heavily on public transit for their daily mobility needs (see Chapter 3), and economic shocks to transit systems such as that brought on by the pandemic adversely affect the quality and level of service. It is therefore arguable that this has a greater impact on more economically vulnerable populations that depend on the service (Apaloaza and Gutierrez 2018; Lubitow, Rainer, and Bassett 2017; Sanchez-Paramo 2020).

In the initial stages of the pandemic, most collaborations between public health authorities and transit operators were aimed at containing the virus (LEDS-LAC 2020), with a secondary focus on financial sustainability. Public transportation was viewed as a vector for contagion within vehicles (Tirachini and Cats 2020). Although operators sought to coordinate a medium-term plan to preserve the system (Jornal de Brasilia 2020), the actual response from countries in the region and their evolution has been understudied.

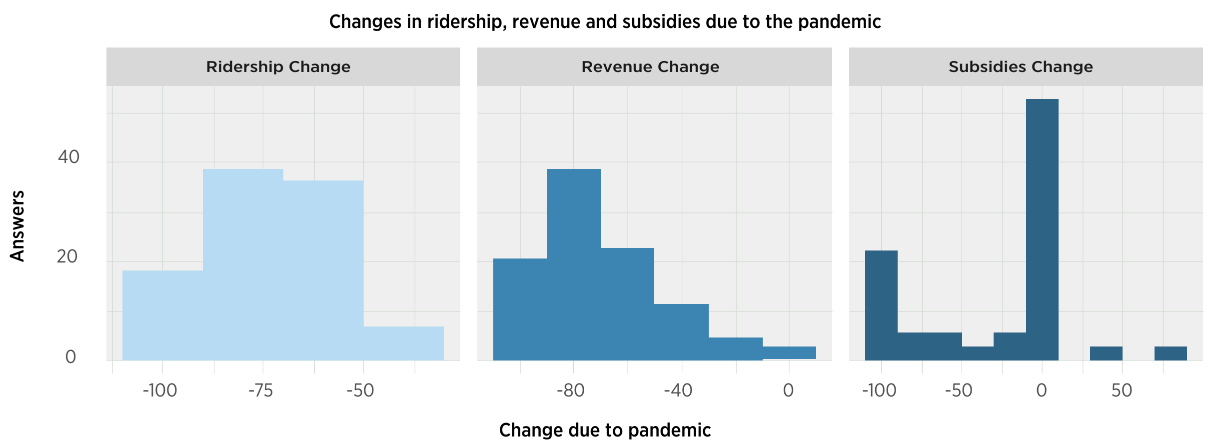
Moreover, public transit operators in Latin America and the Caribbean are largely privately owned and operated, and fare income represents a substantial share of total revenue, ranging from 20 to 75 percent (Rivas, Brichetti, and Serebrisky 2020). For the average firm with 50 percent of its income obtained through fares, the 75 percent drop in ridership (Serebrisky et al. 2020) has devastating consequences for financial sustainability. The situation is exacerbated by the need to maintain service coverage (schedules and routes) in spite of the massive decrease in users (Marquez 2020).

Unfortunately, data on operator finances needed to evaluate the financial impact of the pandemic are scarce. While a handful of operators and government agencies in the region publish reports detailing the funding sources and operating costs of transit services (FIMETRO 2019; Marquez 2020; Transmilenio S.A. 2020), most operators do not publish these figures (Rivas, Brichetti, and Serebrisky 2020).

The IDB Urban Transport Division conducted a survey of public transit operators during September and October 2020 to measure the impact of changes brought about by the pandemic on transit balance sheets (including operational costs, revenues, and subsidies), day-to-day operations, the response from local government, and the future outlook. The survey was targeted to public transit agencies with a myriad of ownership structures (including public, private, and public-private partnerships) and modes (including Bus Rapid Transit, metro systems, and microbuses),[7] across numerous countries in Latin America and the Caribbean.[8] The survey was directed toward administrative staff with financial data availability, managers, and senior executives/owners of transit agencies

Public transit agencies that responded to the survey reported significant financial stress and other impacts on their operations due to the pandemic. Over 80 percent of transit operators stated that they were strongly and negatively affected economically by the pandemic. Only a small share of the operators stated that they experienced little to no effect (5.6 percent). This is understood considering the results from Figure 9.6

FIGURE 9.6 Reported Changes in Key Cash Flow Metrics by Transit Operators between March and September 2020 (percent)



Source: Prepared by the authors based on IDB Public Transit Operator survey data from Scholl et al. (forthcoming).
Note: Histograms for changes in ridership (left), revenue (middle), and subsidies (right). Number of system operators surveyed = 44.

While nearly half of respondents reported no change or an increase of subsidies, the remainder cited a reduction, and of those, 20 percent saw a complete cut. This reduction, combined with declines in ridership, suggests that transit agencies at the time of the survey were experiencing severe constraints in cash flows. In addition, service provision became arguably more expensive due to the

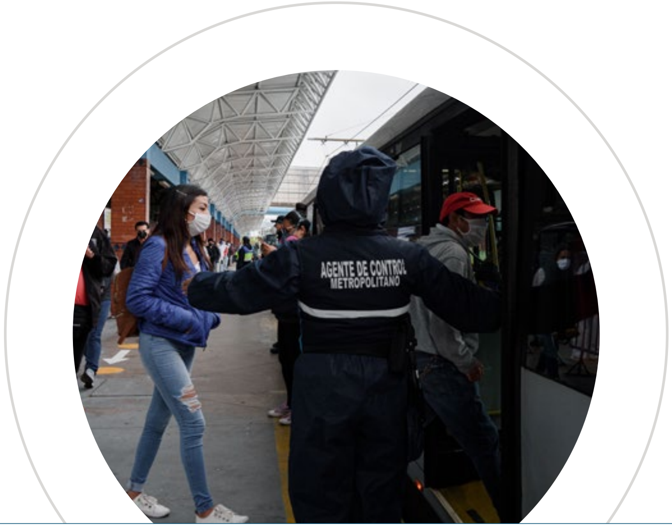
7. To contrast diverse types of operators, respondents were segmented in two ways: first, according to revenue group, which should reflect on the different resources and scale of the served regions; and second, by "system type," broadly referring to the type of service provided, either a massive corridor-serving operation or a more diffuse service with smaller vehicles.

8. Respondents were from Colombia, Barbados, Argentina, Brazil, Ecuador, Honduras, Costa Rica, Mexico, Paraguay, Trinidad and Tobago, Bolivia, Chile, Peru, Uruguay, Venezuela, Jamaica, Panama, and the Dominican Republic.

need to implement measures to contain the spread of the virus and protect the health of workers and passengers. Such measures included the creation of distinct taskforces, purchases of cleaning/health equipment, monitoring employees for COVID-19 symptoms, contact tracing, confinement of exposed workers, social distancing measures, healthcare costs, and reduced schedules, among others (APTA 2021)2021 (CRRSAA. The result is the middle panel of Figure 9.6, a very negatively skewed revenue change distribution.

Transit operators were asked to report perceived financial impacts associated with these containment measures (Table 9.4). The responses show that maintaining operational schedules and reducing maximum occupancy levels due to social distancing were measures with the highest fiscal burden for operators. Vehicle disinfection was ranked as relatively inexpensive, while passenger safety measures were ranked as relatively difficult. The measure ranked as the largest financial burden was the reduction of vehicle capacity (79.4 percent of respondents chose its effect as clearly negative). This is understandable considering the multi-fold effect that such a policy entails. For example, in theory, in order to ensure social distancing, more vehicles would be required to operate at the same level of service at a time when there is even less demand than at previous operating levels.[9]

The fact that the most economically challenging aspects of maintaining service are related to service provision, such as schedules and capacity limits (57.8 percent and 70.5 percent, respectively), also implies a certain degree of detrimental impact on service provision. In turn, this could have an adverse impact on accessibility for those needing service at specific times of day or at locations that may be subject to service cuts.



9. Nevertheless, the survey of transit service providers found that not all countries applied this measure of requiring providers to continue operating at the same fleet level. Instead, they cut back on the number of vehicles in operation to adjust to ridership declines.

TABLE 9.4 Financial Impact of Pandemic-related Service Requirements and Health Measures on Public Transit Operators: Perceptions of Transit Agencies Surveyed (percent)

A. Perceived Financial Difficulty of Complying with Service Operation Requirements				
	Low	Medium	High	
Operation schedules	8.9	33.3	57.8	
Employee safety	8.9	46.7	44.4	
Passenger safety	11.1	40.0	48.9	
Supplies for operation	11.1	37.8	51.1	
Vehicle disinfection	22.2	37.8	40	
Vehicle occupation levels	11.4	18.2	70.5	
B. Perceived Fiscal Impact of Health Measures Taken				
	Not Adopted	Negative	Neutral	Positive
Maximum occupancy	5.9	79.4	5.9	8.8
Mouth cover enforcement	0.0	29.4	55.9	14.7
Passenger disinfection areas	12.9	45.2	22.6	19.4
Widening of stop areas	83.3	6.7	6.7	3.3
Bus only lanes	72.4	10.3	0.0	17.2
Communications	28.1	18.8	37.5	15.6
Passenger temperature control	53.1	9.4	25.0	12.5
Vehicle disinfection	0.0	56.2	18.8	25.0
Periodic driver testing	34.4	18.8	25.0	21.9
Ventilation procedures	29.0	12.9	41.9	16.1
C. Perceived Fiscal Impact of Government Measures in Area of Service Operation				
	Not Adopted	Negative	Neutral	Positive
Stay-at-home directive	4.3	78.3	8.7	8.7
Shutdown of commercial activities	2.2	82.6	4.3	10.9
Worker schedule staggering	20.0	46.7	26.7	6.7
Shutdown of schools	4.4	73.3	13.3	8.9
Restrictions based on gender and peak	44.4	37.8	11.1	6.7
Restrictions based on ID and peak	40.9	40.9	9.1	9.1
Mouth-cover use	0.0	4.3	39.1	56.5
Focalized lockdowns	17.8	53.3	11.1	17.8
International border closure	6.7	40.0	35.6	17.8
Inter-municipal border closure	28.9	46.7	15.6	8.9
Curfew	24.4	44.4	17.8	13.3
Bicycle Infrastructure	45.5	20.5	25.0	9.1

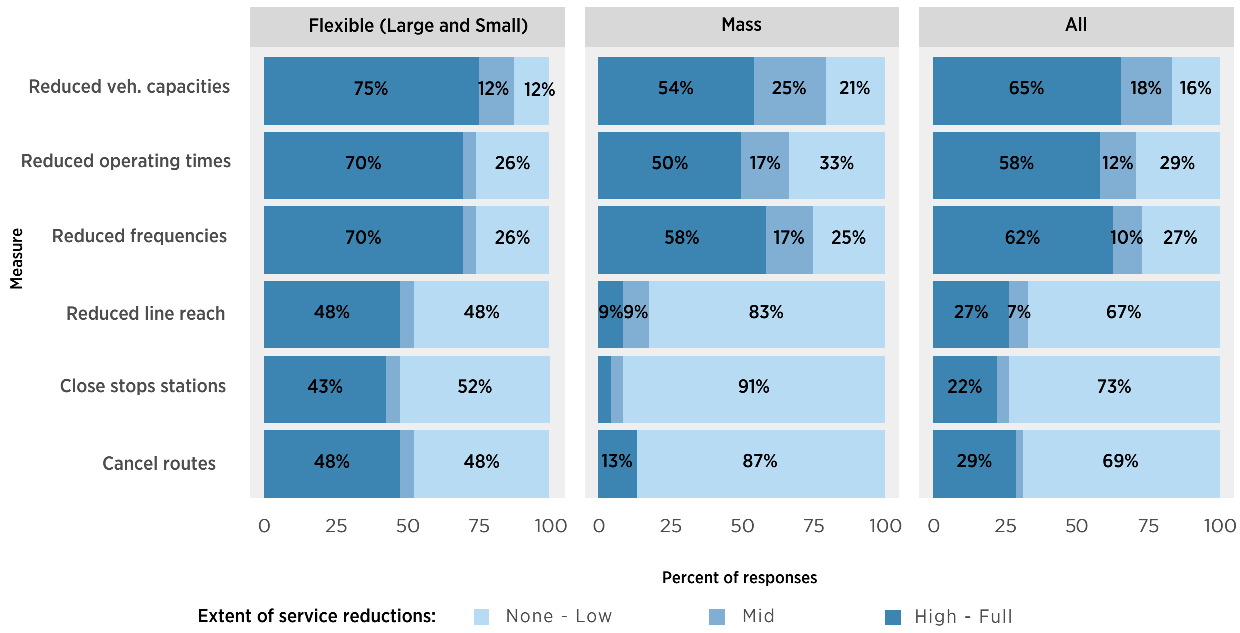
Source: Prepared by the authors based on IDB Public Transit Operator survey data from Scholl et al. (forthcoming).
Note: Number of system operators surveyed = 47.

The operators also viewed other measures external to service provision that were enforced by local authorities as having a negative impact on their finances. The inter-municipal closing of borders, stay-at-home directives, and the shutdown of commercial activities and schools were among the most negatively rated measures since all of them likely had significant downward effects on ridership and fare revenues. At the same time, transit agencies that responded to the survey did not report that mask enforcement had a particularly negative financial impact. The closure of international borders was relevant in countries most dependent on international tourism, such as those in the Caribbean(ECLAC 2021). In sum, the public transit ecosystem suffered a shock beyond ridership levels that raises doubts about the financial sustainability of the service.

9.2.4 Short- and Long-term Measures by Operators May Exacerbate Inaccessibility

How have transit agencies coped with pandemic-related financial shocks? External and internal financial pressures as a result of the pandemic appear to have coalesced into various financial and operational decisions meant to alleviate the financial impact of the pandemic. Reduced revenues with increased costs appear to have led operators to contract service attributes and delay long-term plans to maintain financial solvency. When asked about the types of measures taken in service provision and the extent of the measures throughout their systems, agencies reported several measures that relate directly to the accessibility of transit users (Figure 9.7). For this analysis, transit operators were grouped into three categories by system type: (1) Mass transit, (2) Large flexible service providers, including subways, metro systems, BRT systems, and large fixed-route bus services, and (3) Small flexible service providers, including small buses (mini vans), paratransit services, and taxis.

FIGURE 9.7 **Reported Service Reductions in Flexible and Mass Transit Modes (percent)**



Source: Prepared by the authors based on IDB Public Transit Operator survey data from Scholl et al. (forthcoming).
Note: Number of system operators surveyed = 50.

Three measures stand out as the most widespread across transit systems. Almost all systems reduced vehicle capacity in line with social distancing requirements. However, two other key service elements, operating times, and frequencies, were also reduced. Over 70 percent of all the operators surveyed reporting reducing service frequency or operating times at least partially.

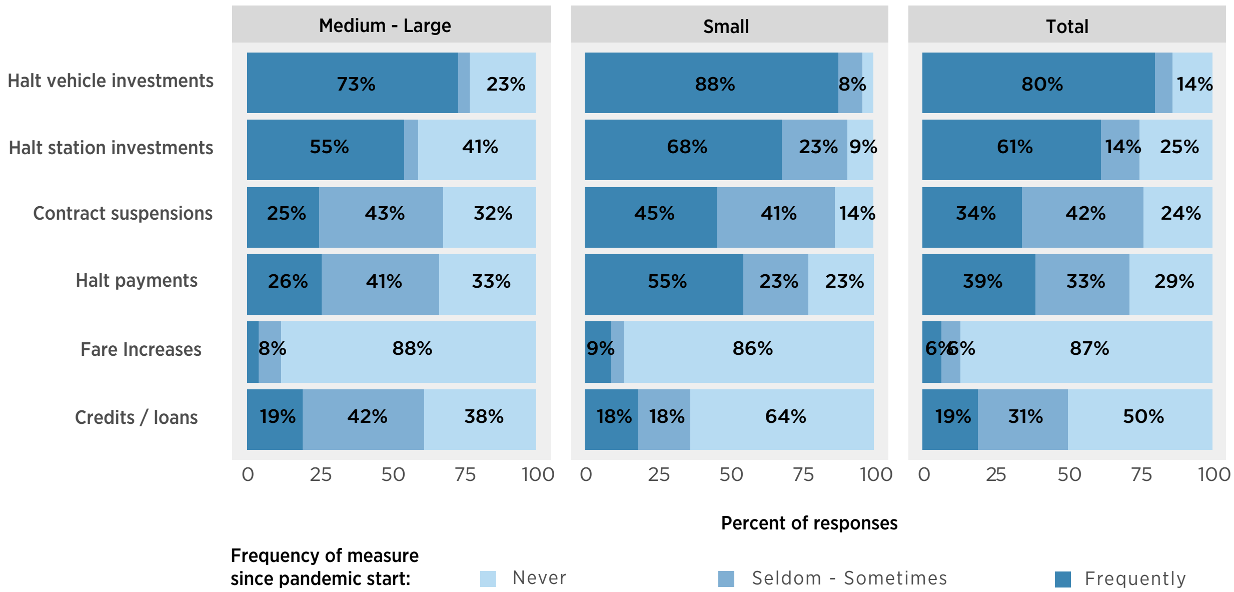
Reduced capacity, frequency, and coverage raise several accessibility concerns for transit-dependent populations, particularly essential workers and those employed in occupations unconducive to teleworking. Reduced hours of transit service (58 percent of the operators report almost all their system working with reduced operating times) can disproportionately affect transit users working late shifts, with long commutes, or with many trip legs (especially when combined with unreliable service). These cuts could adversely affect riders who have late schedules, work off-peak hours, and live in urban peripheries. Additionally, transit users often rate frequent service as an important quality attribute that could make them take public transport more often, implying concerns for a vicious cycle of ridership loss and cutbacks in the face of pandemic stress.

Interestingly, in contrast to the flexible transit operators surveyed, operators of mass transit services seldom reported reducing routes, stations, or spatial coverage. Mass services reported implementing these measures in about 10 percent of cases, while over 40 percent of the flexible systems reported these reductions. This is likely attributable to differences in contracts and to the distinct physical operational characteristics of flexible and massive systems. The operators of Metro and BRT systems tend to serve higher-density areas, while flexible services such as minibuses and collective taxis are generally more demand-responsive, serve lower density areas with lower passenger volumes, and receive lower levels of subsidies, leaving them more vulnerable to the economic shocks of the pandemic. This has negative implications for those who depend on first-last mile and paratransit services in peripheral areas, where lower-income populations tend to live.

In terms of other cost-cutting measures to overcome the financial difficulties of the pandemic, transit operators also had markedly different strategies. The most frequent cost-cutting strategy was to halt investments in new vehicles and stations, including repairs of older stations and the building of new stations (Figure 9.8). Eighty percent stopped investing in new vehicles and 61 percent postponed investments in stations, suggesting potential negative implications for the ability of agencies to improve on-board conditions for riders and expand platforms and walkways around stations to enable social distancing. While these two actions are understandable considering the uncertainty of the pandemic in the long term, this could translate into older and less productive vehicles and stations, as well as a reduction in service quality and safety.

Nearly three-quarters (72 percent) of the agencies also reported that they partially or fully suspended operation contracts and supplier payments to cut costs. Very few reported seeking additional financing, but mid-size to large companies were almost twice as likely as smaller firms to take out loans. While firms in the region have experienced reduced access to credit during the pandemic due to the resulting decline in revenues (Izquierdo et al. 2020), smaller firms or transit agencies may have been disproportionately affected by the contraction in credit due to their lower levels of capital and higher vulnerability to economic shocks.

FIGURE 9.8 Financial Coping Measures Implemented by Different Operator Revenue Groups (percent)



Source: Prepared by the authors based on IDB Public Transit Operator survey data from Scholl et al. (forthcoming).
Note: Number of system operators surveyed = 50.

Finally, the transit agencies surveyed generally did not report raising fares. This could be explained by the fact that many formal transit agencies tend to be regulated with the concession scheme contracts that set fares in the region. Additionally, raising fares during a time of lower demand and reduced income for many people would not only likely present hardships for lower-income riders, but also risk further reducing ridership (Davis 2021; Holmgren 2007), and in turn total fare revenues. Despite fares not being raised, however, households may still find transit more unaffordable if their incomes declined due to the pandemic.

Table 9.5 further explores the steep decline in vehicle and station investments at all levels. Companies seem to have turned to a strategy of survival for the pandemic, but to the extent that this jeopardizes the quality-of-service provision in the long term, it could potentially lead to further reductions in ridership, leading to a further downward spiral.

TABLE 9.5 Maintenance and Investments Halted by Higher- and Lower-income Operators Due to the COVID-19 Pandemic

	Medium-Large	Small	Total
	Number/(Percent)	Number/(Percent)	Number/(Percent)
Infrastructure			
Maintenance of stops	3 (11.5)	4 (20)	7 (15.2)
Office investments	8 (30.8)	4 (20)	12 (26.1)
Building maintenance	10 (38.5)	9 (45)	19 (41.3)
Vehicles			
Fleet modernization	15 (57.7)	14 (70)	29 (63)
Fleet expansion	10 (38.5)	5 (25)	15 (32.6)
Fleet maintenance	8 (30.8)	12 (60)	20 (43.5)
Equipment and Systems			
Equipment investments	11 (42.3)	10 (50)	21 (45.7)
Payment system upgrades	8 (30.8)	6 (30)	14 (30.4)
Other			
Other investment	6 (23.1)	2 (10)	8 (17.4)
Other maintenance	0 (0)	2 (10)	2 (4.3)
No investments were halted	4 (15.4)	1 (5)	5 (10.9)
Maintenance continued as usual	14 (53.8)	3 (15)	17 (37)

Source: Prepared by the authors based on IDB Public Transit Operator survey data from Scholl et al. (forthcoming).
Note: Number of system operators surveyed = 46.

Fleet modernization, equipment investment, and building maintenance were the operations cited most often as being postponed. Overall, close to 90 percent of respondents declared having postponed some type of investment, and over 60 percent postponed some type of maintenance. These postponements may pose a threat to the quality of service and reduce system productivity in the medium to long term. Given that demand for transit depends on many factors, among them service quality, if productivity, safety, and comfort continue to decline, the implications could span well into the future and catalyze a degenerative cycle (Ardila-Gomez 2012).

The combined effect of decreased ridership constrained cash flows, and reductions in investments in and maintenance of public transit systems threatens to exacerbate existing underinvestment in public transit infrastructure and services in Latin America and the Caribbean. In a context in which lower-income groups have been disproportionately affected by the pandemic, this carries significant consequences and may further reduce access to opportunity for those who most desperately need the system to get back on their feet.

9.3. Conclusion: The Road to Equitable and Sustainable Recovery

Unemployment levels in Latin America and the Caribbean are predicted to reach record highs in the aftermath of the COVID-19 pandemic (ILO 2020). Adequate public transit is the primary way to access employment opportunities for much of the most vulnerable urban population. Higher-income groups have a wider array of mobility options and have often turned to teleworking or switched to privatized transport modes. However, lower-income users often need to work outside the home and have no choice but to use public transportation systems struggling to operate with declining revenues, which in turn results in reduced coverage, frequency, and quality. The bulk of the mobility burdens of the pandemic are suffered repeatedly by the same groups – that is, those who are left using the system.

Two lines of policy responses are needed to respond to the challenges outlined in this chapter. First, many transit operators may need supplemental funding and increased access to credit in order to recover and maintain adequate levels of coverage and service. Second, cost-effective measures to improve health and safety are essential to encourage transit riders to return. Although these measures may not guarantee long-term sustainability, they could mitigate the current revenue shortage faced by operators. Moreover, these relief measures need to reach smaller firms that provide the bulk of transportation for lower-income informal workers. Disinvestment in transit is likely to adversely affect those who have no teleworking alternatives and rely almost exclusively on public transit for their work or other commutes. Moreover, a reduction in service delivery will accelerate the migration to private modes of transport and eventually exacerbate urban congestion. Finally, continued expansion and improvement is needed for infrastructure implemented during the pandemic to support the use of active transport modes such as walking and bicycling. This could go a long way towards not only improving accessibility to safe and economical forms of transport as the region emerges from the pandemic, but also towards fostering sustainable mobility.

Four policy measures and infrastructure investments could catalyze the recovery of the region's transport systems from the pandemic:

- **Redefine service standards:** Service standards are essential to regulate safety in vehicle and passenger operations. For example, overcrowded transit vehicles are undesirable even under normal or pre-pandemic conditions. But during a time when health authorities recommend social distancing, they present a significant health risk and also likely discourage or disincentivize transit use. Therefore, redefining standards for lower vehicle occupancy levels should contribute to mitigate transmission of the virus. At the same time, additional space inside the vehicles improves comfort and service quality, attributes that are valued by transit passengers (Batarce et al. 2015).

- **Improve public transport infrastructure and vehicles.** Public transit infrastructure is a key element to facilitate efficient and safer transit services in the context of the current health crisis. Additional capital investments could benefit both public health and mobility in the near term by upgrading vehicles to have more interpersonal space and better air circulation, and in the medium term by expanding boarding stations and offering dedicated lanes to provide better spacing and shorter in-vehicle travel times. Both investments, along with improved integration with active transport modes (see Chapter 2) should also provide better service and attract additional ridership.

- **Automate fare collection and target subsidies.** While cash is still prevalent in transit systems, contact-less fare collection systems are becoming the norm in the industry. The shift to contact-less fare collection systems could mitigate virus transmission and strengthen efforts to target subsidies to lower-income sectors. Cash-less payments could be an opportunity to rethink the systems to make them more efficient (see Chapter 7), redesign subsidies to better target different income levels, and effectively promote long-term financial sustainability (see Chapter 7; see also Serebrisky et al. 2020). This could be instrumental in ensuring affordability and updating vehicles for improved quality and environmental friendliness.

- **Revise the current public transport business models**. The economic and financial effects of COVID-19 only worsened the economic health of public transport networks. With the need for subsidies from the government, it is urgent to revise the current business models that up until now have been based almost exclusively on the coverage of transport fares. Many transportation systems have already reported that it will take years to fully recover financially. This means that the subsidies granted today to support transit systems during the pandemic crisis might also be necessary to maintain the quality and continuity of the systems going forward, especially considering the gradual return of the population to using these services. A revision of the business model appears necessary not only to support the future of public transport systems, but also to ensure the sustainability and viability of transport activities in cities. Cross-subsidizing sustainable transit modes with charges to congestion-intensive private transportation could be the path to achieving sustainable urban mobility goals.

While the COVID-19 pandemic poses a formidable mobility challenge in Latin America and the Caribbean, it also represents a unique opportunity to improve the equity and sustainability of mobility in cities in the region (Rivas, Suárez-Alemán, and Serebrisky 2019). Building systems that are resilient, that leverage modern technology, and that are aligned with social equity objectives is critical to improving mobility and accessibility, particularly for those who depend on public transit and non-motorized modes for their daily travel. Helping public transit operators recover from the economic shock, working to improve standards of service for the most vulnerable, and expanding on gains in infrastructure for non-motorized or active transport modes that are interconnected with public transit are some of the first steps to take towards a sustainable and equitable recovery.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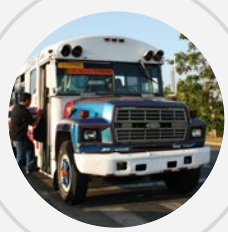
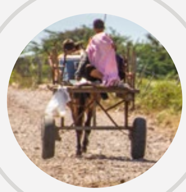
Palmeiras
Barra Funda

Transport Beyond the City: A Pathway to Universal Access and Rural Inclusion

10





Seonhwa Lee

Rural areas were home to an estimated 120.6 million people in Latin America and the Caribbean in 2020 (Dirven 2019). They represent just 18.5 percent of the region's population, but nearly half of them live below the poverty line. According to ECLAC (2019), the poverty rate in rural areas stands at 46.8 percent in the region, including 21.2 percent who are extremely poor, 25.6 percent who are poor, and a further 24.8 percent who can be classified as low-income (see Chapter 1).[1] As more and more people migrate into cities, those who stay in rural areas are more likely to be excluded and lack adequate access to basic services, including transport, necessary to improving their lives.

Through its positive impact on rural households and communities, improved rural transport is essential to advancing towards the United Nations Sustainable Development Goals (SDGs). Better transport can help to alleviate poverty (SDG 1), achieve zero hunger and ensure food security, health and well-being (SDGs 2 and 3), provide access to education (SDG 4), empower women in rural areas (SDGs 5), facilitate access to clean water and sanitation (SDG 6), promote inclusive growth and economic opportunities (SDG 8), contribute to sustainable infrastructure and communities (SDG 9 and 11), and increase climate resilience and adaptation in rural areas (SDG 13) (Cook et al. 2013).

Rural transport infrastructure and services are critical to enable access to the economic opportunities and basic social services for people living in remote and isolated areas. However, rural transport has often been neglected or received inadequate attention on policy agendas. This is mainly associated with a lack of economic incentives such as low passenger demand and fewer market incentives for operators, low-volume traffic in expanded geographic areas, invisibility due to data scarcity in rural sectors, a large proportion of informal transport services, substantial deficiencies in infrastructure, and low financial and technical capacity of local governments in charge (SUMA 2019). Due to a lack of investment and coverage of rural infrastructure services, many rural residents in the region face long travel times and high monetary costs for travel and are still unconnected to markets and services, resulting in their paying more for goods and services. High operational and time costs in remote rural areas can also lead to inefficient resource allocation between the farm and non-farm sectors and reduce labor market participation and employment. As a result, rural households struggle to generate sufficient income, exacerbating and deepening rural poverty.

To address these challenges, rural transport projects in Latin America and the Caribbean should be comprehensively designed and implemented to scale up the benefits for local communities and rural livelihoods, and to enhance the potential for transport to reduce poverty and foster social in-

1. The definition of poverty used here follows the classification of the United Nations (2010), which defines it as a situation where household income is less than the basic basket of agricultural and non-agricultural goods and services. Extreme poverty is defined as a condition of serious scarcity in which persons do not have resources to satisfy basic food demands.

clusion. Maximizing the impact of transport for vulnerable and marginal rural populations requires not only a technical approach to rural transport infrastructure, but also a thorough understanding of the multi-dimensional challenges that rural inhabitants face. In this regard, this chapter attempts to advance the understanding of how rural transport infrastructure and services can be leveraged to generate pro-poor impacts in the region and inform policy and practice at the nexus of transport and rural economic development.

10.1 Maximizing the Impact of Rural Transport to Benefit the Poor and Vulnerable

It has been demonstrated that rural transport brings both direct and indirect benefits for rural households and local communities, contributing to rural poverty alleviation and to universal access, defined as people having equal opportunities to achieve their mobility objectives. Three direct effects of rural transport include (i) reducing transport costs and delivery time for agricultural products, (ii) increasing off-farm and non-farm job opportunities, and (iii) improving access to basic services (summarized in Figure 10.1).

Improved rural transport infrastructure can reduce monetary and time costs for transporting agricultural products and thus provide better access to markets for rural farmers (Lyngby 2008; Crossley et al. 2009; Valdivia 2010; DANIDA 2010; Krygsman and Fungo 2017). The lack of transport infrastructure and poor road conditions often results in what is known as "road seasonality," where weather conditions significantly affect operation of the road, making it difficult for rural producers to obtain farm inputs and sell their agricultural products. Thus, even when transport services are available in rural areas, they are more expensive because transport providers are reluctant to operate on poor-quality roads and typically charge higher fares to offset the costs of vehicle maintenance. This lack of accessibility to the market discourages agricultural production and generates a significant amount of agricultural product waste. Around 40 percent of food losses in low-income countries occur post-harvest as a result of product quality degradation and spillage associated with poor transport conditions (World Bank 2017). Thus, consistent access to good-quality, all-season roads is essential to enhance agricultural productivity, as the improved market access and reduction in transportation costs allow farmers to earn higher incomes from selling value-added agricultural products to a bigger market rather than the food products sold in a primarily local market (Krygsman and Fungo 2017).

Rural road investments also contribute to the diversification of rural economies by increasing access to off-farm and non-farm job opportunities, strengthening connectivity between rural and urban areas where better-paying jobs tend to be concentrated. Although agriculture is still the primary source of income for rural economies, non-farm employment plays a key role as an effective strategy for financial diversification to help rural households escape poverty (Bentancor and Modrego 2011). According to impact evaluations of rural road programs in Peru (RRP-PROVIAS RURAL)[2] paved

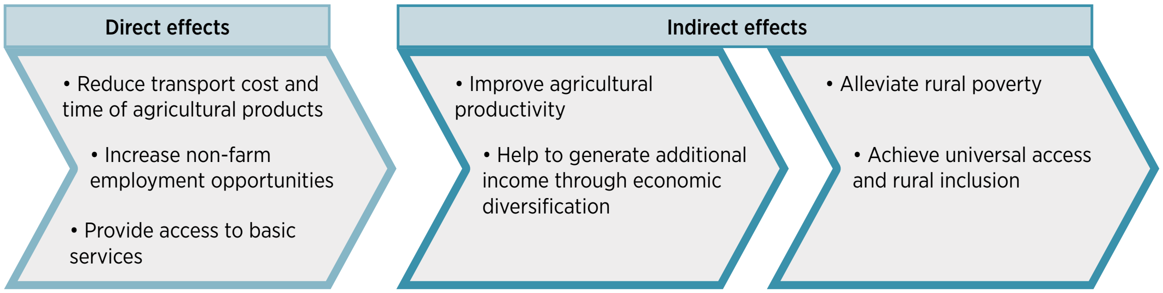
2. The Peruvian Rural Road Program (RRP) operated by PROVIAS RURAL from 1996 to 2006 aimed to improve transport conditions in rural villages by contracting private local firms to manage and sustain the maintenance of rural roads in the poorest areas and offering village development plans. During the first phase of RRP (1995–2000), the project improved rural accessibility in 314 districts, contracting with 495 local firms to rehabilitate and maintain about 12,000 kms of rural roads and about 3,000 kms of non-motorized tracks (Valdivia 2010).

roads have an especially important impact on areas with very restricted access to non-agricultural wage labor markets, as they help reduce unpaid participation in family farms (Escobal and Ponce 2008; Valdivia 2010). These investments help make markets much more dynamic and increase the probability of new individuals accessing the labor market and generating wage income. This is especially the case for persons with the small incomes – such as farmers with small landholdings or working-age men – for whom the labor market gains are largest (Escobal and Ponce 2008; Asher and Novosad 2018). A study in Colombia showed that a road intervention affected the pattern of income generation of rural households, increasing income from non-farm employment by around 14 percent for the poorest group (Sanchez 2016).

Finally, improved rural roads also allow residents to access basic services, including education and health services, and improve social inclusion. Here, access to basic services implies the minimum level of rural transport infrastructure network services required to sustain socioeconomic activity (Lebo 2001). The result of rural road projects in Nicaragua (Lyngby 2008) indicates that the presence of both paved and non-paved roads encourages the emergence of transport services, and households in the affected area have more willingness to pay for the transport services than households with access to only small trails. The increased use of transport services can also improve access to basic services located further away. In Peru, Valdivia (2010) found a strong positive effect on school attendance for children in villages located in the project area of the rural roads program.

When rural transport projects result in direct benefits for rural livelihoods in the longer term, this increases agricultural productivity and household income through lower monetary costs for transport and time use and enhanced economic and social opportunities from the diversification of the rural economy. As a result, reliable access to quality rural transport in the region is vital to alleviating rural poverty and can ultimately contribute to rural development and inclusion with universal access. A study carried out in Colombia found a positive relationship between road infrastructure development and economic and social growth. The analysis showed that as road connectivity increased – as perceived by households – annual household consumption increased by about 14 percent on average for the three years of the intervention (Sánchez 2016). A road project in Haiti also shows that transport investments generated between 0.5 and 2.1 percent increase in the GDP of the intervened communities (Box 10.1).

FIGURE 10.1 The Effects of Rural Transport Development



Source: Prepared by the author based on the literature review.

BOX 10.1

Night-light Luminosity Level Change in Haiti After Road Construction between 2000 and 2013

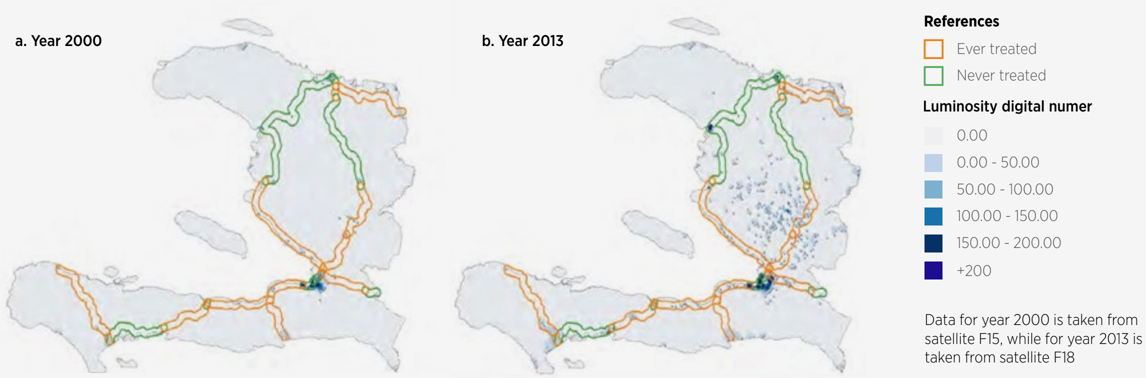
Data selection and collection to quantify the impact of rural road programs can often be challenging, so certain non-traditional data sources have been used to measure their impact. An impact evaluation of road construction conducted for IDB Invest in Haiti used the satellite night-light luminosity level as a proxy for economic activity and development (Figure 10.1.1) (Mitnik, Sanchez, and Yañez 2018).

The combined multiple sources of data such as satellite imagery data, administrative data, and secondary data were developed to produce a novel geo-referenced panel for Haiti. The remotely sensed night-light density data were taken from the Defense Meteorological Satellite Program, Operational Linescan System (DMSP/OLS), available from the U.S. National Oceanic and Atmospheric Administration (NOAA). An important assumption in this analysis was to transform luminosity into economic outcomes so that it computed the elasticity between the national luminosity value and GDP and assessed the result at the communal sectional level.

The results indicate that a road rehabilitation project led to an increase in satellite night-light luminosity values by between 6 and 26 percent in project-area communities. Taking into consideration the relationship between luminosity and GDP at the national level, it was approximated that transport investments generated between a 0.5 and 2.1 percent increase in the communal GDP of the intervened communal sections during the period of the project.

The main findings of the study strongly emphasize that middle-income households – defined by the level of the distribution of an unsatisfied basic needs indicator – experienced the most gains from the road investment, while there were no significant effects in the richest or poorest areas. This result implies that transport investments by themselves will not be sufficient to reduce poverty and promote inclusive growth. Rather, there is a need for complementary cross-sectoral policies such as those for education, health, and poverty reduction programs. The study also found that most impacts appear four or more years after project approval and that the longer-term impacts are much larger and could be close to a 26 percent increase in luminosity values (i.e., a 2.1 percent increase in GDP)

FIGURE 10.1.1 Deblurred Night-light Luminosity Level Change in Haiti



Source: Mitnik, Sanchez, and Yañez (2018).

Despite the empirical evidence to support the positive effects of transport on rural dwellers, benefits may tend to accrue more to the "non-poor" or "less-poor" and may not reach the most marginalized rural populations (Van de Walle 2002; Starkey and Hine 2014; Cook et al. 2017; Mitnik, Sanchez, and Yañez 2018). For instance, people with more resources at the start of the program are likely to benefit more from the improved access to employment, markets, healthcare, and education, while the poorest may benefit only marginally because they lack the basic assets to take advantage of the improved transport infrastructure. In the case of motorized roads in particular, the effects do not significantly impact those who do not own a motorized means of transport, unless public or private transport services are available. Also, the more remote and isolated the area, the greater the possibility that the other necessary infrastructure, facilities, and market conditions are still underdeveloped and that the road itself cannot generate significant outcomes. Moreover, there is a huge lack of impact studies of other types of transport such as fluvial or air transport for rural communities in the region.

In addition, adverse socio-environmental impacts on rural communities associated with construction and rehabilitation of rural transport infrastructure, and increased traffic to remote locations as a result, should be mitigated. It has been found that all road projects, although to different degrees, can negatively affect the environment in the form of destruction of habitats, degradation of ecosystems, deforestation, and loss of biodiversity (Vilela et al. 2020; Coffin et al. 2021). Additionally, the increased traffic could lead to potential road safety issues such as conflicts between vehicles and pedestrians, as well as the negative consequences for the living standards of rural residents, such as noise or air pollution in project areas. Given the heterogeneity of the rural landscape in Latin America and the Caribbean, the level of rurality and the livelihood strategies can vary depending on the surrounding natural resources. As a result, rural communities and their livelihoods, especially indigenous communities and Afro-descendent groups who more often live in isolated areas, can be significantly affected by large-scale motorized road construction if these impacts are not adequately managed and mitigated.

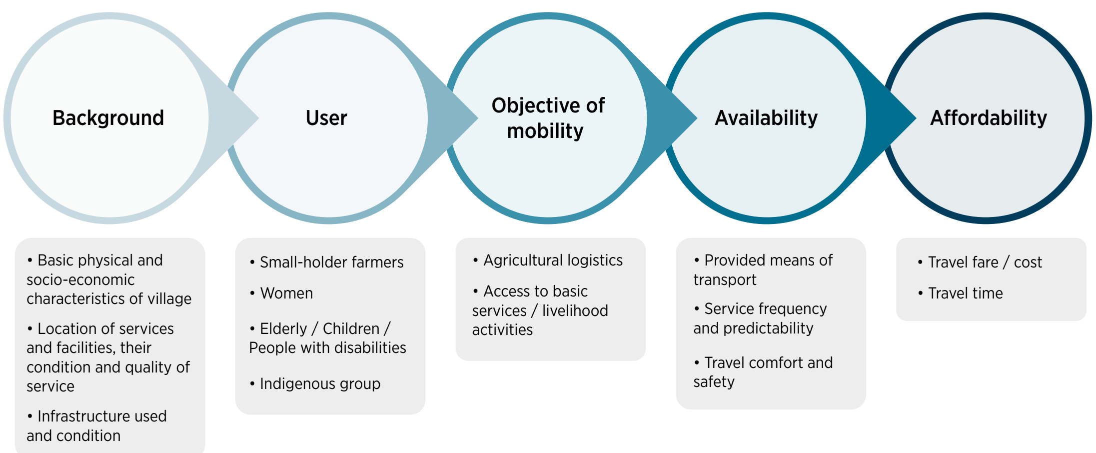
Importantly, the pro-poor impact of rural transport will not be generated solely by infrastructure investment. Those initiatives must be enhanced by complementary measures to accelerate the beneficial impacts for marginalized groups. In other words, the connections between road infrastructure and their impact on poverty reduction cannot be assumed to be straightforward. More studies are needed to understand how rural transport projects and complementary interventions – that is, the combination of available and affordable transport with the provision of equal opportunities in rural economies stimulated by the investment – can be maximized to benefit poor people in rural areas.

10.2 Challenges for Ensuring Rural Mobility for All

Addressing the transport-related challenges faced by rural communities requires a holistic understanding of their needs and mobility patterns, as well as a thorough analysis of the infrastructure to which they have access. Access for all requires better transport infrastructure and services in rural areas that effectively play the important role of connecting people and goods between urban and rural areas where mobility is limited by geographical conditions (SUMA 2019).

Rural transport broadly includes commercial and private passenger transport and freight logistic services that operate within rural areas or between rural and urban areas. It can take place on roads, waterways, or via air. Analysis of rural transport is very community-specific depending on the geographic and social context, and it can be difficult to diagnose, particularly due to the lack of data and dominance of informality. In this sense, a conceptual framework could help to see the holistic picture of rural transport from infrastructure to services. Based on the elements of the tools that have been developed to analyze the needs of users of transport services, the dimension of those needs is shown in Figure 10.2.

FIGURE 10.2 Conceptual Framework for Rural Transport



Source: Prepared by the author based on the IRAP tool (ILO 2003) and Starkey 2013).
Note: The IRAP tool, developed by the International Labor Organization (ILO 2003), is a multi-sectoral and integrated planning tool that addresses the major aspects of access needs of rural households for subsistence, social, and economic purposes. The Rural Transport Services Indicator (RTSI), developed by the International Forum of Rural Transport and Development, measures the supply side of transport services at the community level in order to provide an up-to-date understanding of both the access and mobility issues of rural communities and how various public transport services (conventional and intermediate) are perceived by users, operators, and those concerned with rural development (Afukaar et al. 2019).

The preliminary understanding of the background context of the target community should be prioritized, including its basic geographic and socioeconomic characteristics, level of remoteness considering the locations and distance of necessary facilities and destinations from the community, and available transport infrastructure in use and its conditions. After that, an understanding is needed of the mobility patterns from the user side to achieve the objective of mobility. Some members of the user group could face greater vulnerability due to their physical and socioeconomic conditions within rural populations, and their primary objective of mobility should be met by the infrastructure and transport services provided, which should be complemented by an understanding of the local availability of public or private services and their affordability.

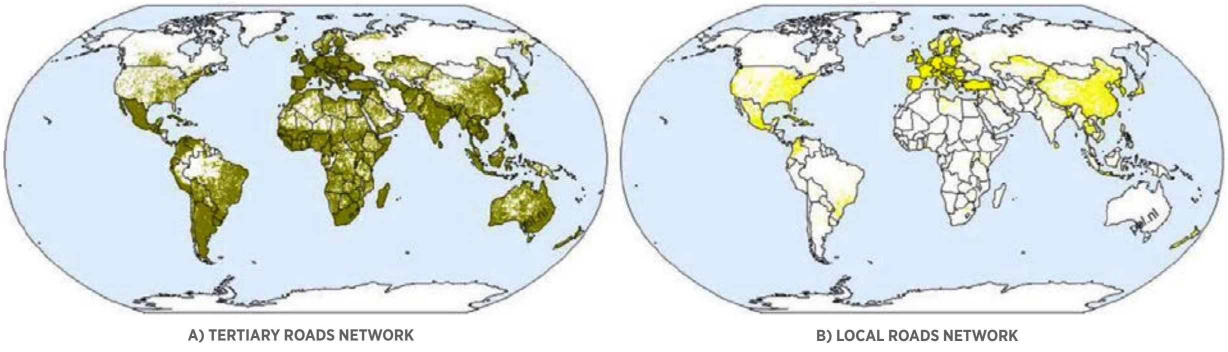
This section thoroughly considers the challenges to guarantee access and mobility for rural residents in the region following the conceptual framework shown in Figure 10.2. It examines the lack of coverage and connectivity caused by the considerable deficit of good-quality infrastructure and the limited mobility of rural populations due to high dependency on non-motorized means of transport and lack of available and affordable transport services. Although rural transport includes a range of transport modes that includes not only roads but also fluvial and air transport, the focus of the analysis here is on road infrastructure because of rural communities' high dependency on it and the scarcity of data regarding the other transport modes. The analysis also looks at the institutional challenges faced by local authorities to ensure inclusive rural transport.

10.2.1 The Role of Transport Infrastructure: Coverage, Connectivity, and Quality

The quantity and quality of available infrastructure determine the extent of connectivity, defined as the capacity to move goods, services, information, and people between different points of a territory in accordance with their needs and interests (Pérez 2020). The main infrastructure-related challenges of rural connectivity in Latin America and the Caribbean are rural road extension deficits and poor road maintenance, as well as the lack of data and adequate indicators to measure accessibility.

The absence of road infrastructure in the region's rural areas is one of the main factors constraining rural communities from having access to transport services (Pérez 2020). Given the geographic conditions and limited financial capacity, many countries in the region have difficulty adequately covering all territories (Narvaez 2017). In most countries, rural roads can include tertiary roads and local road extensions (Box 10.2). According to the Global Roads Inventory Project (GRIP) (Meijer et al. 2018)[3], Latin America and the Caribbean has less dense road coverage when compared to other regions and other road types, and its roads are mainly limited to larger urban areas (Figure 10.3). Table 10.1 shows the available data on tertiary and local road length and the road density for selected Latin American and Caribbean countries at the national level.

FIGURE 10.3 Global Road Inventories of Tertiary Roads and Local Roads



Source: Global Roads Inventory Project (Meijer et al. 2018).

3. The GRIP is a global set of approximately 60 geospatial datasets on road infrastructure. The resulting global dataset covers 222 countries and includes over 21 million km of roads, which is two to three times the total length in the currently best available country-based global road datasets. This dataset is split into five road types: highways, and primary, secondary, tertiary, and local roads (Meijer et al. 2018)

TABLE 10.1 Tertiary Road Extension and Density by Country, 2019

Country	Total Length (km)	Tertiary/Local Road Length (km)	Road Density (Km of roads/km^2)	Year
Argentina	241038		0,09	2016
Bolivia	152.441	104.440	0,14	2017
Brazil	1.580.965		0,19	2017
Chile	85.221		0,11	2017
Colombia	206.500	142.284	0,19	2016
Ecuador	43.670		0,17	2017
Paraguay	32.663	13.849	0,08	2016
Peru	166.765	112.492	0,13	2017
Uruguay	77.732		0,44	2004
Nicaragua	24.515		0,2	2017
Guatemala	17.203		0,16	2017
The Bahamas	2.693		0,27	2000
Belize	4.521	3.134,40	0,2	2014
El Salvador	7.298	486	0,35	2011
Haiti	3.400		0,12	2004
Honduras	16.085		0,14	2016
Panama	16.408		0,22	2017
Costa Rica	44.118	5.961	0,86	2017
Mexico	328.780	144.533	0,17	2017
Jamaica	22.198	2.260	2,05	2017
Dominican Republic	14.211	10.186	0,29	2017
Trinidad and Tobago	8.320		1,62	2010
Venezuela	96.155		0,11	2000

Source: International Road Federation, World Road Statistics Database.

BOX 10.2

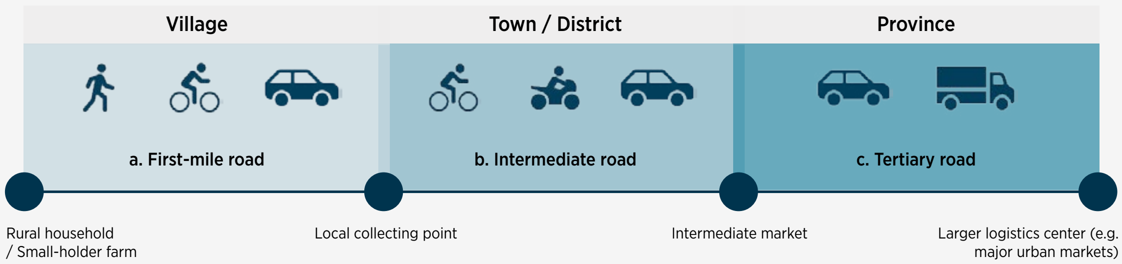
Definition of the Rural Road Network

The definition and the range of rural roads can vary depending on the context of the analysis or the categorization of roads by each country. This is an important point to clarify because any further analysis of road infrastructure in the rural context relies on data classified by road type. The level of improvement should be fit for purpose in accordance with the economic uses or the access of the rural population to public and private service providers (SUMA 2019).

In general, rural roads include all publicly owned roads whose primary objective is to provide rural villages and communities with direct access to economic and social services (Donnges, Edmonds, and Johannessen 2007; Van de Walle 2009). In a narrower sense, rural roads can be defined as small roads, including paths and tracks, within rural areas that typically connect villages with each other or with the main road network, and that are expected to have primarily local impacts (Van de Walle 2009).

The range of rural road typologies illustrated in Figure 10.2.1 shows their uses for both passenger and agricultural logistics, depending on the principal objective of the road considering the different traffic volume and size, keeping in mind that all roads serve multiple purposes, including providing access to basic services.

FIGURE 10.2.1 Rural Road Categorization in Agricultural Logistic Terms



Source: Prepared by the author.

In terms of agricultural logistics, local roads, including the lower level of tertiary roads, can be referred to as first-mile roads and intermediate roads. For this analysis, these two road segments are not officially determined by the legislative framework, but rather depending on the objective of use, the key actors on the road, and the principal means of transport. Although all rural communities in the region have different contexts for their agricultural logistics, it is helpful to understand the mechanism of agricultural transport for people in rural areas where agriculture is the principal economic activity.

A "first-mile" road is a term used figuratively to describe a road used for the movement of produce from the farm to the first collection point to reach commercial markets (that is, the first market in immediate proximity), or a motorable road of large volume, which can refer to a few meters up to several kilometers, depending on the remoteness of the farm. The road may simply be in the local village and consist of farm paths and tracks that are inaccessible to conventional transport vehicles. Since the primary users of the first-mile road segment are the farmers, they should be considered as particularly important from the perspective of rural inclusion. From the first local collecting point, the market traders or merchants transfer the products to an intermediate market through intermediate roads with low volumes of motorized traffic, possibly mixed with non-motorized transport. The primary users of intermediary roads are agricultural traders and those farmers who have their own means of transport (Njenga, Willilo, and Hine 2015).

On a larger scale at the national level, tertiary roads with low to medium traffic volumes that provide interconnection within departments and links to the outside world for villages and agricultural production centers are also classified as rural roads in many Latin American countries.[1] Tertiary roads can offer relatively higher quality and greater service capacity, with higher motorized traffic volume, that attract further increases in private passenger and freight transport services. Tertiary roads play a key role in the agricultural value chain because they facilitate access to bigger logistical centers and markets, such as those in urban areas or ports for exports, as well as to basic social services (e.g., health, education, and other essential services) and the junctions with paved national roads.

1. For example, Paraguay's functional classification of its road network is as follows: (i) Primary or national roads connect the main cities and provide Paraguay's links to the outside world, (ii) Secondary or departmental roads ensure the interconnection of departmental (provincial) capitals as well as the main cities; and (iii) Tertiary or rural roads.

The degree of tertiary and local road network extension and road density in a country serves as a key indicator of the level of territorial connectivity and road infrastructure development for rural areas.[4] While the absolute length and density of the road network does not necessarily mean that the country has a well-developed rural road network, it can provide an indication of its capacity to facilitate access for people, resources, and services between different territorial points as well as function as a catalyst to lead State action to achieve sustainable rural development in the area (Box 10.3). The tertiary road density and multi-dimensional poverty level in Colombia have been shown to be inversely correlated (DNP 2015), regardless of road condition, implying that higher densities of tertiary roads are associated with lower rates of poverty.

4. Road density is calculated as the ratio of the length of the country's total road network to the country's land area or to the total population.

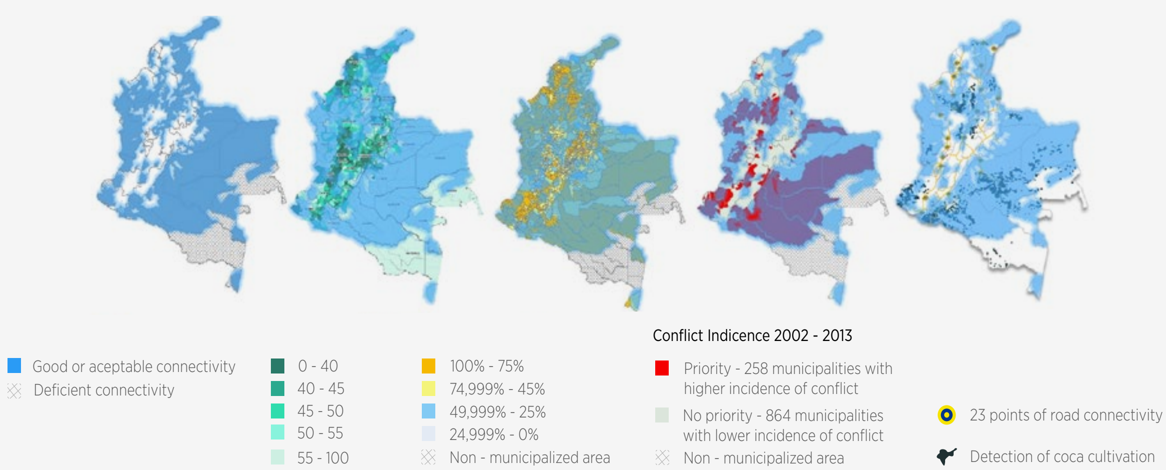
BOX 10.3

The Role of Road Infrastructure in a National Rural Development Program: A Case in Colombia

A rural development program is designed to strengthen the sustainability of the rural economy and improve the living conditions of rural households that contribute to the economic and social development of the entire nation. Road infrastructure is a crucial factor for a national rural development program, helping to facilitate lower costs to transport agricultural products to markets, higher incomes, and lower rates of poverty among farmers.

In the case of Colombia, the incidence of illicit crop cultivation and internal armed conflicts has been one of the barriers hindering the nation's peace-building process. The 2016 National Development Plan noted that areas with fewer good-quality tertiary roads tend to have a higher incidence of multi-dimensional poverty as well as higher rates of illicit crop cultivation (Figure 10.3.1). When marginal farmers, particularly those who do not own land and lack assets, are more isolated from communities and less connected to society, they are more willing to succumb to the temptation to cultivate illicit crops as a unique income source.

FIGURE 10.3.1 Correlation between Tertiary Road Density and the Other Socioeconomic Indices



Source: DNP (2016).
Note: (i) Tertiary road density km/km2, (ii) Rurality index (percent), (iii) Multidimensional poverty index (percent), (iv) High incidence of conflicts, (v) Illicit crop cultivation.

As a post-conflict strategy, Colombia implemented the National Comprehensive Program for the Substitution of Illicit Crops (*Programa Nacional Integral de Sustitución de Cultivos Ilícitos* - PNIS), which aims to eradicate coca cultivation, contribute to peacebuilding, and reduce rural poverty by providing farmers financial incentives under the condition of voluntary substitution of coca cultivation for more sustainable crops, such as fruits and vegetables. Nearly 100,000 rural farms enrolled in the program in 2016, according to the United Nations Office of Drugs and Crime (UNODC).

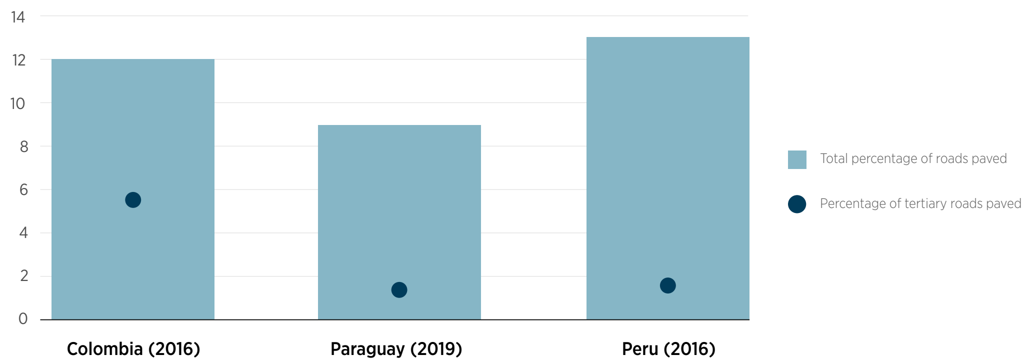
Under the PNIS, 65 percent of the municipalities in Colombia in 2017 participated in the 50/51 of Tertiary Road Plan, whose strategy is to improve 50 km of tertiary roads in the 51 prioritized municipalities for better logistics of agricultural outputs, according to the Fundación Ideas para la Paz (FIP), an independent think tank in Colombia (FIP 2018). In total, 2,550 km were targeted for intervention. Even though the 50/51 Plan was expected to bring about significant progress for people of villages in the project area in terms of benefits from improved rural roads, its coverage is still insufficient at the national level, since the road project under the plan covers only 1.79 percent of tertiary roads in Colombia. Moreover, a household survey conducted by the UNODC of 3,543 households in the 28 municipalities affected by the plan found that 45 percent of households do not have access to the road. In the cases of respondents who do have access, 48 percent considered the road conditions as only "adequate" and another 36 percent described them as "bad."

This highlights the need to further extend the rural road network and provide better accessibility to farmers in Colombia. Without road infrastructure, farmers will incur higher logistical costs to substitute other agricultural products for illicit crops. This deters farmers from making the switch and ultimately threatens the nation's progress towards sustainable and inclusive rural development.

With regard to the quality of road infrastructure, regular maintenance of rural roads is a critical precondition for sustaining the positive impacts that roads bring to rural communities (ADB 2017). Most food producers and traders in Central America are forced to use unpaved roads, and the results from field research show that drivers have to traverse up to 50 km of unpaved roads on average before reaching a paved or tarred road (FAO 2008). In the rainy season, these unpaved roads are inaccessible to conventional vehicles of five tons or more and can only be accessed by pick-up trucks carrying no more than one ton. As a result, poor road conditions interrupt the access of rural communities to larger roads or markets and reduce transport efficiency in terms of operation time and costs, worsening agricultural productivity. Additionally, public and private transport operators are reluctant to provide the transport services because poor road conditions result in damage to vehicles and high operating costs and long amounts of time, which in turn are major obstacles for the producers, since most of them lack their own vehicle to take their products to market.

Although all tertiary roads and rural roads do not need to be paved to be effective for agricultural logistics and passenger mobility, the pavement rate can be one of the principal indicators of road conditions in rural provinces. However, most tertiary and rural roads remain unpaved in the region. According to the GRIP (Meijer et al. 2018), worldwide, most paved roads are found in North America and Europe, whereas most unpaved and only seasonally accessible roads are found in Central and South America and Africa. From 2014 to 2019, the average ratio of paved to total road network of 21 countries in Latin America and the Caribbean was 23.85 percent, ranging from 9 percent in Paraguay on the low end to a high 63 percent in El Salvador (ECLAC 2019). Even though the share of tertiary roads accounts for more than 50 percent of Paraguay's total national network, its pavement rate is very low in comparison with the primary and secondary road network in many countries (Figure 10.4).

FIGURE 10.4 Pavement Rate of Total National Roads and Tertiary Roads (percent)

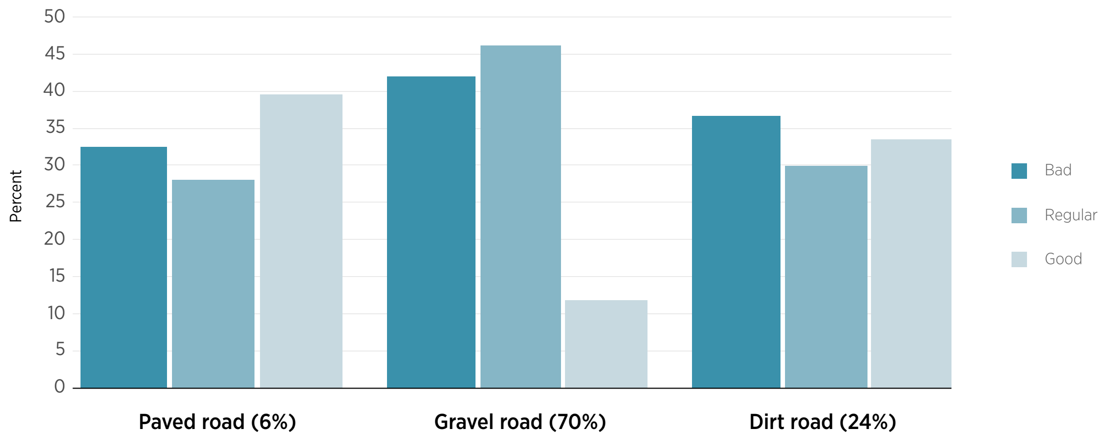


Sources: ECLAC (2019); and World Bank, Country Profiles.

Data on pavement rates for rural road networks at the national level in the region are very limited and only available for Paraguay (2018) and Peru (2016) (World Bank 2019). In Paraguay, rural roads accounted for 74.1 percent of the total road network in 2018, and less than 1.5 percent of them are paved, compared to 91 percent of national roads and 23 percent of departmental roads. Although more systematic data are not available, it can be presumed that most of the 60,000 kms of rural roads are in very poor condition (World Bank 2019). In Peru, 2,430 km (9.7 percent) of regional roads and 1,925 km (1.7 percent) of rural roads are paved (World Bank 2016). Given that the likelihood of pavement is much higher for national highways or primary-secondary roads, it can be assumed that the percentage of paved tertiary and local roads is very low level in many countries in the region. When paving of rural roads is not a feasible investment plan, methodologies should be designed and put in place to maintain unpaved local roads in good condition.

Regardless of the length of a road network, tertiary road networks receive the least maintenance, and their quality is mostly poor and not effectively usable for vehicles as a result (Donnges, Edmonds, and Johannessen 2007). Whether the road is categorized as paved or gravel, its status can vary from good to poor quality. Research by Colombia's DNP (2016) shows that of the 6 percent of the country's roads that are paved tertiary roads, only 39.5 percent are reported to be of good quality and another 32.5 percent are classified as bad quality. Gravel and dirt roads account for almost 95 percent of total tertiary roads, and more than half are described as being in only adequate or bad condition (Figure 10.5).

FIGURE 10.5 Tertiary Road Quality Evaluation in Colombia (percent)



Source: DNP (2016).

As an indicator of the level of accessibility for people in rural areas, the Rural Access Index (RAI) developed by World Bank measures the share of the rural population that lives within walking distance (defined as approximately 2 kilometers) of an all-season, "good-quality" road.[5] In Latin America and the Caribbean, the average RAI was estimated at 59.4 percent in 2006, indicating that physical road infrastructure is inaccessible to around 40 percent of the region's population (World Bank 2016). The estimate for Latin America and the Caribbean is less than the global average RAI (68.3 percent) and compares unfavorably to Europe (81.8 percent) and East Asia and the Pacific (89.9 percent). Beyond this, data at the national and subnational levels are very scarce

5. The RAI is measured by combining three sets of geospatial data – the location where people live, the spatial distribution of the road network, and road condition – by using the parameters such as the International Roughness Index (IRI), Pavement Condition Index (PCI), and visual assessment using four or five categories (excellent, good, fair, poor, and very poor).

in the region, with recent data only for Paraguay and Peru, which scored 42.4 percent (2019) and 37.2 percent (2016), respectively. In the case of Paraguay, the data show the gap in access to paved roads across subregions of the country. For example, in 2019, more than 60-90 percent of people in the capital of Asunción and the Central province had access to paved roads, whereas paved roads in the Norte and Chaco provinces reached only around 27 percent of the population (World Bank 2019). As a result, access to all-season roads in Paraguay is 70 percent universal, but only 42 percent for rural populations.

The advantage of the RAI is its straightforward ability to estimate rural access and the relative ease of data collection, if appropriate technologies are available, compared to conducting household surveys.[6] However, the RAI only measures the infrastructure and does not consider the transport service sector, which is crucial for people's mobility in rural areas (Starkey 2016b). Measuring rural accessibility is challenging because it requires multiple layers of data, including data not only for a complete road network and for road quality, but also data on the provision of public transit and its quality, residential location, and the needs of users and vulnerable groups in the community (SUMA 2017). For example, apart from roads, infrastructure for waterborne and air transport can play a significant role in accessibility for rural communities. However, the measurement of accessibility through different transport modes is often neglected and challenging. Thus, the collection of quality data and adequate people-focused indicators to measure more advanced levels of accessibility covering a variety of types of transport is crucial for effective policy design and implementation planning in Latin America and the Caribbean.

6. Compared to household surveys, measuring the RAI is not complicated if the database is available in the country, since the RAI estimates the rural accessibility at the national level without consideration of other important conditions in the household level such as the availability of transport services, people's time and costs, etc., which could be analyzed by conducting household surveys that require more time and cost (World Bank 2016).

10.2.2 Travel Needs and Mobility Constraints of Low-income and Vulnerable Rural Populations

The connections between road infrastructure and its impact on poverty reduction cannot be assumed straightforwardly. Despite the proven benefits of transport infrastructure investments, the mere existence of a transport infrastructure link, such as a road between two points, is not a sufficient condition to achieve equal universal access (Perez 2020). Instead, the level of accessibility is determined by a host of factors, including the time, effort, and cost needed to access opportunities. Transport service is a necessary component to scale up the level of accessibility by providing the available, affordable, and reliable means of transport to ensure the access and mobility of rural dwellers.

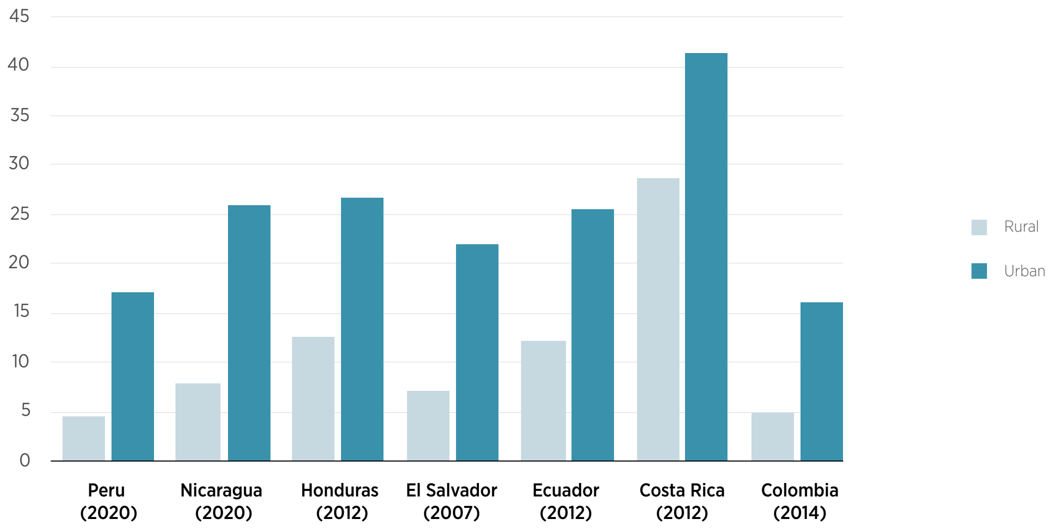
Designing transport services to meet the needs of rural residents is paramount for determining the quantity and quality of transport services in an area. Most rural households in developing countries do not own motorized means of transport and depend instead on public transport services, which are typically operated by the informal private sector (Starkey 2016b; Afukaar et al. 2019) Moreover, some of the user groups in rural areas face additional mobility restrictions due to their physical, economic, and social vulnerability. These barriers in using and providing rural transport services will be discussed in this section.

Lack of Access to Motorized Transport and High Dependency on Non-motorized and Informal Transport

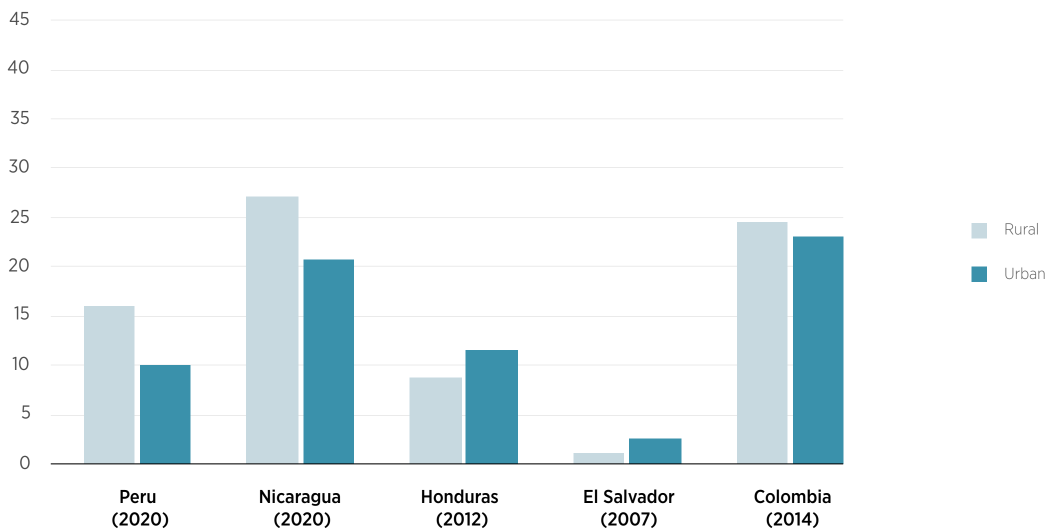
The need for rural transport services is even more relevant when considering the low rate of private motorized vehicle ownership among rural households in Latin America and the Caribbean, and the fact that rural residents depend primarily on non-motorized transport modes for their daily activities. According to the national household surveys conducted in seven countries (Peru, Nicaragua, Honduras, El Salvador, Ecuador, Costa Rica, and Colombia), the share of rural households that possess a private four-wheel vehicle or a motorcycle is much lower than in urban areas. In the case of four-wheel vehicles, the average share in rural areas is around 10 percent, ranging from a minimum of 4.3 percent in Peru to a maximum of 28.3 percent in Costa Rica. The average share for motorcycle ownership (15 percent) is higher than for four-wheel vehicles based on data collected in five countries (not including Ecuador and Costa Rica), with the maximum share of 27 percent in Nicaragua and the minimum share of 1.1 percent in El Salvador (Figure 10.6).

FIGURE 10.6 Share of Rural Households Owning a Private Vehicle in Latin America and the Caribbean (percent)

A) FOUR-WHEEL VEHICLE



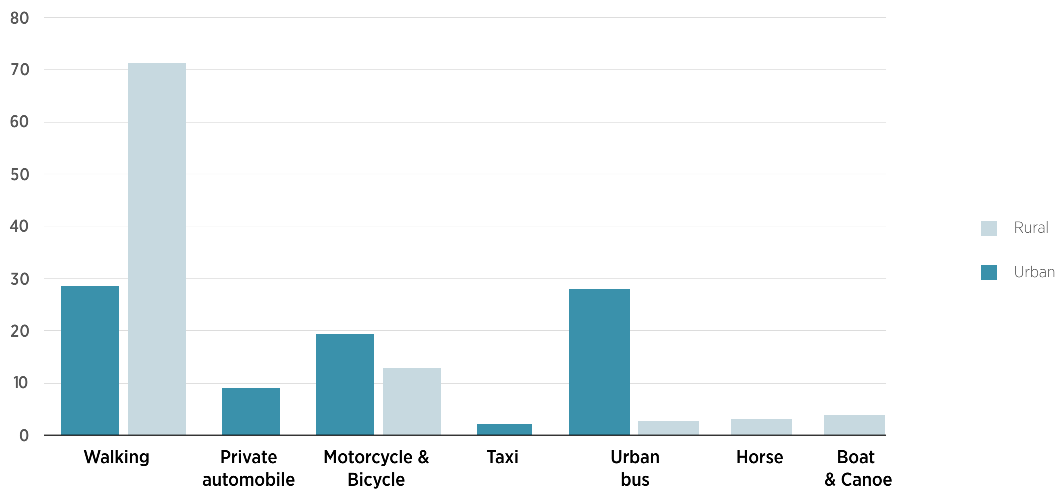
B) MOTORCYCLE



Source: National household survey of each country.

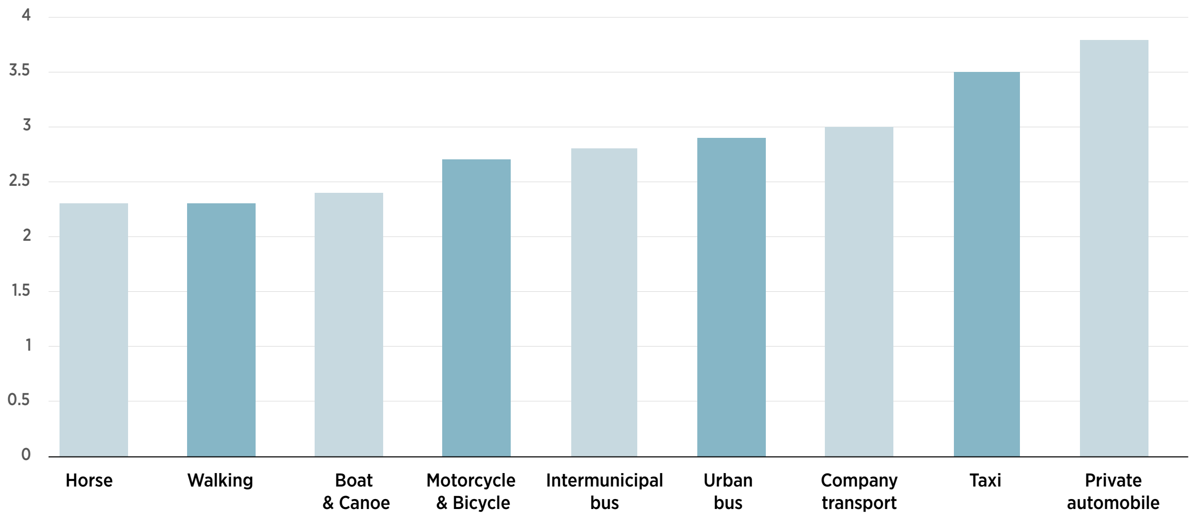
This low rate of vehicle ownership is reflected in the high rates of dependence on non-motorized transport for daily activities in rural areas. In Colombia, walking is the most commonly used mode of transport to traverse rural areas, accounting for 71.2 of percent of commutes to work, while in urban areas 28.6 percent of persons commute walking (Yepes et al. 2013) (Figure 10.7). Motorcycle or bicycle use appears comparably high both in urban and rural areas, at 19.3 percent and 12.7 percent, respectively. Also, the means of transport appear more varied in rural areas, as they also include 3.7 percent of persons who travel by boat or canoe and 3.1 percent by horse. The share of non-motorized transport such as walking or using an animal or a boat also appears much higher than motorized transport among lower income quintiles (Figure 10.8). This implies that more than 80 percent of rural residents, especially low-income people, use non-motorized modes of transport for their subsistence purposes. This should be taken account for policy and project designs, given that transport approaches in the past have mainly focused on transport for economic purposes using paved roads with motorized vehicles, which may result in a limited pro-poor impact (ILO 2003).

FIGURE 10.7 Means of Transport to Work by Area in Colombia, 2011 (percent)



Source: Yepez et al. (2013).

FIGURE 10.8 Means of Transport to Work by Average Income Quintile in Rural Areas in Colombia, 2011

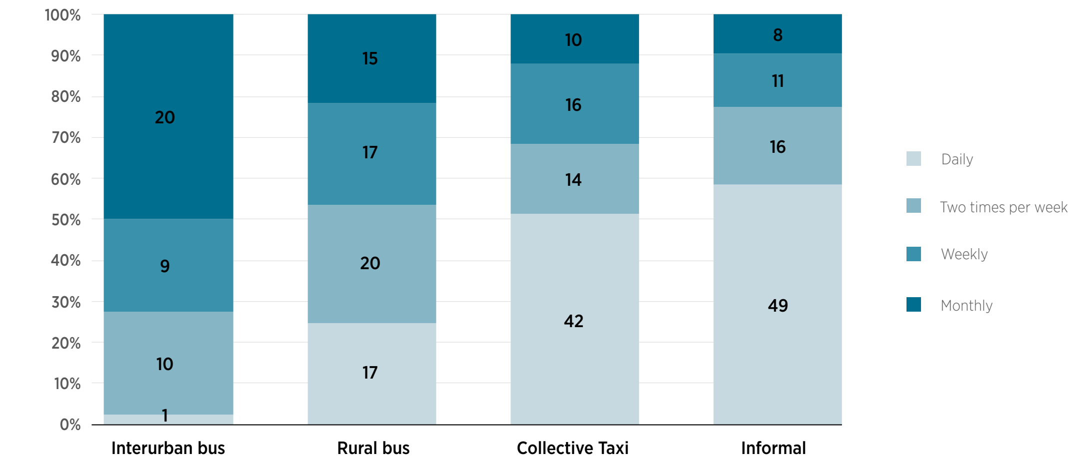


Source: Yepez et al. (2013).

Despite the high dependency on non-motorized means of transport in rural areas, motorized transport services are still indispensable for rural residents to travel the longer distances required, carry out their livelihood activities, and access social services. However, low population densities and low demand in remote areas make achieving economies of scale more challenging and provide little incentive for public and private operators to provide services. In many cases, public transport services provided by local government are poorly funded, neglected, inefficient, and of poor quality.

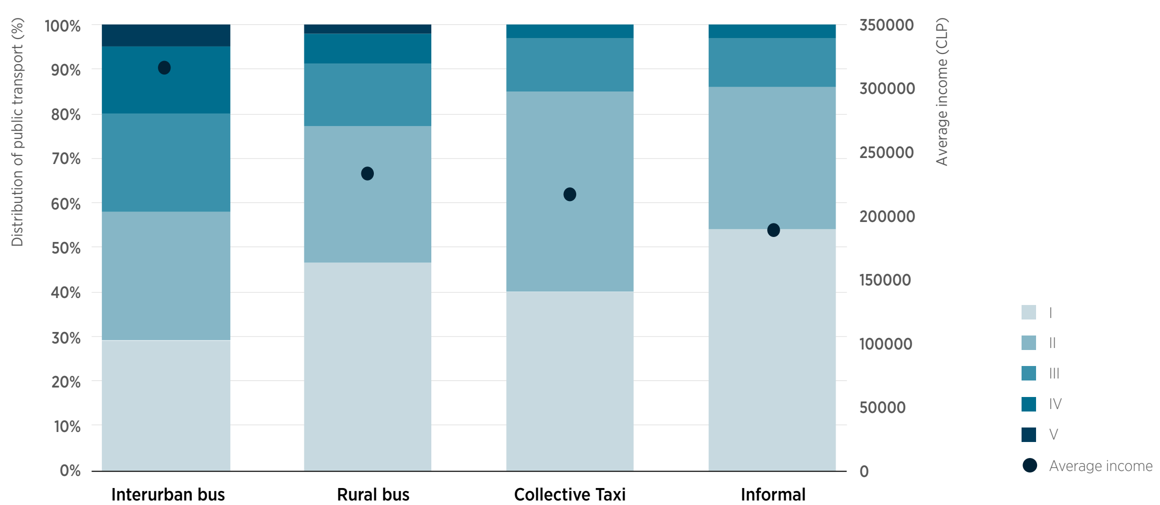
Given the low levels of accessibility to transport services, low-income rural populations become more dependent on the informal transport services provided by individuals on a small scale for their livelihood. A survey on rural and inter-urban public transport conducted in Chile in 2006 shows the frequency of the usage of each type of transport service, the distribution of using each type, and the passengers' average income level. Collective taxis and informal transport are types of transport that rural passengers use more frequently on a daily basis than interurban or rural buses that might operate for a longer distance. Moreover, although the higher proportion of a lower-income group of passengers uses informal transport and rural buses, the average income level is the lowest for informal transport compared to the income level of those using rural buses or collective taxis (Figures 10.9 and 10.10).

FIGURE 10.9 Frequency of Use of Public Transport in Rural/Inter-Urban Chile (percent)



Source: Ministerio de Transporte y Telecomunicacones (2006).

FIGURE 10.10 Income Distribution of Use of Public Transport in Rural/Inter-Urban Chile



Source: Ministerio de Transporte y Telecomunicacones (2006).
Note: Income level: I – up to 190,000 CLP; II – between 190,001 and 310,000 CLP; III – between 310,001 and 430,000 CLP; IV – between 430,001 and 740,000 CLP; V – more than 740,000 CLP. Sample size: 2,829 (Interurban bus – 495, Rural bus – 2,053, Collective taxi – 244, Informal transport – 37)

Informal transport can refer to various forms of vehicles, not only small-sized buses, vans, or trucks. It can also refer to intermediate means of transport that are mainly two-wheel and three-wheel vehicles such as motorcycles or an "adapted" vehicle used as a rural taxi for one or two passengers. In some Latin American countries, mototaxis, which are converted three-wheel motorcycles with an enclosed cabin or bench seat in the rear for passengers and cargo, have become very common in rural and peri-urban areas (Box 10.4).[7] While informal transport may seem unconventional from a modern, urban, and developed-country perspective, millions of such vehicles are in daily use for private and public transport in many developing countries (Afukaar et al. 2019). The use of mototaxis has been "spreading, evolving and morphing into one of the most important forms of ground transportation in the world," with their rapid growth attributable to their "stylistic simplicity, demonstrated flexibility and inexpensive operational cost" (Kumar and Saputra 2014, 67). In 2014, there were more than 9 million tuk-tuks in Thailand and 3 million in India, and some studies have noted that they are fast becoming commonplace on the streets of Central America and South America (Kumar and Saputra 2014; Mbara 2016). However, there is no accurate census regarding their use in the region.

Using mototaxis can have several benefits, such as the flexibility to provide on-demand access and more ample service coverage than formal transport services can realistically provide in remote areas (Cervero and Golub 2011; Starkey 2016a). Three-wheelers and other smaller vehicles, including mototaxis, complement rather than compete with conventional public transport nodes in that they can provide the first/last-mile connectivity between the public transport nodes and the final destination (Mbara 2016). Especially in rural areas where public transport cannot play a key role in fulfilling people's mobility needs, this flexible mode of transport can meet a niche demand in that the vehicles can travel along footpaths and tracks, which can be highly effective in bringing road transport services to villages and households living away from the road and ultimately contribute to improved rural access (Christoffel, Malesela, and Mac 2014; Starkey 2016a). Also, since the fare for such trips can be adjusted at the discretion of the service provider and in response to community-level demand, the fares are likely to be more affordable for rural dwellers than formal transit. In the case of rural passengers who might be carrying some agricultural goods with them, the extra space provided by mototaxis can be useful. Moreover, this mode can play a key role for rural tourism, as tourists can move around an area easily, conveniently, and inexpensively. Finally, driving them as an operator could be one of the non-farm job opportunities for rural dwellers.

Despite the potential benefits of informal transport in rural areas, several operational and safety issues arise. For example, informal transport can be less predictable, which can be inconvenient

7. In Latin America, "mototaxi" is the most common term used in Peru, Mexico, and Ecuador. However, many other terms are also used, such as "caponera" in Nicaragua, "tuk-tuk" in Guatemala, "motoración" in coastal areas of Colombia, and "tricimoto" and "motorcar" in the Ecuadorian and Peruvian Amazon areas, respectively.

for passengers. Also, in the absence of adequate oversight over vehicles, routes, passengers, and cargo, these services may be characterized by unprofessional management and the use of old, unreliable, and poorly maintained vehicles, making operations highly inefficient (and potentially dangerous) for both users and providers. These characteristics may lead to uncompetitive practices and pricing above fair-market levels, while at the same time the user experience may suffer due to poor service quality (Christoffel et al. 2014; Starkey 2016a). In the case of mototaxis, the vehicle itself is vulnerable to crime and can generate some detrimental environmental harm by way of fuel emissions and noise pollution.

BOX 10.4

Mototaxis and Their Regulation

According to Ecuador's National Transit Agency (*Agencia Nacionalde Tránsito* - ANT), mototaxis and tricimotos are among the main modes of transport in rural provinces, especially in rural towns such as Atacames, Pedernales, and Puerto López that are popular with tourists. Mototaxis first appeared in Atacames in Ecuador in 2000, bringing the concept from Peru and India, and the services have since expanded to other regions. Although mototaxis were not accepted as an official means of transport at first, the regularization process of them started in 2015, resulting in around 9,000 mototaxis registered to circulate with more frequent use by local residents.[1]

In order for a mototaxi to be registered as authorized public transport, the following requirements must be met, as defined in 2017 by the Municipal Transit Management Agency (*Dirección de Transito Municipal*):

- Two wheels in the back of the vehicle
- Maximum capacity of passengers of up to four people, including the driver
- Maximum operating velocity of 40km/h
- The vehicle must display the license place and registration certificate issued by the Authority of Municipal Transit (ATM)
- The vehicle must have valid permission to operate authorized by the ATM
- The vehicle must have the GPS that ATM authorized for monitoring of the routes in the assigned areas

San Pedro de Lago Atitlan, Guatemala

Given the recognition of the key role of that informal transport plays for people living in rural areas, the legislation and regularization process for mototaxis can help improve transparency in monitoring supply and demand and improve passenger safety. Informal transport does not necessarily have to be synonymous with illegal transport. The difference between "informality" and "illegality" in terms of public transport is that informal transport provides mobility services to users that are distinct from the traditional and typical public transport, while illegal transport refers to vehicles that are not allowed or authorized to provide such service.

There is an urgent need to close the data gap to understand how mototaxis and other informal transport modes can contribute to improving daily mobility of people in rural or peri-urban areas and to identifying the potential and constraints of expanding them as principal transport services. In this sense, there is a need for further research from the following perspectives:

- Identify the operational characteristics of mototaxis with data on the socioeconomic aspects of drivers, vehicle maintenance, transit supply and demand, management, etc.
- Collect census data on local passengers regarding their transit patterns, including the objective of their mobility and their numbers of trips, their socioeconomic characteristics, and their experience in terms of accessibility, affordability, comfort, and security when using mototaxis for their livelihood activities
- Research existing public policies about mototaxis such as governmental regulation and legislation processes, dynamics and impact in the transport market, etc. in the region

1. *El Diario*, "Las Mototaxis atraen a visitantes," February 7, 2017 (https://www.eldiario.ec/noticias-manabi-ecuador/422022-las-mototaxis-atraen-a-visitantes/).

With regard to transport service generation, it has been shown that improved road conditions can affect the quantity and quality of transport services because operators become more willing to deploy newer and better vehicles and operate more frequently and at lower fares (Christoffel et al. 2014; Asher et al. 2018). The evidence from Peru's RRP-PROVIAS RURAL Program showed a positive impact on the supply of transport services, with an increased amount of transport by automobiles and buses, and as a result, a decrease in prices for passengers, making travel more affordable during the four years that the impact study was conducted.

Yet, the relationship between new rural road construction and rehabilitation is still not straightforward (ADB 2017). There is a lack of knowledge and analysis about the generation and management of rural transport services – for example, how the supply mechanism and transport fare strategies are established in rural areas, and how routes are decided by individual providers (Christoffel et al. 2014). In addition, because measuring the new supply of transport services is not easy in rural areas, the focus of the impact studies has been mostly on quantifying only the effects of the change in travel costs and time or in household income growth due to changes in the prices of agricultural products. A deeper analysis of the generation of new transport services or transport patterns is still lacking (Christoffel et al. 2014). It could be also argued that if there is not enough demand for transport services, transport providers will offer the services at high fares and still not be incentivized to improve quality due to the lack of competition, despite the presence of a new road. It could well be that the benefits will naturally appear only over the longer term, when additional infrastructure and facilities are built that stimulate other economic activities (ADB 2006).

Understanding Mobility Needs and the Vulnerability of Rural Residents

Vulnerability and poverty are not experienced equally by all those who live in rural areas. Depending on ownership of agricultural assets, gender, ethnicity, and physical conditions, the likelihood of accessing economic and social opportunities can vary, as can accessibility to and affordability of transport. Although the level of accessibility to basic facilities is fundamentally lower in rural areas than in urban areas, some specific user groups in rural areas, such as small-holder farmers, women, the elderly, children, persons with disabilities, and indigenous peoples, face bigger barriers to meet their mobility objectives due to economic and social vulnerabilities that impede their ability to improve their livelihoods.

Small-holder or family farmers who are involved in small-scale production largely based on family labor account for about 81 percent of agricultural activities in Latin America and the Caribbean, where the number of family farmers was estimated to be around 16.6 million in 2010 (Leporati et al. 2014). However, two-thirds of family farmers in the region tend to face greater vulnerability and poverty because of severe limitations such as a lack of land ownership, agricultural assets, and access to quality education and social services, technologies, financial services, and markets (Berdegué and Fuentealba 2014).

Connecting small-holder farmers with markets is paramount to support the success of commercial farming activities, which constitute the main source of household income.[8] Most small-holder farmers use their agricultural output for their own subsistence, yet simultaneously they pursue commercial farming for income generation. However, the connection between small-holder farmers and markets is disrupted by many factors, and one of them is the high logistical and transport costs in the first mile of the production chain. Since many small-holder farmers do not have motorized vehicles or trucks, the first-mile logistics to move their agricultural products impedes the efficient marketing of their production and their ability to reach markets and logistics hubs, resulting in reduced farm-related income, a high burden of household expenditure on transport, spoilage of agricultural products, and lower economic welfare (Box 10.5). In this circumstance where farmers lack complementary infrastructure to assemble and consolidate their produce for collection and are more dependent on low-cost collection points without controlling temperature and ambient conditions, this first stage of transport has been found to be a critical transport bottleneck for perishable agricultural produce such as fruits and vegetables.

8. In Peru, 64.1 percent of small and medium-scale farmers sell 77.6 percent of their total production in the market (INEI 2012).

BOX 10.5

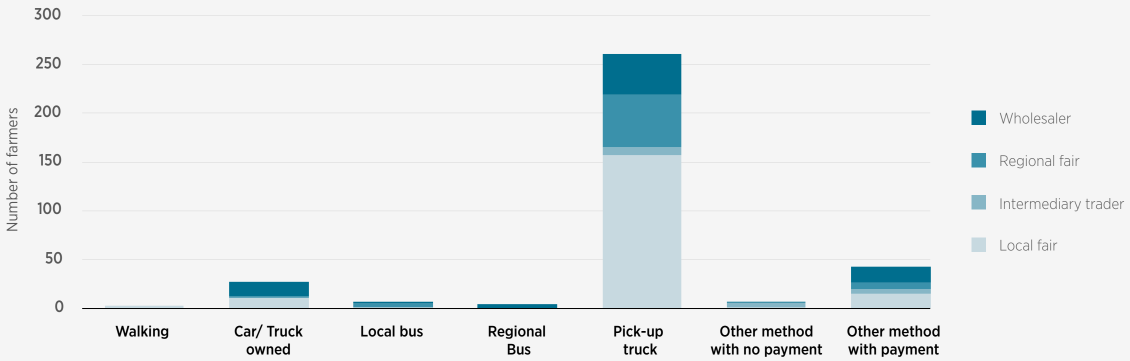
Small-holder Farmers on the Move: Case Study in Chimborazo, Ecuador

The department of Chimborazo in the Sierra region of central Ecuador has a population over 450,000 inhabitants, of whom around 65 percent are identified as indigenous, and 48 percent live in rural areas (Corral and Zane 2021). In 2010, 67 percent of the population was found to be poor, and 90 percent of the farmers had between 1 and 5 hectares of land for agricultural production, which classifies them as small-holder farmers. This number accounts for around 59 percent of the total small-holder farmer group of the national level (Chiriboga Vega 2015).

Source: Wikipedia.

A household survey was conducted during the impact evaluation of a rural road rehabilitation and improvement project implemented by the Chimborazo provincial government from 2013 to 2018, with funding from the Inter-American Development Bank (IDB) (Corral and Zane 2020). In total, around 1,300 households in 30 communities participated in the survey, which examined the principal transport mode and main selling points of principal crops in the area, including potatoes, corn, haba, chocho, and barley (Figure 10.5.1).

FIGURE 10.5.1 Survey of Main Transport Mode for Agricultural Products and Selling Points Used by Farmers, Chimborazo, Ecuador



Source: IDB household cultivation survey, 2015.

Of the 352 farmers surveyed, around 45 percent used a pick-up truck to sell their products in local markets. The average distance from the farm to those markets was calculated to be around 28 kilometers. In general, small-scale farmers in Ecuador sell their agricultural products in one of two ways: (i) Directly in local markets (that can be held weekly in local community centers) and at local collection points where farmers can leave their products, and (ii) To intermediary traders who visit their farms with their own means of transport and bring the farmers' goods to wholesalers or bigger markets (Chiriboga Vega 2015). Depending on the production scale, geographic conditions, and community situation, the role of local markets and intermediary traders can be more or less important. In Chimborazo, small-holder farmers primarily sell at the local market, since their product volumes are too small to attract intermediary traders. Some of the farmers may consolidate the loads they take to market in order to reduce logistics costs, which could be considered a form of strategic planning in terms of their rural road network.

Achieving optimal efficiency of agricultural value chain logistics for small-holder farmers by minimizing the financial costs and time of getting their products to market is key to alleviating poverty and ensuring food security for all. For small-holder farmers, first-mile logistics are found to be a burden because of higher transport costs per kilogram (Njenga, Willilo, and Hine 2015). Alongside transport projects, then, understanding sales patterns and strengthening the sustainability of the agricultural transport chain from farmers to the marketplace will help maximize the impact of road infrastructure and logistic services.

Women in rural areas in Latin America and the Caribbean have a higher incidence of poverty and extreme poverty than men. According to FAO (2018), between 2007 and 2014, the femininity index for both rural poverty and extreme poverty in the region, as calculated by the number of women in poverty divided by the number of men in poverty (Nobre et al. 2017), increased from 108.7 to 114.7 and from 113 to 114.9, respectively. The higher incidence of poverty among rural women is significantly related to women's lack of ownership of household assets, quality education services, and mostly unpaid family work involvement that constrains women's ability to have an independent source of income. In many countries of the region, a significant proportion of rural women perform unpaid family work, with levels varying widely by country (FAO 2018).[9] In 2014, 39 percent of rural women over 15 years of age in the region did not have their own income, whereas only 12.7 per-

9. For example, in Chile, 67 percent of rural women are salaried employees and only 1.5 percent are unpaid family workers, but in Peru the situation is reversed, with only 14 percent of rural women working as salaried employees and 43 percent as unpaid family workers (FAO 2018).

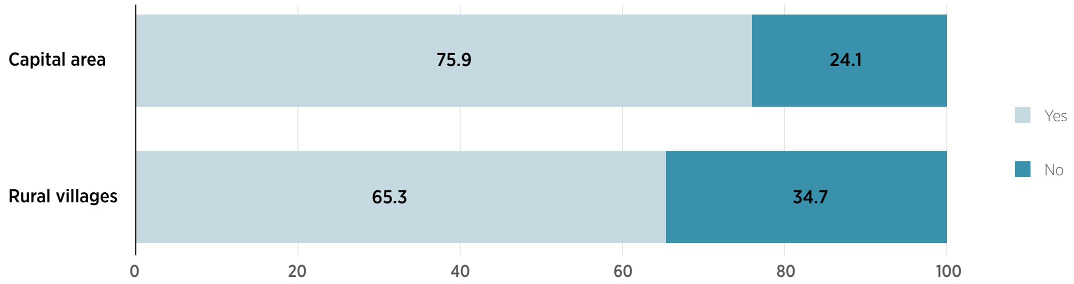
cent of rural men did not have their own income. Against the backdrop of limited economic and social opportunities, the lack of accessible and affordable transport services for women widens the gender gap in rural areas.

Ensuring women's access to safe, reliable, and affordable transport services is crucial for their participation in economic activities and to facilitate multiple family and community activities, yet as in the case of urban transport (see Chapter 2), travel patterns are not gender-neutral for multiple gender-related reasons, including tradition, access to resources, and security (Starkey 2016b). Women generally have less access to monetary resources than men, and transport affordability, as well as a high dependence on non-motorized transport modes, can be a barrier to accessing opportunities (Starkey, 2016b; Kemtsop and Starkey 2013).

Also, safety concerns may discourage women from using public transit both in urban and rural areas. In rural areas, women have more limited time to travel because, while an all-day return trip to the market town may suit men, women may prefer a later departure and earlier return to ensure dependability of the return transport (Starkey 2016b). Women are less likely to travel on the top or on the sides of vehicles, which is normal in rural locations due to the shortage of public transport. This makes meeting their transport needs inefficient and time-consuming for women in rural areas (ADB 2017).

Elderly persons living in rural areas are increasingly disconnected and lack access to basic services such as medical facilities (Okumura et al. 2020). Fewer opportunities to access medical facilities can threaten the health of the elderly in rural areas by preventing them from accessing appropriate medical services in emergency situations. Opportunities for regular medical consultations are also much scarcer for rural inhabitants than for people living in urban areas, given the low number of medical facilities, the long distance and time required to reach dispersed clinics, and the deficit of adequate rural transport solutions. According to the National Quality of Life Survey (DANE 2015), the percentage of rural dwellers in Colombia in 2015 who had preventative medical consultations at least one time per year was 65.3 percent, lower than the 75.9 percent figure for people living in urban areas (Figure 10.11). Enhanced accessibility via the provision of better public transport services to medical facilities in rural areas has been shown to ameliorate the perception of the elderly of their health status as bad or very bad, and its impact was greater especially among the elderly with worse health conditions (Yi and Kim 2015).

FIGURE 10.11 Distribution of Percentage of Yearly Medical Consultations in Colombia, 2015



Source: DANE (2015).

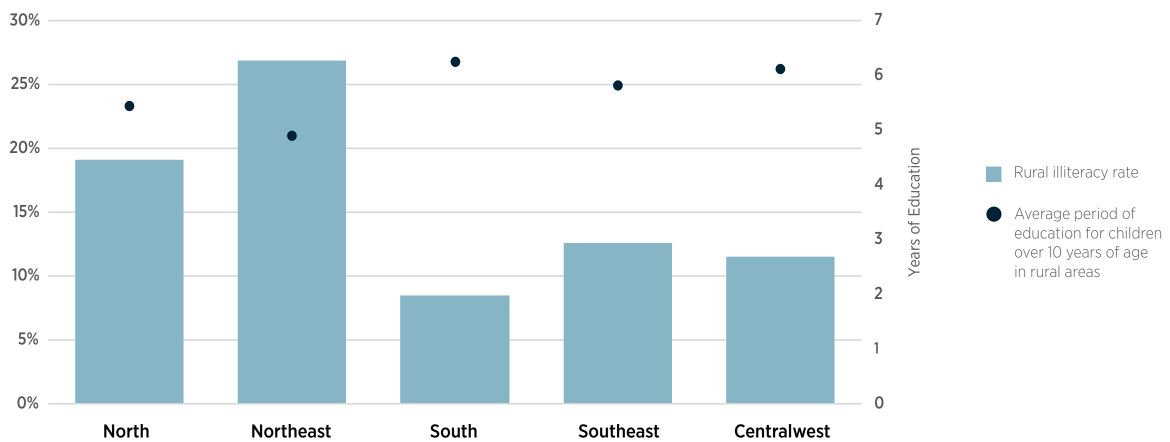
Access to adequate and safe transportation to attend school, regardless of geographic remoteness, helps secure children's right to education. In rural areas, children often must travel long distances to reach schools, which has repercussions on grade repetition, school dropout rates, and social exclusion, and may induce early entrance of children into the job market (i.e., agricultural activities). Another associated problem with long travel time to school is that children have less time for recreational activities, such as spending time with their families, sports, and other types of physical and emotional development activities that are fundamental for a child's learning process.

For example, in the Municipality of Onzaga, Santander (Colombia), the community complained about the long distance that children had to walk to reach the nearest school because of the lack of a proper transport system from farms located in different villages. This case was taken to the Constitutional Court of Colombia, which ruled that education is a fundamental right that cannot be denied to low-income families and mandated that the states guarantee transportation to schools for children living in rural areas (Colombian Constitutional Court 2016[10]). The ruling established the obligation to provide transportation for children when the closest educational institution is far from their home, making education accessible both from a physical and economic point of view.

Also, Figure 10.12 compares the level of illiteracy and average years of education for children over 10 years of age in rural areas in Brazil. The Northern Region shows the lowest levels of educational attainment, as indicated by low levels of literacy and a shorter education period. As the provinces of the Northern Region have many rural communities that use waterway transport on the Amazon (UFT 2012), the monthly cost of school transport for waterways and average daily hours of operation are higher than for roads, as shown in the Table 10.2. The average daily operation hours of rural school transport in waterway can be as long as two hours, which disrupts children's commuting to school.

10. https://www.corteconstitucional.gov.co/relatoria/2016/t-008-16.htm

FIGURE 10.12 **Rural Illiteracy Rate and Average Years of Education in Brazil**



Sources: Instituto Brasileiro de Geografia e Estatística, PNAD - National Household Sample Survey, 2015 (https://www.ibge.gov.br/en/statistics/social/education/18079-brazil-volume-pnad1.html?=&t=resultados).

TABLE 10.2 **Rural School Transport Cost and Time in Northern Brazil**

	Monthly Rural School Transport Cost per Student by Road (Brazilian real)	Monthly Rural School Transport Cost per Student by Waterway (Brazilian real)	Rural School Transport Average Daily Operation Hours (Waterway) (hour)
North	99.57	111.63	2.35
Northeast	61.05	104.16	1.9

Source: Report on the Cost of Rural School Transport in Brazil (Universidade Federaldo Tocantins 2012).

Issues of accessibility of transport for persons with disabilities are even more magnified in rural areas. There is less road safety for these persons, and the gaps in universal access are more pronounced, considerably affecting their quality of life. The types of vehicles generally used in rural areas are not accessible to persons with disabilities. Therefore, persons with disabilities in rural areas have to travel in whatever way they can figure out, often at their own risk in vehicles that are not adapted to protect them. This leads to persons with disabilities in rural areas having a higher risk of poverty and social exclusion.

In Latin America and the Caribbean, indigenous groups, native communities, and the Afro-descendent population account for large shares of the population in rural areas. On average, 51 percent of indigenous people in the region live in rural areas, though the level varies by country. In Brazil, Panama, Colombia, Ecuador, and Honduras, more than 70 percent of indigenous people live in rural areas (Freire et al. 2015). Indigenous groups and native communities have a higher incidence of poverty and social exclusion due to historical and cultural factors and geographical isolation. As highlighted in Chapter 1, and according to ECLAC (2019), the incidence of poverty among indigenous group and Afro-descendants are on average 1.62 times and 1.32 times higher, respectively, than that of non-indigenous and non-Afro-descendent people in rural areas (ECLAC 2019).

Many rural communities in Latin America and the Caribbean, especially native communities, live on inland waterways such as rivers, lakes, and wetlands. For example, in the Amazon area of Brazil, Colombia, Bolivia, and Peru, native communities depend for their daily livelihoods on fishing for both subsistence and income generation and other commercial activities. In Peru, around 76.7 percent of native communities use a boat as a means of transport to visit the community center, according to the 2012 National Agricultural Census. Despite their importance, however, inland waterway transport infrastructure and services are still underdeveloped and have received little attention in the region. Under the circumstance of seasonal differences of the water level and non-availability of the alternative road network due to environmental conservation, there is a considerable deficit of transport services for cargo and passengers, long operation times, and high costs, resulting in stranded and isolated communities with low human development rates.

10.2.3 Institutional Challenges for Rural Transport Development

The role of local institutions is particularly critical in rural transport development since the authorities and responsibilities in administrative and management processes have been decentralized in many countries in the region. Decentralization is defined as transferring the control of an activity or organization to several local governments, rather than one central government. In terms of rural transport, decentralization can represent an improvement in the sense that responsibilities are clearly defined and better carried out by specific local government units, so capital and human resources, which tend to be easily neglected by the central government, can be effectively allocated to manage rural roads.

Despite the advantages of decentralization, however, the administration and management of rural roads are often less organized due to the high level of bureaucracy (ADB 2017). The responsibility to manage rural roads is sometimes assigned to a non-technical transport ministry with limited technical capacity or distributed among several different agencies such as ministries of agriculture, rural development, public resources, or infrastructure (Donnges, Edmonds, and Johannessen 2007). If the scope of what "rural roads" means is not clearly defined, proper prioritization, project management, standardization, and optimal budget allocations can overlap and become inefficient. This can happen, for example, when tertiary road development is the responsibility of the Ministry of Transportation and Infrastructure, but local roads or roads categorized as "rural" are the responsibility of the Ministry of Agriculture and Rural Development. This poses challenges of inter-ministerial coordination for projects in terms of institutional hierarchies, linkages between central, regional, and local governments, and relations between horizontal institutions involved in agriculture, the environment, and transport infrastructure. Also, independent local entities sometimes assume responsibilities for rural road maintenance, and the maintenance process can be inefficient due to local corruption and lack of capacity.

From the economic perspective, the linkage between investment and economic return of national highways and primary roads is much clearer than for rural roads. Local roads in particular, are not principally for an economic investment; rather, the socioeconomic benefits come in the longer term. The lack of direct incentives to improve rural transport infrastructure for local governments also needs to be addressed. Moreover, local government entities often struggle with deficits of financial resources and technical capacity to improve and rehabilitate road density and maintain good road quality. Complementary interventions for local entities, such as a subsidy program targeting vulnerable groups and regular road maintenance, can also be impeded if there is a lack of sustainable financing, technical monitoring, and institutional capacity for project supervision.

Apart from infrastructure, the role of government in the provision, management, and supervision of transport services and agricultural logistics in rural areas is often obscure. The traditional assumption governing the development of rural roads is that investment in roads will spontaneously lead to the provision of transport services by the private sector as passenger and freight operators benefit from lowered vehicle operating costs and travel time savings (Mbabazi 2019). As a result, the government may wait for market and competitive forces to drive the provision of transport services in rural areas without taking an active role.

The existence of data gaps, low data quality, and non-availability of adequate indicators impedes data-driven decision-making by policymakers, exacerbating the invisibility of rural infrastructure inventories and the socioeconomic status of rural inhabitants. Data collection in rural areas is much more difficult than in urban areas because small communities are dispersed and usually have lower response rates to national surveys due to the lack of Internet access. As a result, engineers at the local level must rely on old and outdated statistics, which results in a huge inefficiency in the prioritization and design of road projects. The outdated rural road data are nonetheless still included in the road network inventory, which causes confusion for decision-making by local authorities (Donnges, Edmonds, and Johannessen 2007).

10.3 A Step Towards Rural Development through Sustainable and Inclusive Rural Mobility

Leveraging the pro-poor impact of rural transport requires comprehensive design and implementation of policies and projects that reflect the critical role of mobility in rural development. In rural areas, transport benefits depend heavily on interactions with other infrastructure, as well as geographic, community, and household characteristics. Rural transport itself cannot solve the many external and structural factors of rural poverty, including climate conditions, lack of land ownership, remoteness, a lack of market-incentive mechanisms, and volatile terms of trade of agriculture. However, rural transport is indispensable as a catalyst to contribute to the coping strategies of rural poverty alleviation (ADB 2006). Therefore, multi-dimensional factors that exacerbate rural poverty and exclusion in the region should be fully understood prior to designing strategies to address them. Rural transport needs to be designed and implemented with complementary interventions conceived to multiply the economic and social benefits for rural communities and to help mitigate their vulnerabilities.

Effective policy actions to enhance rural connectivity and accessibility in the region are broadly classified into the following strategies: (i) Higher road density and quality improvement with inclusive prioritization of project areas; (ii) Community participation in employment and gender-inclusive road projects; (iii) Synergetic interventions to achieve rural development alongside transport projects; (iv) Consideration of reliable, safe, and affordable rural transport services; and (v) Institutional capacity-building for sustainable financing and post-project monitoring and evaluation. Each policy area includes the identified strategies that can enhance the impact of transport on reducing poverty in rural areas. The policy actions are outlined in more detail below and then summarized in Table 10.2.

10.3.1 Higher Road Density and Quality Improvement with Inclusive Prioritization of Project Areas

Broadening accessibility through higher road density and quality improvement of tertiary and local roads is essential to enhance the rural economy and improve rural access. However, due to the limited financial resources invested solely in rural transport infrastructure, balanced allocation of financial resources and prioritization of project areas is crucial to bring about the biggest economic and social impact possible in the short and long terms.

In this regard, rural transport infrastructure and services should meet three criteria: (i) Ensure economic feasibility; (ii) Amplify the economic and social benefits to vulnerable people living in the project areas; and (iii) Guarantee environmental sustainability of the projects (McNish and Granada 2013; Vilela et al. 2020). It is challenging to emphasize the long-term social benefits of rural transport infrastructure, since governments might have a strong incentive to invest primarily in areas with higher potential in order to generate instant positive economic benefits to the national economy, a decision that can leave behind those areas with lower potential for short-term economic outcomes, resulting in unbalanced territorial development. Moreover, traditional approaches to determine investments in infrastructure, such as cost-benefit analysis, do not accurately capture the indirect economic, social, and environmental impact of infrastructure in monetary terms. That mid- to longer-term impact should be considered in terms of land value changes and additional income generation through diversified economic activities in rural areas.

Therefore, more inclusive and sustainable project prioritization should be encouraged using innovative methodologies to identify the most cost-effective way to maximize social and environmental impacts on rural communities. Considering the limitations of traditional methodologies to reflect the socioeconomic impact of projects, the role of local government and the full participation of local communities are crucial to the entire process of designing and managing projects, from the selection of routes to impact evaluation, since more accurate information can be provided by local groups that better understand their urgent needs and the factors affecting the decision to use transport services. This participation and the input resulting from it improve the ability to design appropriate transport infrastructure to serve the needs of rural areas.

10.3.2 Community Participation in Employment and Gender-inclusive Road Projects

Regular road asset management is crucial in rural areas to ensure good road conditions and prevent their deterioration over time. Community participation through employment in labor-intensive road projects – including not only construction and rehabilitation but also maintenance – has always been encouraged to provide rural dwellers with opportunities to participate in additional income generation and capital accumulation for the initial start-up or purchase of agricultural assets. In particular, rural road maintenance managed through local microenterprises has been demonstrated to be a comparatively low-cost intervention that helps to ensure the sustainability of infrastructure investments in the long term while at the same time providing employment for low-skilled workers from the local area. Rural communities suffer from under-employment, and these additional job opportunities have proven to be the most cost-effective way to bolster inclusive local employment (ADB 2017). Thus, it is necessary to help local governments establish and manage microenterprises and cooperatives to enhance the double impact of economic efficiency and social equity. Local microenterprises still face the challenges of administration and management with insufficient civic and social capital to handle such matters as legal contracts, fiscal sustainability, and monitoring and evaluation (Escobal, Inurritegui, and Benavides 2005).

This local employment through microenterprises for road maintenance can also provide economic opportunities for women, who not only have little access to paid jobs that may require greater skills but also suffer from cultural restrictions in labor markets. PROVIAS RURALES in Peru generated nearly 6,000 jobs, with 25 percent of them filled by women (McSweeney and Remy 2008). The impact study of the Bolivian Road Conservation Program Using Microenterprises (PROVIAL) (Bonfert et al. 2021) also showed that women employed for rural road projects, especially non-motorized road maintenance, were empowered in the various dimensions of their individual agency, such as a shift of less time-sensitive household responsibilities towards men, increased self-esteem and social status, and improved economic wellbeing.[11]

Still, more inclusive selection processes for local labor participation need to be encouraged, since the level of employment of women and marginal groups in road projects still tends to be low and temporary (Casabonne, Jimenez, and Muller 2015; ADB 2017). Explicit quotas for the employment of women and a variety of recruitment strategies to equally distribute the opportunities are strongly recommended. In addition, assessing the impact of this injection of cash flow from rural road program employment on the livelihoods of local workers by analyzing changes in the functioning of rural household consumption can be important to understanding their strategies for coping with poverty. For instance, such analyses can help to understand the extent to which short-term income increases are used to invest in agricultural assets or start-up capital, access and use educational/medical services, pay debt, build savings, or other activities.

10.3.3 Synergetic Interventions to Achieve Rural Development Alongside Transport Projects

Synergistic interventions accompanying road projects should be integrated to amplify and diversify the economic impact of improved rural-urban connectivity on the profile and structure of rural economies. Developing cross-sectoral programs to support agri-business and agricultural extension services for local producers and rural households in the project area can boost the economic development of local communities. This is an essential step to strengthen first-mile logistics for farmers in order to build efficient agricultural logistics for freight and a systematic value chain re-

11. Individual agency is defined as an individual's (or group's) ability to make effective choices and to transform those choices into desired actions and outcomes (World Bank 2015).

inforced through improved transport. Such interventions should be moderated and integrated by multisectoral entities working in rural development and the agricultural sector.

For example, Peru's Local Development Window Program, designed and supported in 2001 by the Ministry of Transport and Communications, was implemented alongside a road project and had a significant impact on local development by helping a small association of rural producers develop business plans, obtain funding from various sources, and strengthen the public sector's involvement in rural development (Paredes and Pinch 2014; Casabonne, Jimenez, and Muller 2016).[12] These interventions had a positive impact on poverty reduction, income generation, and economic diversification by creating employment and improving education levels (Paredes and Pinch 2014).

In addition, driven by growing interest in exploring Latin America and the Caribbean's natural assets, culture, history, and gastronomy, rural tourism has the potential to be a major employment engine to inject new economic demand and revitalize rural economies (UNWTO 2020; Alcívar 2020).[13] Rural tourism also has the potential to reduce poverty in rural areas by bringing new economic and social benefits through the creation of local economic activities and employment such as commercial activities, including the sale of craftwork or traditional products. (Dirven 2019; Pérez 2020).

10.3.4 Consideration of Reliable, Safe, and Affordable Rural Transport Services

Government should take an active role in facilitating reliable, safe, and affordable transport services for passengers and freight in order to encourage the full use of rural transport infrastructure (Cook et al. 2017). Road infrastructure programs should also deliberately consider transport service as a core element and ensure that transport planners develop integrated strategies to address poor transport service issues (Starkey et al. 2002). Depending on population density, the level of supply, and the demand for transport services and average incomes, different interventions and regulatory environments are required to develop appropriate levels of competition in the transport service sector as a precondition for development (Starkey et al. 2002; ADB 2006; SUMA 2019). For example, instead of over-emphasizing competition as a means of promoting better rural transport services,

12. Programs within the Development Window Program include various activities ranging from local production to rural tourism. Example in the provinces of San Martín, Lamas, El Dorado and Picota in the region of San Martín, Peru include support for value addition to local products such as coffee, cacao, milk, tobacco, and leather, industrialization of production systems, and support for the development of tourist accommodations (Paredes and Pinch 2014).

13. Rural tourism is defined by the United Nations World Tourism Organization as "a type of tourism activity in which the visitor's experience is related to a wide range of products generally linked to nature-based activities, agriculture, rural lifestyle and culture, angling and sightseeing" (see https://www.unwto.org/rural-tourism#:~:text=UNWTO%20understands%20Rural%20Tourism%20as,%2F%20culture%2C%20angling%20and%20sightseeing).

cooperative and self-organizing approaches might be more beneficial to users in marginal markets with lack of supply of transport services, since the evidence shows that rural mobility benefits significantly from the differentiated service hierarchy for route allocation in rural roads involving a variety of vehicle types suited to different operating conditions. Thus, the government should take a role in supporting this market mechanism and ensuring a safe and reliable atmosphere for passengers and private transport operators (Christoffel, Malasela, and Mac 2014).

To enhance the potential of flexible transport modes in remote areas with lower demand, and where public entities cannot play a key role, recognizing the benefit and potential of informal transport services can be the first step to support the transit needs of marginalized people. Thus, appropriate regulatory guidelines should be provided to enhance the transparency of informal transport and improve its efficiency, quality, and safety. Supporting the organization of operators' associations or unions can reduce excessive competition, establish optimal fares that are both affordable for users and financially viable for operators, identify efficient time schedules and routes, and increase the transparency of private transport provision so that road safety can be improved both for passengers and operators.

Public transport subsidy programs should be encouraged for vulnerable groups in isolated areas.[14] These programs should connect the main social service nodes, including education and health facilities, by operating school buses and demand-responsive transport with suitable vehicles for persons with disabilities. Given the lack of market incentives to supply transport services due to low demand and the geographic dispersion of communities, governments may need to subsidize flexible, demand-responsive, or semi-fixed transport services with the objective of ensuring the mobility of vulnerable groups.

Due to high levels of dependence on non-motorized modes and intermediate means of transport, a greater focus on the extension and maintenance of small paths and non-motorized tracks can generate a bigger pro-poor impact if it targets the groups principally dependent on them, such as women, the elderly, and children. Given that projects explicitly targeting marginalized people often lack political and financial incentives, pro-active policies of external financiers such as the IDB need to mandate the inclusion of small paths or non-motorized roads within the scope of motorized road projects.

14. In Chile, the government established the "Mirror Law" in 2009 that provides regions with amounts equal to that allocated to finance Transantiago, which has allocated 1.816 million CLP to finance transport services and projects in isolated areas. The subsidy program implemented by the Ministry of Transport and Telecommunications determined the prioritized area for the subsidy based on the degree of isolation, which is measured by three components of accessibility: education, health facilities, and basic services. The level of accessibility was measured by the travel time needed to get to each service. As a result, children and the elderly living in isolated areas received a 50 percent subsidy on public transport fares.

Finally, providing non-motorized means of transport, such as bicycles for households and students for commuting, could also be encouraged, as in the case of Peru's "Rutas Solidarias: Bicicletas para llegar a la escuela" Program.[15] Also, given the geographic conditions of the region and the considerable share of the rural population in inland waterway areas living in poverty, water and air transport should receive more attention and deeper analysis, with more actions undertaken to safeguard mobility.

10.3.5 Institutional Capacity-Building for Sustainable Financing and Post-Project Monitoring and Evaluation

In order to strengthen financial capacity and promote investment in rural transport projects, diverse financing sources and separate fiscal budgets should be identified to promote regular medium- and long-term maintenance and rehabilitation of tertiary and local roads. These projects should complement national development initiatives and other productive infrastructure programs (McNish and Granada 2013). Given the fiscal constraints faced by many governments in the region, partnerships with development agencies can help close the gap in available investment financing (SUMA 2019).

The technical capacity of local institutions to lead and manage projects, as well as to improve their efficiency and transparency, should be strengthened by providing proper guidelines and training. Vertical distribution of the responsibility for transport planning and maintenance between local authorities at different levels of the community, district, and province, and their interaction and coordination, is particularly important. Active communication and efficient coordination with the other relevant sectors such as agriculture, energy, health, and rural development is encouraged as a way to establish integrated transport master plans that maximize the pro-poor impact on local communities.

Rather than sticking to traditional methodologies that might require more time and financial resources, proven technologies and innovations that make infrastructure construction and maintenance, data collection, and impact measurement more cost-effective through the use of local materials should be explored and encouraged.

Regular monitoring and post-project management over the long term are essential after road construction is completed, since the welfare impact generated by the road infrastructure is expected

15. Peru's Ministry of Education started the program in 2012 to improve access to schools in rural areas with high poverty rates by donating bicycles and other complementary transport goods in order to reduce the time and cost of trips to school. For many students it takes an average of one hour to get to school from their homes. To date, more than 123,000 bicycles have been donated through the program. See http://www.minedu.gob.pe/rutas-solidarias/usuarios.php.

to take time to appear, especially the indirect effects on poverty alleviation (Van de Walle 2009). Monitoring project outcomes should not be limited to measuring improvements in vehicle operation time and cost, but also include sufficient long-term measurement to test the resilience of local communities to absorb the benefits and external changes of rural transport over time, which are invisible in early project evaluation (Valdivia 2010; Hine et al. 2016).

Adequate indicators to measure the advanced level of accessibility and multi-dimensional impact of transport projects should also be put in place, with a particular focus on communities and vulnerable groups (ADB 2006). The repercussions of rural infrastructure projects should be carefully assessed and mitigated, including possible increases in rural-urban migration, increased traffic accidents, environmental degradation[16], increased land values and speculation, forced displacement of rural communities, pollution associated with higher emissions, and any social and cultural changes.

16. Transportation networks can play a direct and indirect role in future deforestation. Road-driven clearing in rural Amazon areas is associated with biodiversity loss, displacement of indigenous communities, and increased greenhouse gas emissions and reduced carbon storage (Vilela et al. 2020)

TABLE 10.3 Summary of Policy Interventions and Strategies

Policy Intervention	Purpose	Strategies
Higher road density and quality improvement with inclusive prioritization of project areas	Amplify road density and improve road quality	• Ensure economic feasibility, social equity, and environmental sustainability of rural infrastructure projects • Develop methodologies of cost-effective and inclusive route prioritization with local governments and with community participation
Community participation in employment and gender-inclusive road projects	Create direct job opportunities through road projects	• Support establishing microenterprises in charge of local road maintenance • Establish explicit quotas and a variety of recruitment strategies for women and less-privileged groups • Carefully analyze the influence of employment-related cash flows on rural households' consumption patterns
Synergetic interventions to achieve rural development alongside transport projects	Implement cross-sectoral programs for the diversification of rural economies	• Support local producers and rural households to maximize the impact of road programs on their first-mile logistics • Encourage local activities in rural economies such as rural tourism, trading businesses, etc.
Consideration of reliable, safe, and affordable rural transport services	Facilitate sustainable transport services for passengers and freight	• Understand transport service market mechanisms in rural areas and introduce supportive instruments for private operators • Put in place a suitable regulatory environment for informal transport to enhance transparency • Support organizing operators' associations or unions • Develop a public transport subsidy program targeting vulnerable groups • Encourage projects for non-motorized roads, paths, and small tracks and include them as an obligatory condition within main motorized road interventions • Provide more attention to water and air transport
Institutional capacity-building for sustainable financing and post-project monitoring and evaluation	Strengthen financial and technical capacity	• Strengthen financial capacity by identifying diverse financing sources • Communicate actively and coordinate efficiently with cross-sectoral stakeholders • Propose and utilize feasible technologies and innovations
	Regular monitoring and post-project management with a longer-term perspective	• Measure the long-term welfare impact driven by transport • Assess the adverse impact or spillover effects of transport projects • Develop and analyze adequate indicators

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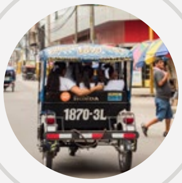
Where Do We Go from Here? Moving Towards More Socially Inclusive Transport

11



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Mobility and accessibility are essential elements for a dignified life and the full development of people and societies. In 2020, a third of the population of Latin America and the Caribbean was living in poverty and more than 1 in 10 persons were living in extreme poverty. Therefore, ensuring equitable access to opportunities in the region is critical to alleviating poverty and fostering social inclusion. As discussed throughout this book, transport facilitates people's ability to meet even their most basic needs and access opportunities to improve living conditions. It also directly influences their ability to fully participate in society. Nevertheless, the degree of access to opportunities that transport provides can vary widely among different groups of people and is inextricably linked with where they live and their individual characteristics and capabilities. For poor and other marginalized groups that may already face differential access to employment and other economic opportunities, transport-related barriers can deepen and compound existing inequities, as well as constrain earning potential and the ability to contribute to and benefit from broader economic and social development in the region. This is particularly relevant for disadvantaged and vulnerable populations that already face high levels of social exclusion and poverty.

In Latin America and the Caribbean, an overwhelming majority of the population lives in cities, which are often hubs for economic, commercial, political, and social activities. This makes cities the key drivers of development and a source of opportunities for low-income populations. However, not everyone has equal access to the opportunities offered by cities. When the concentration of employment and other activities in certain parts of a city is coupled with transport systems that do not adequately serve all urban dwellers, it can result in unequal access to housing, jobs, and public services. This in turn generates socio-spatial inequalities that deepen socioeconomic divides and exacerbate social exclusion. For example, the poorest, who often have fewer options to choose their place of residence and work, must spend more effort and resources to access the full spectrum of activities offered by the city. In addition, they may live under lower-quality environmental conditions and be exposed to greater health risks. Limited access to efficient means of transportation exacerbates those inequalities.

Public transit systems are critical to providing equitable access to opportunities in the region, both within the city and beyond (see Chapter 4). The public transit sector has become a space for numerous innovations, and some of the region's public transport systems are hailed as international best practices in the field. These include Bus Rapid Transit (BRT) and aerial cable car systems that

1. The authors drew upon the conclusions and recommendations presented throughout this book and would like to acknowledge the excellent contribution of the flagship team/authors who provided the material and concepts summarized in this chapter.

have brought about substantial positive transformations of the urban transport landscape. Such interventions have not only extended the coverage of public transport networks in cities of all sizes, but have also provided higher-quality and more modern services in areas where transport development had struggled in previous years. These investments have also had several positive impacts on the poor and disadvantaged in terms of a range of benefits associated with the coverage and quality of public transit services, including significant travel time savings and improved employment access for populations historically challenged by both social and transport disadvantage. However, limited resources constrain the scale at which new services and infrastructure can be provided, and the criteria for prioritization of public investment often creates a division between those who benefit from reforms and those bypassed by them, with the latter becoming captive users of informal or semi-formal alternatives. Conventional transport planning has been traditionally guided by aggregated city-level analysis that prioritizes efficiency, speed, and maximization of demand (i.e., serving as many people as possible). This has led to a continued focus on high-demand areas and a failure to recognize and respond to the diversity of travel needs and preferences of the larger population, particularly lower-income, transit-dependent groups. Further, the cost of transport in Latin America and the Caribbean can be a source of economic stress and vulnerability for those spending a disproportionate share of their income accessing mobility and the opportunities it makes available.

This development pattern of transport, coupled with widespread policies requiring that the operational costs of public transit systems be self-sustaining based on fare revenue, often leads to a lack of revenue to fund high-quality transit service and results in gaps in coverage in peripheral and often disadvantaged neighborhoods. Underinvestment in infrastructure in these neighborhoods contributes to their progressive disconnection from the rest of the urban fabric. Furthermore, a lack of political representation and participation in planning processes by low-income populations at distinct stages of project implementation leads to their needs and preferences going unaddressed (Kash and Hidalgo 2014). The COVID-19 pandemic has compounded these trends and has resulted in cuts to and/or elimination of public transit services for many dependent communities (Arellana, Márquez, and Cantillo 2020), and it has disproportionately affected lower-income, car-less, and transit-dependent populations, many of which did not have the option of teleworking during lockdowns (DeWeese et al. 2020).

Finally, as discussed in Chapters 7 and 8 of this book, emerging transport alternatives based on digitalization and information, and communication technology have catalyzed broad transformations in urban mobility at the local neighborhood and city levels. While these innovations have brought many opportunities and improvements for urban mobility, they may also present risks in terms of transport-related social exclusion and transport (dis)advantage. For example, while cashless payments provide an opportunity to revamp public transit systems to make them more efficient, better target subsidies to disadvantaged populations, and effectively promote long-term financial sustainability (see Chapter 7), the impact of cashless fare policies for low-income, un(der)banked, and digitally excluded riders should be considered with particular care, ensuring equal access.

To leverage the potential for transport investments and polices to reduce poverty and inequality and foster socially inclusive development, a new approach is needed that focuses on improving accessibility and addressing the needs of poor and disadvantaged groups. This calls for the prioritization of social inclusion in urban transport policies, and for understanding the barriers and enablers that determine the ability of different social groups to access and make the best possible use of available transport alternatives. Prioritization of social inclusion must be accompanied by a holistic approach that considers both the physical infrastructure and the services used during the whole trip, as well as the role that land use and urban planning plays in facilitating travel for vulnerable populations. This approach should draw upon a clear understanding of the challenges faced by disadvantaged populations in the region and from lessons learned from projects and programs to improve transport with inclusion goals in mind. Based on the case studies and lessons learned from policies and practices in the region discussed in this volume, several key actions and policies that can help to achieve equitable and inclusive transport in both urban and rural areas have been identified.

11.1 Understand and Respond to the Needs of Transport-disadvantaged Populations

In the design, planning, implementation, and evaluation of transport programs and projects, it is critical that the needs of vulnerable and transport-disadvantaged populations be thoroughly understood and considered (see Chapters 2, 4, 6, and 10). Considering mobility through an integrated, intermodal, intersectional, and interdependent lens is fundamental to responding to the travel needs of diverse groups, including the poor, women, LGBTQ+ persons, persons with disabilities, the elderly, and children in urban and rural environments. Income-disaggregated, gender- and diversity-sensitive data play a crucial role in understanding the mobility needs of disadvantaged populations and the underlying determinants that influence such mobility decisions, so the availability of such data is essential to facilitate inclusive planning.[2] Towards that end, transport planners and policymakers should seek to gather data from different sources, using different methodologies to yield databases that are both *big* (i.e., large samples) and *thick* (i.e., in-depth qualitative information). Origin-destination surveys should include detailed information on a range of trip purposes (in addition to work trips), including chained trips related to what is called the mobility of care (ECLAC 2019). They can be complemented by focus groups, interviews, and travel diaries, for example to add much-needed context about the needs and challenges that influence mobility decisions and drive travel behaviors. Data collection and community engagement should seek to identify access gaps and barriers to mobility affecting vulnerable and transport-disadvantaged populations, give end-users a voice in the process, and facilitate inclusive planning.

The full participation of beneficiary communities – which can be facilitated through participatory budgeting, active consultations, and local representation in project appraisal and evaluation processes – is critical to ensuring that the entire process of designing and managing projects, from the selection of routes to impact evaluation, is inclusive and responsive to local needs and realities. For example, satisfaction surveys during the implementation phase can provide essential input and feedback to ensure that infrastructure and services are addressing the needs prioritized by the local community. The technical capacity of local institutions to lead, manage, and evaluate projects, as well as to improve their efficiency and transparency, should be strengthened by providing proper guidelines and training. Such participation and representation should also be extended to the informal and small-scale operators currently meeting the needs of under-served communities. Despite the challenges they bring to cities, these services have flexibility, adaptability to local needs,

2. Examples include data on transport mode choice, travel times, distances, and purposes of trips, disaggregated by socioeconomic data such as sex (and gender identity), age, disability, household composition, and income, among other categories. The data should reveal how users respond to the existent mobility services and their specific needs.

and social capital that can benefit the processes of formalization and modernization of the public transport supply to low-income neighborhoods.

Finally, more empirical evidence – from rigorous quantitative and qualitative evaluations that assess the effectiveness of policies and projects to address transport-related social exclusion among disadvantaged and vulnerable populations – is needed to identify what is working and what can be improved, and to inform evidence-based approaches to policymaking. For example, more systematic study of cashless fare collection systems could help identify ways to measure the equity implications of the digitization of fares, including the particular benefits for poor and underserved communities. Further, more research and data are needed to better understand the challenges and conceptualize the mobility barriers faced by other marginalized groups in the region, such as indigenous persons and afro-descendants. In this regard, the inclusion of robust and meaningful social equality indicators in the design and implementation of transportation projects is a critical step toward defining a more comprehensive and effective approach to promoting social inclusion that prioritizes the project areas with a larger impact on poverty reduction and social inclusion both in urban and rural areas.

11.2 Promote Socially Inclusive Transit-Oriented Development Approaches that Coordinate Transit Investments with Land-use

Recognizing that transport is not an end in and of itself, but rather an enabler to access opportunities, cities should promote transit-oriented development approaches that coordinate transit investments with land-use plans clustering a mix of land uses, such as for day care, offices, and shopping, near public transport stations (see Chapter 3). Such an multisectoral approach can make mobility more efficient and represents an opportunity to address the inequalities observed in the urban spatial structure, as described in this book. Other multisectoral approaches could entail coupling development projects that improve healthcare, education, or job training for vulnerable groups with investments and subsidies for transport services targeted toward beneficiaries of those programs to enable their access to such programs. Also, within a wider policy framework, these projects can strengthen coordination between the transportation, land-use planning, housing, and other sectors where reducing poverty, inequality, and social exclusion are also among the priorities.

Transit-oriented development projects in the region could also be used to promote value-capture mechanisms and cross-housing subsidies for inclusionary housing measures near transit systems to reduce the affordability barriers for low-income groups that otherwise usually access land and housing at urban peripheries far from formal transit networks (see Chapter 3). In this vein, it is important that cities define transit-oriented development policies, with pilot projects based on previous research on the dynamics of real estate, land, and housing markets, and within a long-term planning process that includes citizen participation. Moreover, more diverse and innovative affordable housing initiatives are needed – for example, by developing a portfolio of affordable housing options linked to mass transit and other infrastructure investments – that increase accessibility for lower-income residents to these projects.

To improve gender inclusion and equality, transport planners should design and build infrastructure to make trips related to mobility of care and reproductive work easier. Recommendations include putting in place diaper-changing stations in both male and female public transit station bathrooms, digital kiosks to pay for utilities and run bureaucratic errands, accessible signaling and maps of care-related resources, and resting places and playgrounds close to stations. In addition, complementary policy actions are needed to promote a more balanced distribution of the care-related activities between men and women. Finally, more work is needed to reduce crime on public transit. All persons, regardless of gender identity, sexual orientation, or ability, should feel safe using public transport (see Chapter 2).

A stronger commitment is also needed to comply with universal accessibility regulations within transport systems. Although the 26 Latin American and Caribbean countries that are members of the Inter-American Development Bank have transport accessibility regulations in place, and accessibility standards are expected to be included in new transport projects, the rate of implementation of universal accessibility retrofits to date appears to be slow. More systematic monitoring of progress is needed at the local and regional levels. Given the lack of data on barriers faced by persons with disabilities, governments should monitor and assess the barriers they face within the transport system as well as in the urban environment that may limit users' accessibility, taking into account all the stages of a given trip (see Chapter 2).

In the rural context, developing cross-sectoral programs to support agri-business and agricultural extension services for local producers and rural households in transport project areas can boost the economic development of local communities (see Chapter 10). Road infrastructure programs should also deliberately consider transport service as a core element and ensure that transport planners develop integrated strategies to address poor transport service. The repercussions of rural infrastructure projects – including possible increases in rural-urban migration, increased traffic accidents, environmental degradation, increased land values and speculation, forced displacement of rural communities, pollution associated with higher emissions, and any social and cultural changes – should be carefully assessed and mitigated (see Chapter 10).

Finally, more empirical studies that explore the socioeconomic and socio-spatial impacts of mass transit projects are needed to inform policies that more effectively improve inclusionary impacts of transit investments. These studies would also make it possible to identify (and in the future, reduce) the adverse and external impacts of transport infrastructure on local communities. For example, new transport infrastructure can have the unintended impact of decreased affordability of housing options located near the new system, making access to opportunities more difficult for the city's poorest residents. The degree of displacement or gentrification associated with the introduction of mass transit corridors is unknown, given the lack of research on this topic. Additionally, studies are needed to develop effective and efficient public sector mechanisms to capture increases in property values associated with transport investments that could, in turn, be leveraged to finance mass transit projects or their expansion (see Chapter 3).

11.3 Expand the Reach of Public Transit for All

Ensuring mobility for all in a region plagued by high levels of inequality, poverty, and congestion, and facing climate-related threats, hinges on a high-quality public transit system that is affordable and accessible, and that provides necessary coverage for underserved areas to help close existing mobility gaps. Moreover, targeted interventions to improve access for the poor and other vulnerable user groups, as well as improve the accessibility and safety of non-motorized transport options, are critical. This section outlines three specific lines of intervention to advance towards these goals: (1) Improve the coverage and quality of public transit systems, including to mitigate the effects of the COVID-19 crisis; (2) Increase the affordability of public transit for poor and vulnerable user groups, including children; and (3) Improve the access, quality, and safety of infrastructure.

11.3.1 Improve the Coverage, Quality and Financial Sustainability of Public Transit Systems

Given the gaps in public transit infrastructure and services in low-income areas documented throughout this book, expanding the coverage, affordability, and quality of public transit, and targeting areas where disadvantaged populations lack access, are fundamental to improving accessibility and reducing social exclusion among poor and other vulnerable groups in the region (see Chapters 4 and 5). The experiences of various Latin American and Caribbean cities with different forms of formal and informal public transit illustrate a need for a more disaggregated, accessibility-based approach to planning and decision-making. This demands a more nuanced and deeper understanding of the socioeconomic composition of the population and its needs, preferences, and abilities.

Moreover, while the COVID-19 pandemic poses a formidable mobility challenge in the region, it also represents a unique opportunity to improve the equity and sustainability of mobility in cities (see Chapter 9). Building systems that are resilient, that leverage modern technology, and that are aligned with social equity objectives is critical to improving mobility and accessibility, particularly for those who depend on public transit and non-motorized modes for their daily travel. Some of the first steps to take towards a sustainable and equitable recovery include helping public transit operators recover from the economic shock, working to improve standards of service for the most vulnerable, and expanding on gains in infrastructure for non-motorized or active transport modes that are interconnected with public transit.

Policy measures and infrastructure investments that could catalyze a more equitable urban mobility landscape and the recovery of the region's public transport systems from the pandemic include the following.

- **Set benchmarks and targets for service standards and minimal levels of access to public transit that inform decisions geared towards reducing inequalities across income groups.** This requires monitoring tools such as satisfaction surveys designed to enable comparative analysis of perceptions of a range of groups, including disadvantaged and low-income populations, during the operation phase of public transit systems in order to provide and adjust infrastructure and services that respond to the needs prioritized by communities.

- **Strengthen the diagnosis, monitoring, and evaluation mechanisms of urban and rural mobility (including for public transit and for active transport modes) through the use of metrics for accessibility, coverage, and quality disaggregated by relevant socioeconomic level that enable the comparison of service quality levels and both spatial and temporal coverage of transport infrastructure and services that low-income and other disadvantaged populations receive compared to wealthier areas of the city.** The use of accessibility metrics such as the Cumulative Opportunities Index that require relatively low amounts of data and are easily comparable across jurisdictions can help attain this objective (see Chapter 1).

- **Improve public transport infrastructure and vehicles.** Public transit infrastructure is a key element to facilitate efficient, safer, and more accessible transit services in the context of the current health crisis and high levels of poverty and inequality in the region. Additional capital investments could benefit both public health and mobility in the near term by upgrading vehicles to be universally accessible, have more interpersonal space and better air circulation, and in the medium term by expanding boarding stations and offering dedicated lanes to provide better spacing and shorter in-vehicle travel times. Such investments, along with improved integration with active transport modes, can help to provide better service and attract additional ridership.

- **Revise current public transport business models.** The economic and financial effects of COVID-19 only worsened the economic health of public transport networks. Given the need for subsidies from the government, it is urgent to revise the current business models that up until now have been based almost exclusively on transport fares. Many transportation systems have already reported that it will take years to fully recover financially. This means that the subsidies granted today to support transit systems during the pandemic might also be necessary to maintain the quality and continuity of the systems going forward, especially considering the gradual return of the population to using these services. A revision of the business model appears necessary not only to support the future of public transport systems, but also to ensure the sustainability and viability of transport activities in cities.

- **Target supply-side subsidies for transit operators conditioned on service quality standards.** Additionally, pricing policies should mitigate the negative externalities of private transport through road pricing and congestion charges that could cross subsidize subsidies for public transit.

11.3.2 Increase the Affordability of Public Transit

Addressing the challenge of improving the affordability of public transport for vulnerable groups should include a holistic approach that considers urban form and the entire transport network. It must also leverage metropolitan planning to foster more equitable allocation of resources and distribution of routes and frequencies of public transit services. Addressing the affordability challenges in transit services in Latin America and the Caribbean requires thinking beyond the conventional limits of transport planning. A key aspect of this effort is to work across disciplines and areas of urban governance and planning to reach holistic solutions that build on the strengths of other sectors. One example of a more holistic approach is the use of targeting mechanisms, such as Bogota's Program to Identify and Classify Potential Beneficiaries of Social Programs (*Sistema de Identificación y Clasificación de Potenciales Beneficiarios para Programas Sociales* - SISBEN). Another example is the recognition of specific vulnerable groups (such as informal workers) that are unique to regional contexts and have already been addressed by other areas of local governments.

Demand-side public transit tariff subsidies are also needed to enable the poor to benefit from high-quality public transit without compromising their ability to afford other essential needs (see Chapter 5). Subsidies remain a key option, particularly to achieve equity and reduce disparities between the average user and those who are disadvantaged. However, targeting mechanisms need to better recognize the diversity of intersecting needs for specific groups (e.g., low-income women), and strategies are needed to improve the prospects for these groups to access opportunities at a lower cost, taking into account their specific mobility and other needs.

Although the region's policymakers have mostly focused on subsidies to address affordability, other alternatives such as conditional cash transfers, cross-sectoral subsidies, and hopper fares can have positive effects on reducing the financial burdens of transport for households. Pricing measures coupled with other structural interventions such as improving coverage and quality can go a long way towards reducing the time and monetary costs for the poor. One of the most effective measures to improve both affordability and accessibility involve mechanisms for physical and technological integration, as well as adequate information systems that allow for targeting beneficiaries and for monitoring and evaluation.

Given the high reliance on informal and non-motorized transport in Latin American and Caribbean cities, exploring synergies and alliances between informal operators and elements of formal transport systems (e.g., shared bicycles or other formal operators of on-demand service) could contribute to improving coverage and connectivity at integrated rates that make it cheaper and more convenient to transfer from local services to long-distance ones (i.e., mass transit). This book has provided metrics and evidence to support such objectives. However, achieving equitable and affordable transport systems is possible only to the extent that other dimensions of social inclusion in transport are addressed in concert.

11.4 Improve and Expand the Infrastructure for Active Modes - Targeting Economically Disadvantaged Areas

Improving active transport conditions for all is key to encouraging more sustainable, socially inclusive, and equitable transport solutions, especially in Latin America and the Caribbean (See Chapter 6). In this vein, there is an urgent need to consider active transport modes as an integral part of transport systems that serve a vital role in urban mobility. Integration should consider the full gamut of transport system components, including services, facilities, and transfer locations. Cities and rural towns alike should strive to improve access for under-served groups by focusing on four main areas of action: (1) Improving and expanding non-motorized infrastructure and services targeting low-income areas that lack adequate infrastructure; (2) increasing citizen participation; (3) improving planning and regulation in coordination with different government levels and sectoral planning departments, including public space and territorial divisions; and (4) integrating active transport modes with the greater transport network. Additionally, continued expansion and improvement is needed for infrastructure implemented during the pandemic to support the use of active transport modes such as walking and bicycling. Therefore, enhancing the active mobility of low-income persons requires improving the monitoring and evaluation of policies focused on accessibility and social inclusion. This could go a long way towards not only improving accessibility to safe and economical forms of transport as the region emerges from the pandemic, but also towards fostering sustainable mobility.

Governments should also make improvements to the security of public spaces through investments such as video surveillance and public lighting to reduce the fear-based dimension of social exclusion in urban areas. Robust policy changes and investments are needed to ensure the protection of the most vulnerable road users, who are usually exposed to unsafe maneuvers by motorized vehicle users. Low-income children and youth are the most affected by traffic-related injuries and deaths and by a lack of safe and affordable mobility options. Therefore, more specific plans to address the issues of road insecurity and affordable school transport and to provide solutions so that children can travel safely to school and other activities are urgently needed in urban and rural areas alike. The creation of safer infrastructure and subsidies for school transport has been tested and repeatedly shown to be effective in many countries.

Due to high levels of dependence on non-motorized transport modes and intermediate means of transport in rural areas, a greater focus on the extension and maintenance of small paths and non-motorized tracks can generate a bigger pro-poor impact if it targets the groups principally dependent on them, such as women, the elderly, and children (see Chapter 10). Use of non-motorized means of transport, such as cycling for households and students for commuting, could also be encouraged in that context.

Finally, shedding light on the issues associated with active transport mobility in terms of accessibility and walking and cycling conditions is vital to recognizing their role in enhancing the mobility of low-income people and improving their social inclusion. Therefore, enhancing the active mobility of low-income persons requires improving the monitoring and evaluation of policies focused on accessibility and social inclusion.

11.5 Harness Technology to Diagnose and Improve Transit Service Demand Responsiveness, Security, and Quality

The potentially transformational impact of digital technologies – improved service quality, enhanced security, and more robust data collection – remains largely untapped in the transport systems of Latin America and the Caribbean.

Digital fare collection systems, for example, generate vast amounts of accurate, real-time, and granular usage data (time, day, mode of transportation, frequency of travel, origin, and destination). These data should be more effectively used to identify and diagnose challenges, inform public policy, and support the design and monitoring of targeted initiatives intended to influence transport behaviors (see Chapter 7). The data should be maximized to measure usage, assess impact, and improve the targeting and delivery of transport subsidy programs over time and ensure that operational savings contribute to lowering transport costs for those most in need. This could be instrumental in ensuring affordability and updating vehicles for improved quality and environmental friendliness.

The entrance of other innovations supported by advances in digital technologies, such as app-based mobility – which includes ride-hailing and vehicle-sharing services, micromobility (e.g., shared bikes or e-scooters), and microtransit (minivans or small buses not attached to fixed routes and schedules, otherwise known as demand-responsive transit) – has spurred fierce policy debates surrounding their potential impact on congestion and public transit as well as the opportunities they may offer in terms of sustainable and inclusive urban mobility (see Chapter 8). App-based transport platforms have the potential to improve demand responsiveness, as data on geo-location, direction and speed of travel, and capacity, for example, can be used to find an available scooter or a bus with available seats. Establishing alliances and agreements with ride-hailing and micro-transportation companies could also potentially facilitate more efficient, affordable, and inclusive first- and last-mile mobility services, making economic and other human capital development opportunities more accessible within a reasonable time and cost.

As the challenge of sexual harassment and gender violence on public transit remains unsolved in the region, app-based transport has increasingly become an alternative for those who can afford it. For example, women use ride-hailing more than men and more often to conduct mobility of care trips or in contexts where they feel insecure on public transit. Studies presented in this book demonstrate that they are also more likely than men to value the information provided by apps, the presence of a panic button in the apps, and the ability to share details of their trips in real time through their cell phones. This highlights the importance of exploring how technology similar to that used by transport network companies can be applied and adapted to the public transit context to improve security and safety for vulnerable populations.

The increasing demand for app-based, on-demand services that can be quickly summoned with a cell phone and paid for without handling cash highlights the need for regulations that both harness their benefits and ensure that these services are socially inclusive and environmentally sustainable. In general terms, but more so from a perspective of equality and inclusion, proactively regulating cashless fare collection systems and app-based transport services to shape their evolution becomes more pressing as these technological applications expand in the region. It is urgent to promote discussions on inclusive fare collection systems and app-based mobility services that inform decision-making and open spaces for more conversations on governance and regulation to maximize their positive inclusion effects. For example, the public sector should set clear policy stances and regulations that make supply distribution more inclusive both spatially and economically. Shared mobility platforms, including bike-sharing, e-scooters, ridesharing, car-sharing, and ride-hailing, along with the different practices and policies of private service providers and public sector agencies, have all been shown to have both positive and negative effects on specific dimensions of social exclusion in urban areas across Latin America and the Caribbean. A thorough understanding of such practices and the incentives and disincentives that can lead to more inclusive, equitable, and sustainable behaviors associated with on-demand transport to inform policy and regulation is a priority for transport planning research and practice in the region. Furthermore, leveraging these transit modes to harness new data and improve efficiency and equity beyond that guaranteed by traditional systems is a key potential area of future research.

As outlined in this book and summarized in this chapter, promoting equitable, accessible, and affordable mobility for all will require synchronized and well-targeted public policy efforts. Given the host of socioeconomic challenges facing the region, this is no small feat. However, by embracing measures that are more data-driven, technology-enabled, and accessibility-focused, and by investing in transport infrastructure and services that are intentionally designed, implemented, and monitored to be inclusive, policymakers can go a long way towards ensuring that mobility is an enabler of social and economic progress rather than a barrier to be overcome.


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