Ride-hailing and Social Exclusion: A study of Low Income Neighbourhoods in Bogotá

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List of Acronyms

LAC - Latin American and Caribbean

TRSE - Transport Related Social Exclusion

RH - Ride Hailing

LI - Low Income

MI - Middle Income

HI - High Income

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1. Introduction

The United Nations' 2030 Agenda for Sustainable Development includes several Sustainable Development Goals (SDGs) that emphasise the importance of transportation networks in making cities inclusive, safe, resilient, and sustainable (United Nations, n.d.). While transport services facilitate access to opportunities such as jobs, healthcare and entertainment (Deka, 2004), their unequal distribution could lead to social and spatial inequity (Oviedo and Dávila, 2016). Recent events surrounding the COVID-19 pandemic, according to Oviedo and Nieto-Combariza (2021), have shed light on the problems posed by the latter, pushing practitioners and academics to reconsider transport's role in society and modify their transport strategies accordingly.

Given the rate of population and economic growth in the Global South, such problems will only increase in size and importance. Latin America and the Caribbean (LAC) has witnessed unprecedented urban expansion in the last four decades, with the urban population rising by 127.6% (World Bank staff, 2018). The city of Bogotá, Colombia, experienced rapid and disordered growth in the second part of the twentieth century, and currently boasts of a population of around 8 million, similar to many other cities in LAC. The city's population is very unequally distributed, with low income (LI) neighbourhoods in the city's southern areas having the largest densities and poorest socio-economic conditions (Vecchio, 2018).

1.1. Research Motivation

Ride-hailing services have grown ingrained in the urban mobility landscapes of cities all over the world. Uber alone has completed over 10 billion rides across 10,000 cities in a decade (Uber, 2018; Uber, 2020). During this time, ride-hailing players have revolutionized the transport

sector by disrupting the taxi industry, public transport systems and labour protection laws. Despite its growing popularity in cities, many unknowns about ride-hailing's impact make it difficult to regulate. The case of Uber, which faced regulatory hurdles and briefly ceased operations in Colombia in January 2020 (Feiner, 2020), a first for any LAC nation, exemplifies this.

In the context of concerns about urban sustainability and social equity, Oviedo et al (2020) emphasize that as this new mode becomes more popular in LAC, assessing its impact becomes all the more crucial for local authorities and transport planning organizations. Scholars argue that research on this topic has been limited due to under-conceptualisation (Gomez-Morantes et al, 2021), knowledge gaps regarding emerging markets (Granada et al, 2018) and a lack of focus on distributional perspectives and social disparities (Oviedo et al, 2021). Moreover, disagreements about the effects of ride-hailing and the resulting regulatory inconsistencies stem mainly from a lack of adequate data. Due to the novelty of the service and the unwillingness of its companies to disclose information due to privacy concerns, it has been difficult to measure the impact of ride-hailing. As a result, most of what is known comes from small survey samples, such as Henao's (2018).

To overcome these limitations, this dissertation leverages one of the largest ride-hailing focused datasets made available by the Inter-American Development Bank (IDB) which captures responses from over 4000 LAC respondents. By placing ride-hailing within the well-established transport related social exclusion (TRSE) literature, this timely research adds much-needed information to the field of transport, specifically to the sub-discipline of shared mobility.

As per Casas and Delmelle (2014), the subject of social exclusion in general, and TRSE in particular, has been a focus of academic research and a policy goal for many local

governments throughout the world over the last two decades. A spate of transport projects have been driven by the notion of providing equitable infrastructure and services to all segments of society.

To date, TRSE has primarily been approached from an accessibility viewpoint (Church et al., 2000; Kenyon et al, 2003; Preston and Rajé, 2007; McCray and Brais, 2007; Mackett et al., 2008; Jones et al., 2010; Bocarejo and Oviedo, 2011). On making links between concepts of accessibility and social exclusion, in order to better understand the conditions of access disparities faced by socially disadvantaged residents of LAC, Oviedo (2021) asserts that people experiencing exclusion lose not only access to opportunities, but also the ability to travel to activities that are necessary for participation in society. Within these parameters, this study employs Church et al. (2000)'s approach, which identifies the seven dimensions that contribute to potential exclusion from transport systems. Although this framework has sparked research by many scholars, Oviedo (2021) points out that literature has consistently kept the most general principles of the framework uncontested, which is one of the greatest appeals of the framework for this study.

1.2. Research Focus

The dissertation recognizes the complexity of framing the various dimensions of TRSE and analyzing all these effects in one study. However, at the core, under this theoretical framework, the research objective is to examine the potentially restrictive nature of ride-hailing for residents in LI neighbourhoods in Bogotá, Colombia. Two major research questions are constructed to analyze TRSE in relation to ride-hailing for this group:

- First, do residents of LI neighbourhoods in Bogotá experience lower access to and are excluded from different opportunities in Bogotá? If so, to what extent and in what way does ride-hailing affect the same?
- Second, how do the socio-economic characteristics and other urban dynamics related to this group, like location and surrounding built environments, influence their interaction with ride-hailing, as observed through the lens of the seven dimensions of TRSE?

The dissertation tackles the aforementioned concerns using a mix of literature review and descriptive analysis of the Steer survey data from Bogotá to determine if ride-hailing services have had a beneficial or negative influence on the lives of residents of LI neighbourhoods. It contributes to current debates in literature and reinforces the view that TRSE is a multidimensional construct, and while some characteristics of RH can help disadvantaged groups gain access to opportunities, others can increase their risk of being socially excluded. It also argues that ride-hailing could complement public transport, increase individual mobility, and combat social exclusion in the long run. Through this work, this research aims to feed into the consideration of transport planners and policy makers in their efforts to properly regulate this innovative mode.

The following is the structure of the rest of the paper: The relevant literature is examined in Section 2. The study area is described in Section 3. Section 4 explains the methodology and data, followed by Sections 5, 6 and 7 which include the findings, a discussion, and reflections on policies. Section 8 then sums up the key takeaways.

2. Literature Review of Key Concepts

This section first ascertains socio-economic spatial segregation particularly in the LAC context. Next, it examines concepts of accessibility, social disadvantage and social exclusion. Finally, it focuses on transport disadvantage and how this affects transport related social exclusion and its various dimensions.

2.1. Socio-Economic Spatial Segregation

Since 1950, the world's urban population has risen significantly from 751 million to 4.2 billion in 2018. Today, LAC is the second most urbanized region, with 81% of the population living in cities and expected to grow to nearly 90% by 2050 (United Nations, 2018). Historically, LAC also suffers from high inequality, with the overall Gini index averaging 0.465 and that of Brazil and Colombia, in particular reflecting some of the world's highest income inequality with a Gini index of more than 0.520 (ECLAC, 2019). Lizárraga et al (2011) recognize that LAC cities also show a deficient urban infrastructure and are characterised by precarious public services and low-quality transport infrastructure that lack universal coverage. Infrastructure investment gaps, particularly in LI areas, combined with growing motorization and urbanization, have led to disparate infrastructure provision for urban poor (Sabogal-Cardona et al, 2020).

This differentiated infrastructure provision is referred to by Graham and Marvin (2001) as *"splintering urbanism"*, in which the interplay of power, wealth, and influence leads to the production and reproduction of splintered urban areas in the form of *"premium networked spaces"* for the wealthy, while neglecting less affluent groups who suffer from *"poverty of connection"*. They believe this is because the provision of infrastructure is intended to increase economic efficiency, exacerbating existing socio-economic inequalities. As a result of continued

investments in high-end developments such as gated communities, commercial complexes etc., there is a growing divide between socio-economic groups, with higher-income groups separating themselves from the rest of the urban fabric (Zérah, 2007, cited in Oviedo-Hernandez and Dávila, 2016, p.181), and LI and other disadvantaged groups, often concentrated in a few neighbourhoods, being simultaneously excluded because of restricted interaction with the city (Oviedo, 2021).

This social segregation based on income has led to the phenomenon of *"urban sprawl"* (Lizarrage et al., 2011, p.8) which has magnified in LAC between 1970s-2000s due to lack of capacity, poor enforcement and irregular approaches to social housing by many state governments (Gilbert, 2009). These institutional weaknesses have fuelled the rise of informal housing in less attractive peripheries, which act as a focal point for extreme poverty (Oviedo, Scorcia and Scholl, 2021).

As a result, the emerging urban form is marked by significant inequalities in access to opportunities and services between socio-economic groups. Benevenuto and Caulfield (2019) discern that these spatial patterns have a significant impact on urban development, creating socially unjust cities where wealth, opportunities, and economic activities accumulate in city centres (Oviedo, 2021). On the other hand, the peripheral communities have a poor local supply of employment and other opportunities, exacerbating the adverse effects of urban geography on their accessibility and inclusion (Oviedo and Nieto-Combariza, 2021). Firstly, people in these regions travel to other centralised sites for economic activities, becoming increasingly reliant on motorised transport in the process (Boisjoly et al., 2017; Suárez et al., 2015). Secondly, the challenges for certain social groups in these areas are aggravated because of the lack of resources

and choice to move which further prevents them from interacting with the opportunities on offer (Hernandez Oviedo and Dávila, 2016).

Furthermore, the economic principles that underpin infrastructure supply lead to unreliable provision of roads, utilities, and vital social services in these "less lucrative" areas of the city (Samuels, 2001, cited in Oviedo, 2021, p.12). According to Thibert and Osorio (2014), these self-reinforcing cycles of segregation and spatial concentration of opportunities and investments continue to erect barriers for economically disadvantaged peripheral groups whose mobility is significantly different from their counterparts living in better-served areas of the city. As a result, these populations face disproportionate risk and exclusion (Oviedo and Guzmán, 2021).

2.2. Accessibility, Social Disadvantage and Social Exclusion

Many of our daily activities, such as travelling to work, shopping and visiting friends, depend on our ability to move. Accessibility and mobility are defined by Preston and Rajé (2007) as the “ease of reaching” and “ease of moving,” respectively. In a similar vein, Guers and van-Wee (2004) argue that the accessibility and ease of reaching opportunities is affected by the interplay of land use patterns and transport systems, which determine how households are arranged, where opportunities are situated, and what forms of mobility are available. Hine and Mitchell (2001), stress that accessibility, mobility, and social exclusion are closely linked because travel is a fundamental necessity. Transport services can not only be considered "enablers of opportunities," as they facilitate access to work, health, leisure, etc. (Deka, 2004, quoted in Oviedo and Guzmán, 2021, p. 15), but are also necessary for participation in society and the creation of social networks (Cass et al, 2005).

Social disadvantage is a combination of social traits and circumstances that could limit people's ability to participate in social and economic life, manifesting itself in various forms of social exclusion (Gleeson and Randolph, 2010; Vecchio, 2010). (2017). According to Oviedo (2021), social disadvantage and social exclusion overlap, with the first focusing on specific factors that can put people in a disadvantaged position, and the second on processes that prevent people in disadvantaged positions from participating in social life as well as the consequences of such exclusion.

The definition of the concept of social exclusion (Higgs and White, 2000; Hine and Mitchell, 2001; Kenyon et al. 2002; Lyons, 2003; Bocarejo and Oviedo, 2012; Lizarrage et al, 2011; Lucas 2012; Lucas and Currie, 2012; Casas and Delmelle, 2014; Kamruzzaman et al, 2016; Bocarejo et al, 2016) is contested and tends to be understood as a process:

- which is multidimensional, relational and dynamic in nature
- which leads to denial of resources and access to opportunities
- where people are denied the chance to participate in social, economic and political spheres
- whose outcome is deprivation

2.3. Transport Disadvantage and Transport-Related Social Exclusion

The term 'transport disadvantage' is a multidimensional concept that refers to the consequences of a lack of transport and other external variables such as low income, residential location, non-ownership of private motorised vehicles, disability, accompanying children or adults with disabilities, and so on (Murray and Davis, 2001; Litman, 2008; Currie and Delbosc, 2010; Oviedo-Hernandez and Titheridge, 2016). Scholars (Kenyon et al, 2002; Lucas, 2012) argue that it is not only transport disadvantage that can contribute to social disadvantage, while

the lack of transport options affects access and the formation of social networks, but usually those who are already socially disadvantaged suffer transport disadvantages due to major inequalities in their travel patterns and levels of access to transport. As a result, transport disadvantage and social disadvantage intersect to generate *"transport poverty"* (Lucas, 2012; Lucas et al, 2016; Benevenuto and Caulfield, 2019), leading to transport-related social exclusion (TRSE).

TRSE began to resonate with planners, policymakers, and scholars as early as 2003, according to Lyons, who noted they were interested in understanding the role of transport in producing and perpetuating socioeconomic disadvantage. TRSE is defined as follows by Kenyon et al (2003, cited in Lucas, 2012, p.108), highlighting the dimensions of accessibility and mobility:

> *"The process by which people are prevented from participating in the economic, political and social life of the community because of reduced accessibility to opportunities, services and social networks, due in whole or part to insufficient mobility in a society and environment built around the assumption of high mobility"*

Bocarejo and Oviedo's (2011) rationale for this perspective emphasises a more people-focused and needs-based approach, as well as the economic and social consequences of transport-related inequalities, such as inability to access life-enhancing opportunities like jobs, education, healthcare, and social networks. This approach to social exclusion in transport planning has enabled major delivery agencies to analyse the impact of their policy decisions on certain groups over time.

Nevertheless, Benevenuto and Caulfield (2019) argue that the studies on this subject are not comprehensive enough, and agree with Lucas et al (2016) that there is a greater need for

research specifically tailored to the Global South, as gaps exist, such as regions where poverty is widespread, especially rural areas, are under-investigated, and there are fundamental differences between the context and requirements of countries in the Global North and the Global South, where methodologies applied in the former cannot be replicated in the latter.

2.4. Categories of TRSE

To date, several frameworks have been developed to describe the relationship between transport and social exclusion. Of them, Church et al. (2000) establish a seven-dimensional framework that is one of the most well-known on the subject and has been used in a number of studies.

It is important to note that the framework fails to produce actionable policy outputs as it does not identify the exact scale or layer of activity where exclusion occurs (Lucas 2012; Casas et al, 2014) but despite this shortcoming, this dissertation builds on the categories of Church et al.'s (2000) framework because it is compatible with the multidimensional nature of social exclusion mentioned above.

The seven specific dimensions, which will be analysed in more detail in subsequent sections, are as follows -

i. Geographic: Influence of the location where one lives on accessibility to transport services
ii. Exclusion from facilities: Impact of distance from key facilities like employment, hospitals, schools, etc.
iii. Economic: Monetary restraints in relation to travel expenditure
iv. Fear-based: Fear of personal safety preventing many from using transport services
v. Time-based: Constraints on one's time that limit one's availability to travel

vi. Physical: Physical barriers of the transport system that inhibit its usage

vii. Space: Effect of discrimination and power dynamics which might restrict access for certain groups

3. Study Area

To understand the role of ride-hailing in Bogotá, this section provides a discussion of this travel mode and illustrates the socio-political context within which the case is situated.

3.1. Ride-Hailing

The availability of digital road maps and routing algorithms, along with the widespread use of GPS-encrypted smartphones, has given the necessary enabling technologies for app-based and on-demand ride services. "Transport Network Companies (TNCs)," "ride-hailing," "on-demand rides" and "app-based rides" are all terms used to describe these services. To maintain consistency, in this dissertation, we use the term "ride-hailing" and abbreviate it as "RH" to refer to the service, which:

> *"dynamically matches supply and demand by allowing travelers to request car rides in real-time from potential suppliers using a smartphone application" (*Rayle et al, 2016, p.168)

3.1.1. Proliferation in LAC and Colombia

In recent decades, developments in information and communication technology (ICT) and the widespread availability of mobile phones in Asia and LAC have enabled the idea of a shared economy and led to the creation of new types of digital-technological-driven mobility, such as RH (Watanabe et al, 2016).

It is worth noting that in LAC, 65% of the population are Internet users (World Bank, 2020), and smartphone penetration in 2019 was as high as 69% (GSMA Intelligence, 2019). With regard to Internet and smartphone penetration, Colombia fairs average in the region (Statista, 2021b), but Meltzer and Marulance (2016, quoted in Gomez-Morantes et al, 2021, p. 13) argue that the country's Ministry of ICT has helped create healthy competition in the mobile broadband market along with improvements in service quality and pricing structures.

With this in mind, RH companies have made large investments in LAC cities and quickly expanded their operations. Oviedo et al (2020) note that RH companies have now expanded to more than 600 cities worldwide, of which 173 are in this region alone. LAC is one of RH's fastest growing regions (Azuara et al, 2019) and Uber's most profitable in 2018 (Moed, 2018). Colombia had a significantly high user penetration rate of 21.3% as of 2020 in this region (Figure 1), when Uber provided services to 2.3 million users (Long, 2020). Many other competitors, including Beat, Cabify, Didi and InDriver, are also active in Colombian cities and almost all LAC countries (Grace, 2020).

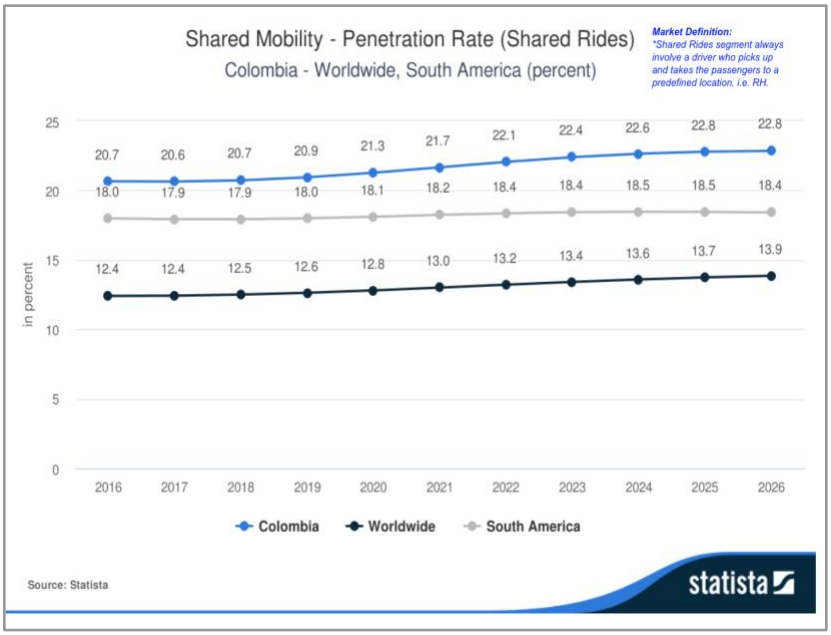

Figure 1 RH Penetration rate in Colombia, South America and Worldwide (Shared Mobility-Worldwide, 2021)

RH service features have been argued to offer several advantages (Granada et al, 2018; Oviedo et al, 2020; Gomez-Morantes et al, 2021; Lesteven and Samadzad, 2021), including relative ease of use, a greater sense of security and constant improvement in service experiences, to name a few. However, scholars have also pointed out several disadvantages (Sabogal-Cardona et al, 2020; Young, 2020), such as promoting congestion, affecting public transport ridership, and exacerbating existing socio-economic inequalities by providing mobility options to only those who can afford them.

The many unknowns that characterize the impact of RH complicate the task of regulating this service. This is perhaps best exemplified by the case of Uber in Colombia where the company ceased operations in a country in LAC for the first time. Uber's services were ruled illegal on 31 January 2020 after a prolonged judicial process with Colombian courts in response to a complaint by incumbent taxi operators. However, it resumed transporting passengers with a new service model just 20 days after exit (Reuters staff, 2020).

3.2. Bogotá and its LI neighbourhoods

Bogotá, Colombia's capital (Figure 2), is by far not only the largest with an urban area of about 380 km2, but also the most populous city in the country with 7.8 million inhabitants (Oviedo and Guzman, 2020). With an average economic growth of 3.4% during the previous decade, it accounts for 25.5% of Colombia's GDP (ITA, 2019). But over the years, the poor have become worse-off, with Bogota's Gini Coefficient as high as 0.50 and the poverty rate rising to 27.2% in 2019 (Statista, 2021c; DANE, 2021). Moreover, official unemployment in the city soared to a historic high of 20.2% in July 2020, significantly higher than national 10.7%, according to DANE (2021).

Figure 2 Bogotá in Colombia on the world map.

Source: Own elaboration with inputs from Free World Maps (n.d.) and KindPNG (n.d.)

Brewer-Carias (2008, cited in Thibert and Osorio, 2014, p. 1328), remarked that Bogotá, like other LAC cities, has a "core-periphery" pattern of segregation. The city's economic activities are extremely concentrated in the central core, which has led to increased infrastructure spending in certain regions (Guzman et al, 2016; Guzman et al, 2017). These trends in urban planning have added to the phenomenon of "splintering urbanism" (Graham and Marvin, 2001), in which less attractive remote areas are overlooked and access to the rest of the city is limited, especially for LI groups (Bocarejo and Oviedo, 2012; Oviedo and Dávila, 2016). In Figure 3, Guzman and Oviedo (2018) show the spatial distribution of population (left) and employment (right), where, first, very high population densities can be seen in city outskirts where local employment is scarce, and second, there is a clear dominance of jobs in the city's wealthier northern and eastern sides along main transport routes.

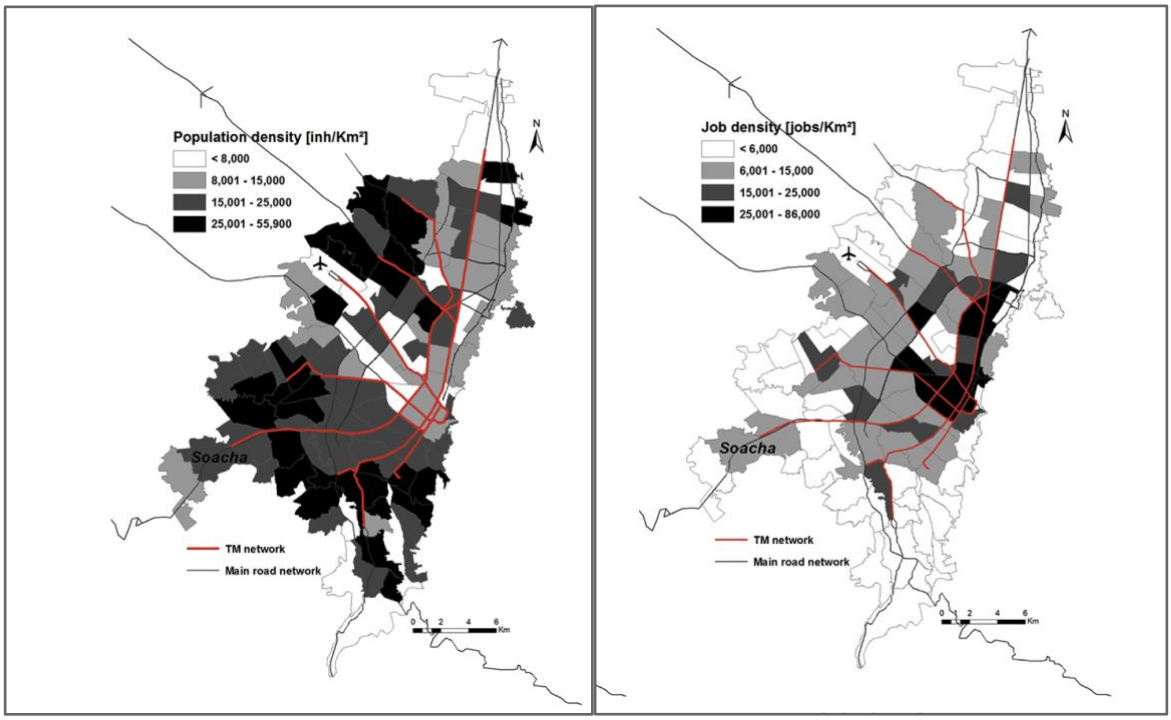

Figure 3 Population density and job location Bogotá. Source: Guzman and Oviedo (2018)

The concentration of opportunities in the city center has led to an increase in land value in the surrounding areas, making housing in these places expensive for the poorest inhabitants. As a result, LI groups have steadily relocated to the outskirts of cities. These LI, mostly informal, neighbourhoods are largely found on the southern and western edges of the city and can have population densities of up to 60,000 people/km2 (Guzman et al, 2017; Oviedo and Guzman 2020).

It is worth noting that Bogotá has a stratum classification system, which is an official socio-economic variable allocated to each residential unit in Colombia, with low-strata corresponding to lower income and high-strata corresponding to higher incomes (Lotero et al, 2014; Caicedo et al, 2021). Strata ranging from one to six is assigned to the building depending on its physical attributes, but not to a particular person. According to Medina and Morales (2007), this categorization is often used as a proxy for Colombia's socio-economic level. In

Figure 4, Guzman et al. (2020) illustrate the spatial distribution of SES groups in Bogotá, which indicates that low-SES families are concentrated in the city's perimeter and also emphasizes the location of the Central Business District (CBD), which corresponds to the largest concentration of employment.

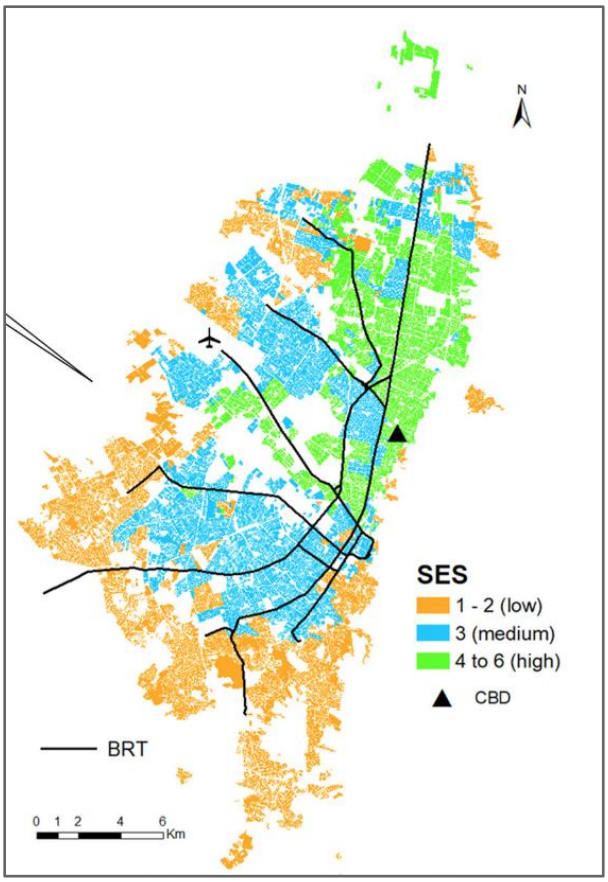

Figure 4 Aggregated Socio-Economic Strata system. Source: Guzman et al (2020)

For many years, the city has been growing along well-defined transport routes, with the 2019 Household Travel Survey estimating that public transport accounts for 30% of all daily journeys. TransMilenio (BRT), the integrated public transport system (SITP) and regular bus services form the public transport structure (Oviedo and Guzman, 2020; Caicedo et al, 2021). Guzman and Oviedo (2018) suggest that despite this coverage, the spatial distribution of the population and economic opportunities has a direct influence on the poorest families' travel

expenses and capacity. LI families, as shown in Figure 5, spend a considerable amount of time and a substantial part of their daily income traveling, with poorer zones having higher trip times. Consequently, the current public transport system structure may have a detrimental impact on the quality of life of LI people who are forced to suffer high costs, discomfort and less time for other activities due to inadequate transport choices.

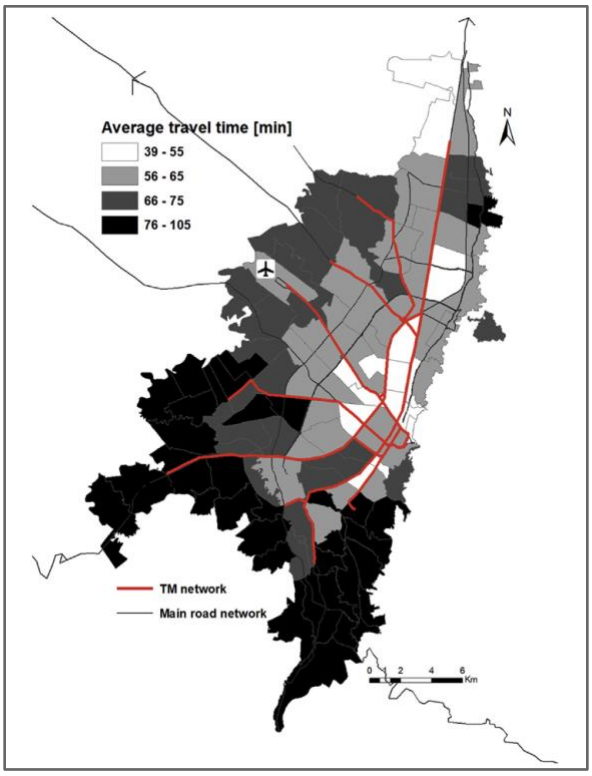

Figure 5 Travel time in public transport. Source: Guzman and Oviedo (2018)

4. Methodology

The methodology for this dissertation is a combination of literature review and descriptive statistical analysis.

The search for relevant evidence for literature review was carried out using three large databases: Science Direct, Google Scholar and Semantic Scholar. To begin with, a study of the internationally published literature was carried out to gain a better understanding of social

exclusion and its relationship to the problem of transport disadvantage. Afterwards, a wide range of academic and grey literature sources were examined to gain a better understanding of Bogotá's transport landscape in general and RH in particular.

In addition, the dissertation builds on data from a survey conducted by Steer in November 2020, with the participation of 2063 Bogotá residents. The survey, which included 49 questions in five sections, was intended to learn more about the impact of RH on people's travel patterns and public transport in Mexico City, Bogotá and Medellín. The data analysed and presented here is based on four of these sections -

- Section 1 collected socio-demographic information.
- Section 2 identified the characteristics of the most frequent trips
- Section 4 captured the characteristics that influence RH's selection as a mode of transport.
- Section 5 examined the impact of RH use and the pandemic on mobility.

To reflect on different vulnerabilities and RH-related travel strategies of residents of LI neighbourhoods that may influence their TRSE, we sought variability in relation to income. Therefore, the sampling frame was designed to categorize respondents into three groups based on their SES as a proxy for their income: Low-Income/LI (SES 1-2), Middle-Income (SES 3-4) and High-Income/HI (SES 5-6). Table 1 summarises the characteristics of this sample. Despite the fact that the sample included people from all intended categories, the representation of older adults was low compared to others, as shown in the table. As Lyons (2003) asserted, such issues of response rates or bias tend to be worse when it comes to the socially excluded, even when surveys and other techniques are applied with rigorous care.

Table 1 Characteristics of the Sample *(Source: Own elaboration using Steer Survey, 2020)*

		Low-Income (SES 1 & 2)	Middle-Income (SES 3 & 4)	High-Income (SES 5 & 6)
Respondents		1028	845	190
		49.83%	40.96%	9.21%
Variables:		**%**	**%**	**%**
Sex	Male	46.40	52.43	47.37
	Female	53.60	47.57	52.63
Age	15-20	10.51	4.85	9.47
	20-30	35.31	23.19	24.74
	30-40	26.17	20.59	27.37
	40-50	19.35	25.92	15.26
	50-60	6.81	16.69	12.63
	>60	1.84	8.76	10.52
Education	Primary	2.53	0.71	0.53
	Baccalaureate	35.51	21.07	17.89
	Technical	37.94	27.57	15.79
	University	20.33	36.57	38.95
	Postgraduate	3.40	13.73	26.84
Occupation	Employee	56.91	50.89	42.11
	Contractor	2.72	4.14	3.68
	Independent Worker	14.88	24.26	24.21
	Student	13.91	10.18	18.42
	Work from Home	3.02	1.89	3.68
	Unemployed	6.81	4.02	3.68

	Pensioner	0.58	3.91	3.16
Data Plan	Yes	52.24	73.61	84.74
	No	47.76	26.39	15.26
Vehicle Availability	Yes	89.98	94.32	94.74
	No	10.02	5.68	5.26
Access to transit station	Less than 10 minutes walking	20.23	30.30	37.89
	Between 10 and 20 minutes walking	27.92	35.98	28.95
	Between 20 and 30 minutes walking	23.54	17.40	17.37
	More than 30 minutes walking	26.07	14.67	13.16
Main Mode of Transport	Car	10.89	21.89	36.32
	Motorbike	7.30	6.86	4.21
	Scooter	0.10	0.36	0.00
	Bicycle	8.27	4.85	4.74
	Walking	1.36	1.30	1.58
	Ride-Hailing (RH)	2.33	4.85	5.79
	Taxi	1.07	1.89	3.68
	TransMilenio	42.22	32.78	30.00
	Bus	22.67	21.18	11.05
Average Travel Time by mode	Car	93	83	71
	Scooter	56	108	20
	Ride-Hailing (RH)	70	56	53
	Public Transport	166	142	132

Frequency of using ride hailing service	More than five (5) times a week	4.57	5.80	6.32
	Between three (3) & five (5) times a week	7.30	13.96	16.32
	Between one (1) & two (2) times a week	19.36	26.86	27.37
	Between two (2) & three (3) times a month	14.20	16.09	20.53
	Oncer month	6.91	6.15	6.32
	Very occasionally	21.98	17.99	10.00

This data was analysed using descriptive statistical analysis in accordance with the dimensions of TRSE, as described in section two. Descriptive statistics was chosen because it enabled the dissertation to quantify the basic characteristics of the data set and to draw observations from the specific population of interest with the help of the integrated statistical software, Stata. This method has also been leveraged by many transport researchers across geographies, like Black, Paez and Suthanaya (2002), Hong, Chu and Wang (2011), Fan, Guthrie and Levinson (2012), Oviedo, Scorcia, and Scholl's (2021) etc. because of its exploratory and graphical aspects to identity patterns.

Inspired by Oviedo and Titheridge's (2016) coding system for content analysis which provided a clear structure for grouping findings, prior to this analysis, each variable in the survey was categorised as per the dominant dimension of TRSE that was applicable to it. Sub-themes associated with each of the dimensions were then found in a second round. Figure 6 depicts the final categorisation system, which includes 13 sub-themes relevant to understanding the connection between RH and social exclusion in Bogotá. The next section summarises the findings against each of these sub-themes.

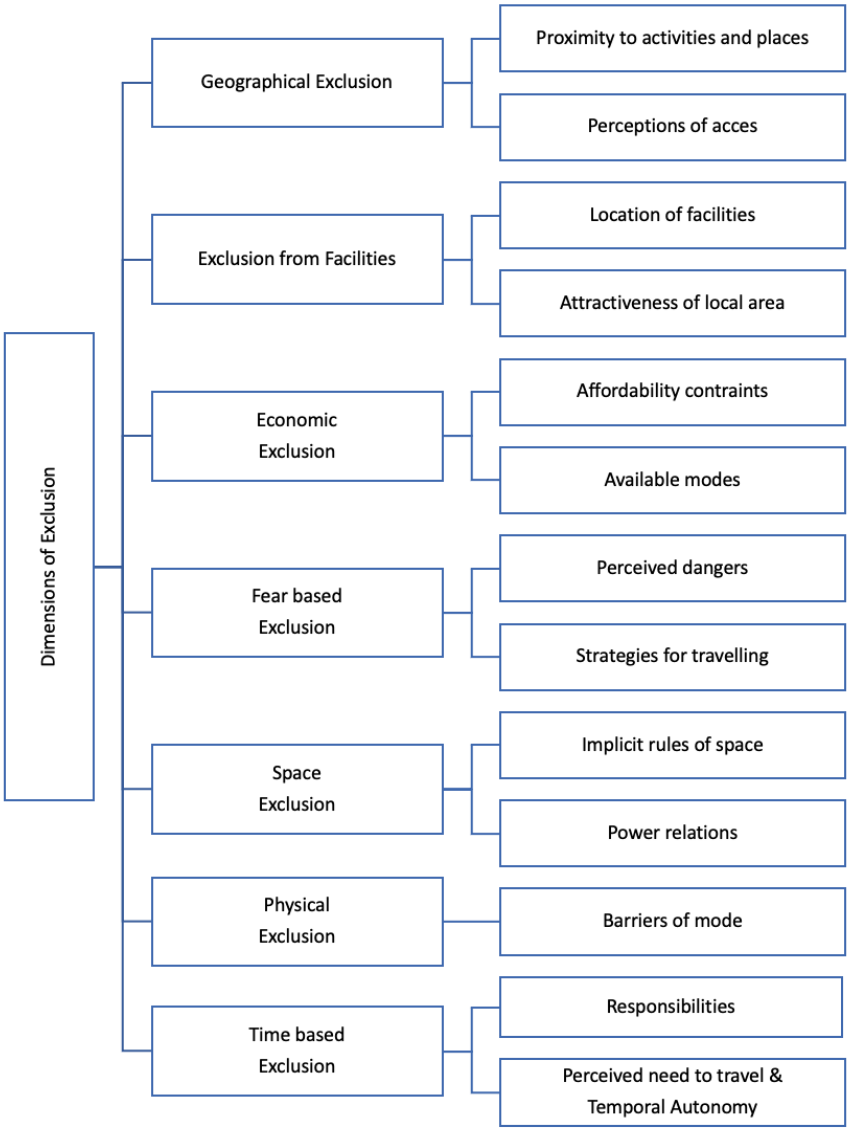

Figure 6 The main themes found during categorisation for data analysis (Source: Own elaboration)

5. Findings

This section summarises the main findings of the survey to obtain information on the impact of RH on the travel patterns of Bogotá's LI neighbourhood residents, to review its ability to help disadvantaged groups overcome social exclusion and to consider policies that can further the same. We analyse the collected data and reflect on the seven dimensions of TRSE to broaden debates about the role of RH in cities with a spatially concentrated urban structure like Bogotá's.

5.1. Geographical Exclusion

Lucas (2012) argues that researchers studying TRSE tend to focus on the repercussions of insufficient transport in terms of people's inability to access essential life-enhancing opportunities like work and education. In this regard, the geographical dimension refers to the proximity to the areas where opportunities are located, and the impact of the place where one lives on access to transport services, which play an important role in reaching such opportunities. (Church et al, 2000; Casa et al, 2014).

5.1.1. Proximity to activities and places

As illustrated in Figure 3, the larger city's structure and transport infrastructure investments have resulted in a concentration of opportunities in the city's central areas, where land value has increased. This, combined with internal migration from rural areas, has contributed to an increase in LI population residing in urban peripheries.

Table 1 shows that more than 61% of LI respondents are educated above high school, and the majority of people identify their main occupation as either working (75%) or studying (14%). A closer look at their main modes of transport and the reason for using the same (Figure 7) indicated that for going to study, 75% used public transport, 7% used a car and 5% used RH. Similarly for going to work, 71% used public transport and 24% used a car, whereas only 2% used RH.

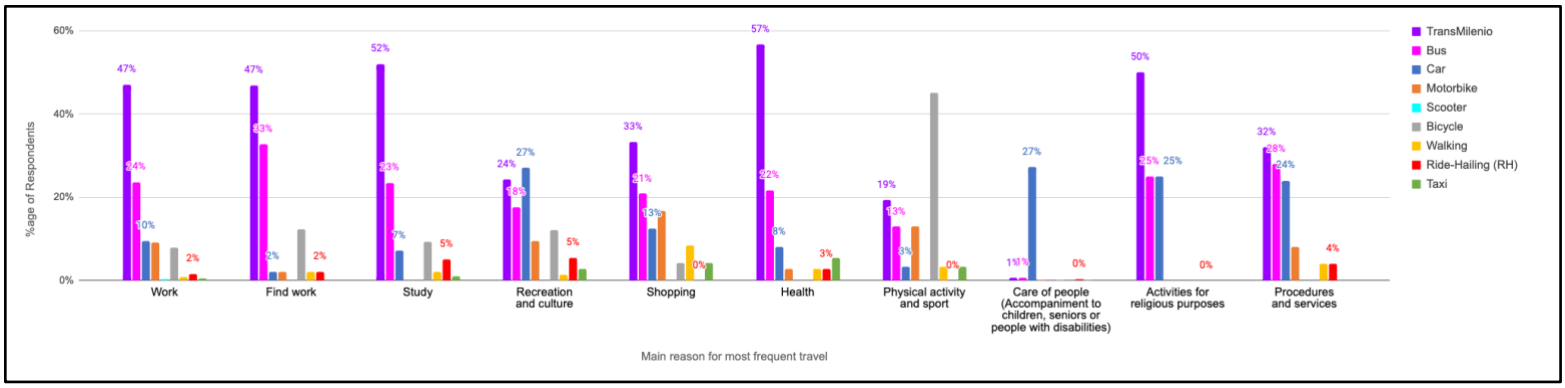

Figure 7 Main modes of transport and the reason for using the same

However, it is important to note that for work trips, 86% respondents travelling by public transport spent more than 100 minutes travelling, while 85% respondents using RH spent only between 0-100 minutes (Figure 8). Moreover, when asked about the perception of 'Reliability of Time' in various transport modes, 42% respondents considered public transport bad/very bad, and on the contrary, 65% considered RH reliability good/very good (Figure 9a). The second most popular reason for using RH was also 'another mode of transport would have been very slow' (Figure 11). However, although RH is perceived as more reliable in comparison to public transport, only 2.33% respondents use the former as their main mode of transport and 65% lean on the latter (Table 1).

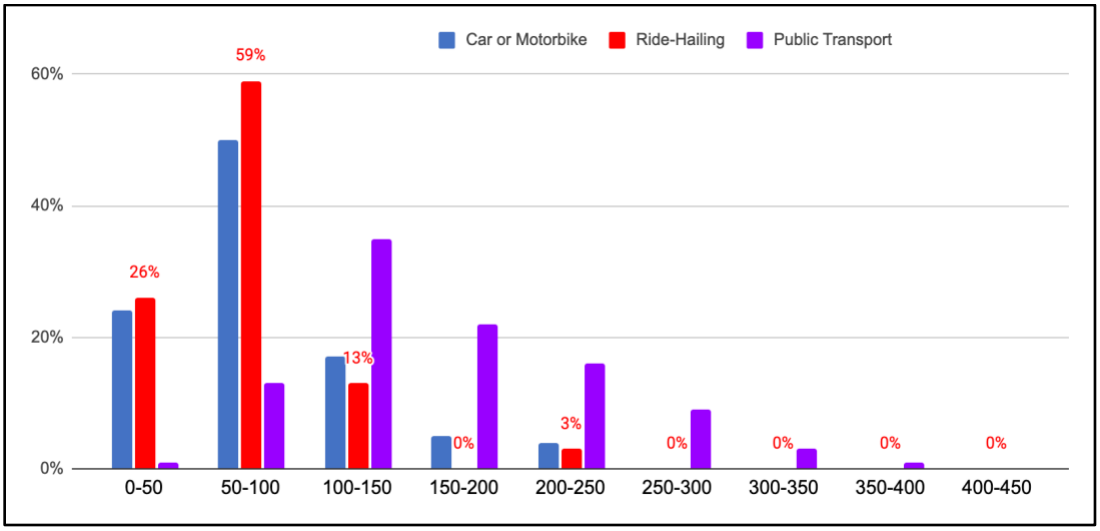

Figure 8 Average travel time for work trips

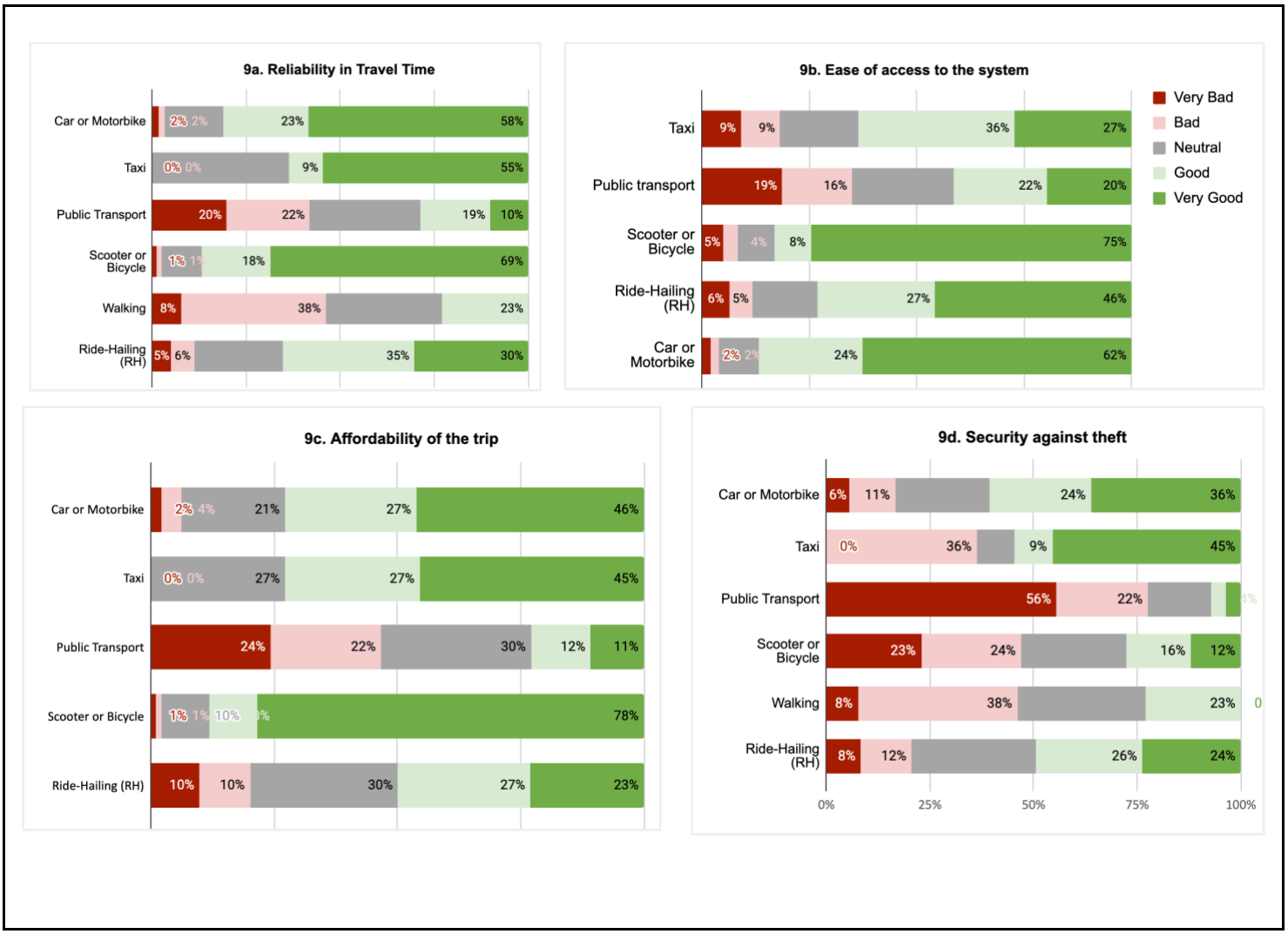

Figure 9 Characteristics evaluated by the main mode of transport used

5.1.2. Perception of Access

While assessing several studies addressing the potential contribution of transport policies to poverty reduction in the Global South, Benevenuto and Caulfield (2019) emphasize that the location where people live has a major impact on their access to transport services. In this regard, 77% of respondents said they had to walk more than 10 minutes from home to the nearest station (Figure 10). In addition, as summarized in Figure 9b, 35% of respondents shared their perception of the 'ease of access to the system' in terms of public transport as bad/very bad. On the

contrary, 73% of respondents said they perceived the same characteristic in relation to RH as good/very good. Moreover, 7% said that the reason respondents chose to travel with a RH service was that there was no public transport available (Figure 11).

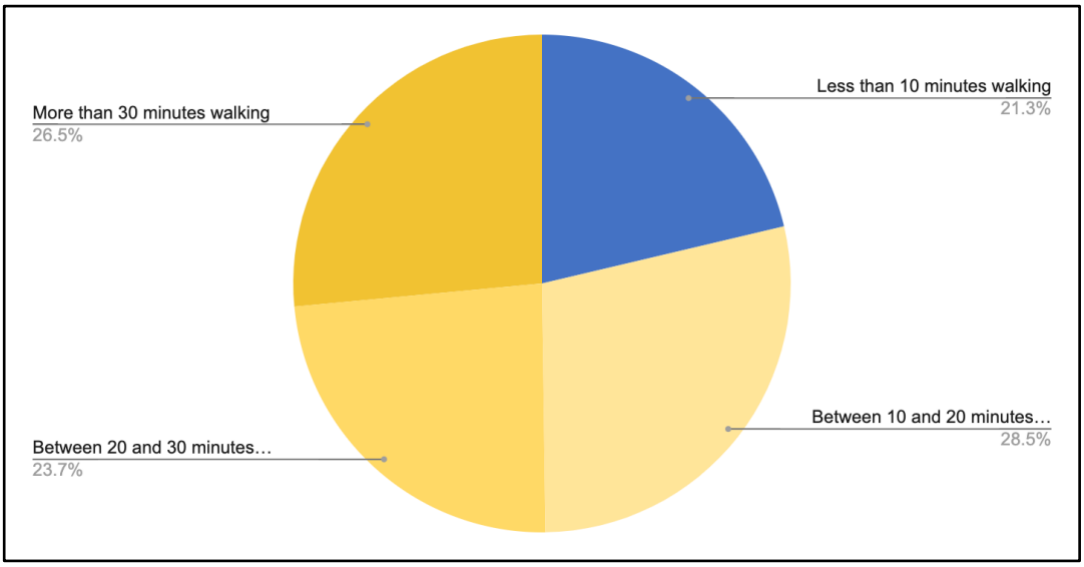

Figure 10 Accessibility to the nearest mass transit station to your home

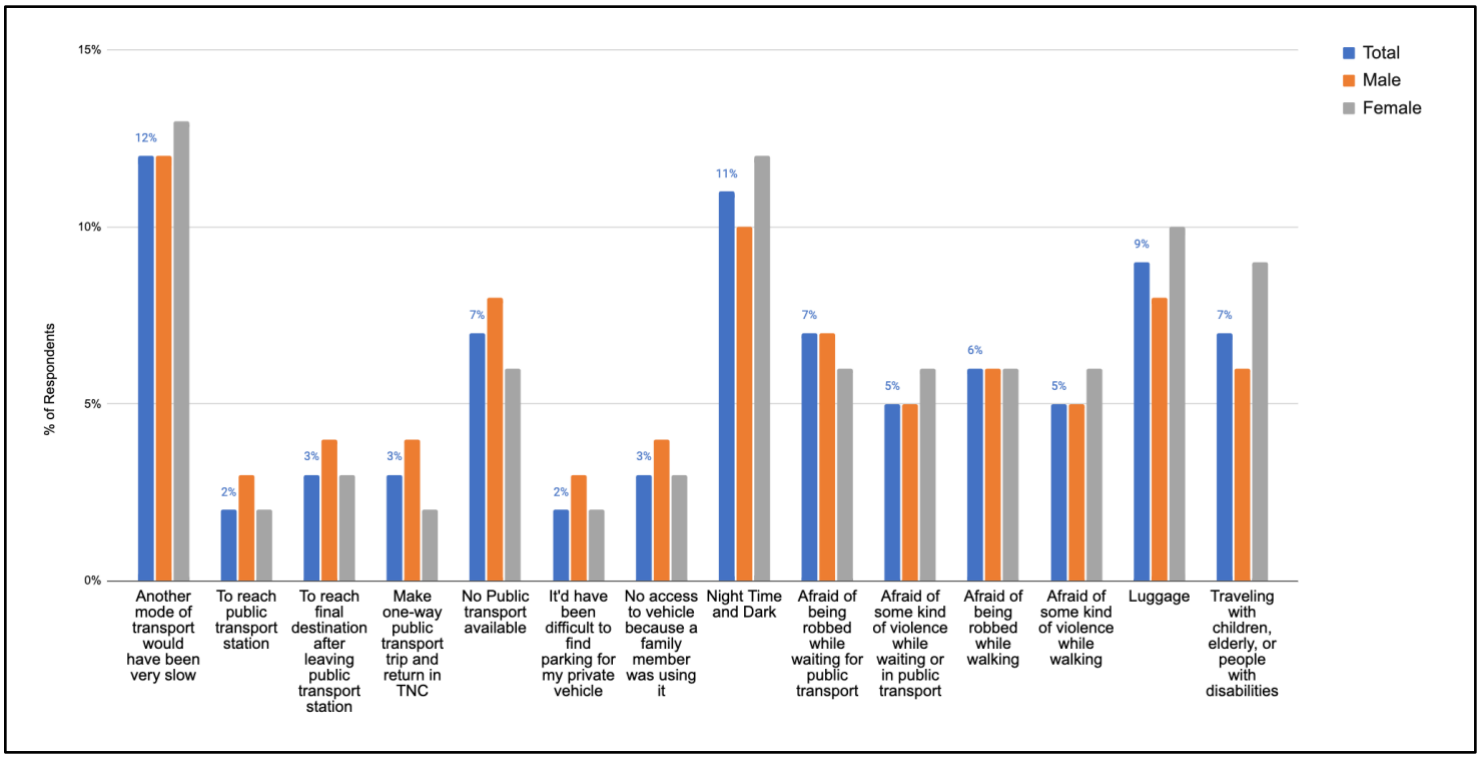

Figure 11 Reasons for using RH

5.2. Exclusion from facilities

Apart from employment opportunities, people living in areas experiencing high social exclusion also have limited access to shopping, health facilities and leisure facilities, as access to these non-income-generating opportunities is constrained by the local availability of key facilities such as shops, hospitals, schools, etc. (Church et al, 2000). Increased distances and inaccessibility to them are clear inequity factors in urban societies and conditions that prohibit participation in social and cultural opportunities (Oviedo-Hernandez and Titheridge, 2016; Benevenuto and Caulfield, 2019). The dimension of exclusion of facilities focuses on these aspects and differs from geographical exclusion, as it takes into account not only the distance to opportunities, but also the location and structural drivers that influence the provision of services and facilities in different parts of the city.

5.2.1. Location of facilities

Oviedo (2021) stresses that land use strategies for the distribution of education and health related facilities are potential factors that can lead to certain areas becoming more attractive for these facilities, which are typically farther away from where LI groups live. Health and household related activities, such as shopping, are major travel motivations that are closely linked to the availability of local amenities. During the analysis, it was observed (Figure 7) that public transport (78%) was the main mode for respondents with ‘health’ as the main reason for travel, rather than walking (3%) or motorbike (3%). Similarly, 54% of respondents relied more on public transport than walking (8%) and bicycle (4%) for ‘shopping’. This suggests that respondents usually have to travel outside the local area for those activities. Despite this, for both these activities, RH was used by only 3% for ‘health’ and 0% for ‘shopping’.

Figure 3 shows that the city of Bogotá is very centralized in terms of job opportunities. This concentration of economic activity has led to greater investments in connectivity to and from areas with more attractiveness and the convergence of social opportunities and essential infrastructure in certain areas. The city has also grown from its historic core along the transport routes that connect it to the major activity hubs, as shown in Figure 5. Despite this and other long-term improvements in many informal neighbourhoods, Bogotá's organization separates most opportunities from these areas, contributing to increased travel distances, heavy reliance on public transport, and high transport costs for their residents. (Guzman et al., 2017; Oviedo and Guzman, 2020). The analysis shows that the distribution of such travel times is not uniform across social groups, with the reported travel time on public transport being 166, 142 and 132 minutes for LI, MI and HI groups, respectively (Figure 12). More specifically, the LI respondents (Table 2) spent significantly longer travelling for non-mandatory activities such as 'recreation and culture' (182 minutes on public transport) as compared to 'work' trips despite the average travel time for such trips on RH being much lesser at 88 minutes.

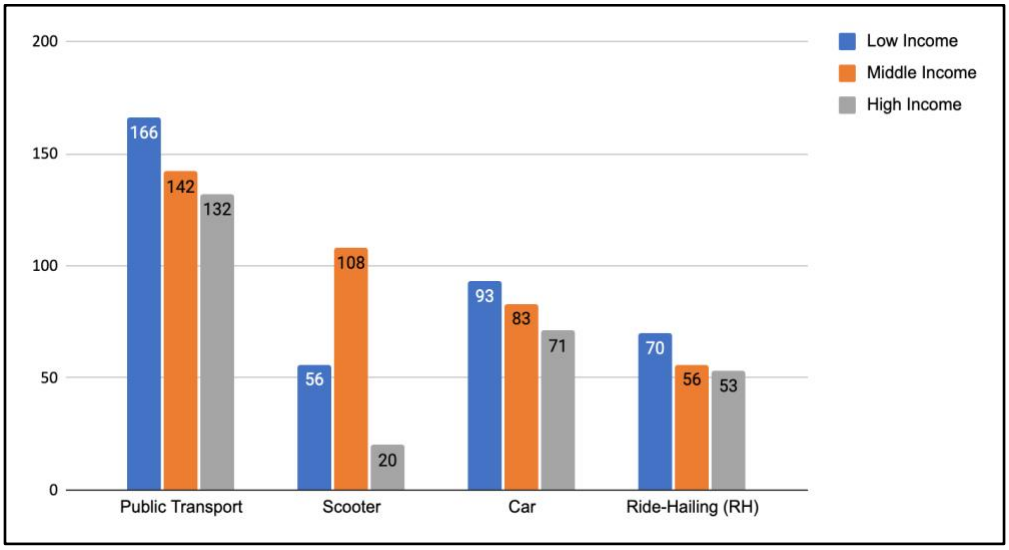

Figure 12 Average reported travel time for each mode across different groups

Table 2 Average Travel Time across modes when reason for travel is 'Recreation and Culture'

(Source: Own analysis)

	Average Travel Time by Travel Mode when Reason for Travel is 'Recreation & Culture'	Average Travel Time by Travel Mode when Reason for Travel is 'Work'
(Motorbike and Car)	120	78
Ride-Hailing (RH)	88	66
Public Transport (Bus and TransMilenio)	182	166

5.2.2. Attractiveness of local area

Attractiveness of LI neighbourhoods is another key issue in terms of exclusion from facilities, as services and places of leisure are not fully available in the area. According to the 2001 Census (Cerevero, 2005), informal settlements in LI neighbourhoods accounted for 22% of the population, with 375,000 slum residences illegally built with relatively few public services such as sewer lines, piped water, paved roads, etc. This, among other things, fuelled the perception of their lack of attractiveness, and Oviedo-Hernandez and Titheridge (2016) underscore that "access is limited to one-way practice," which increases social exclusion because there is limited scope for interactions with people willing to visit their area. Figure 7 shows that 'cars' were the most preferred mode for 27% of respondents who travel for 'recreation and culture', while only 1% chose 'walking' for those activities. Even RH use was only 5% for these activities. Moreover, respondents tended to travel for these purposes at weekends instead of weekdays (Figure 13), suggesting that opportunities for social interaction were not within a reasonable distance and were only pursued on a few days.

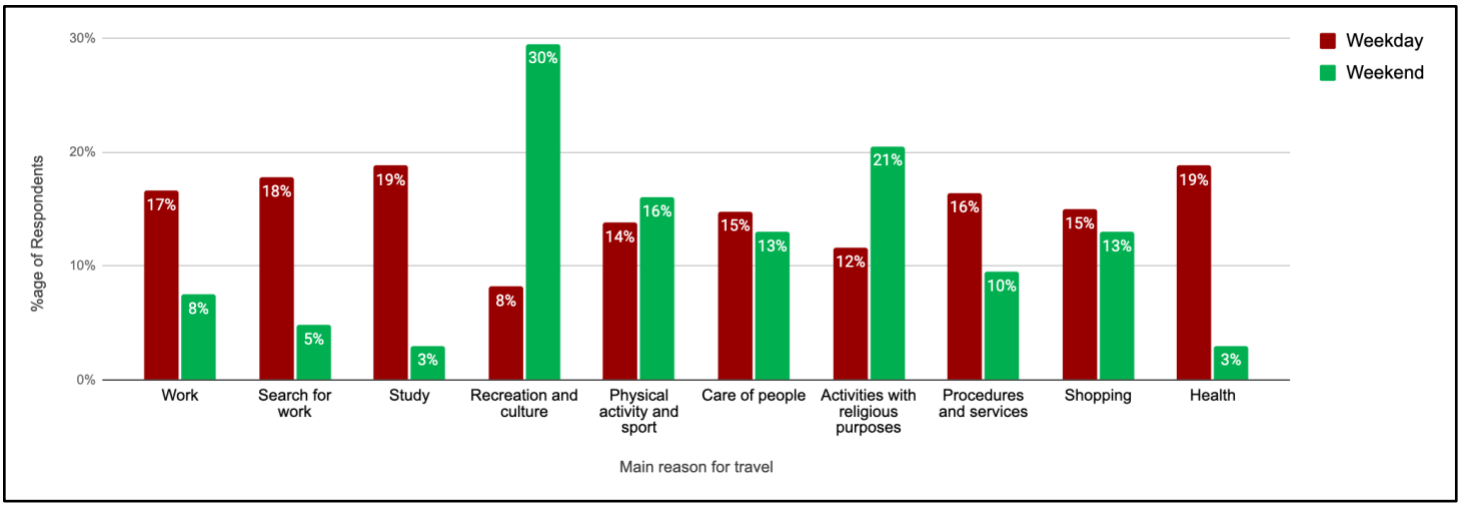

Figure 13 Reasons for Most Frequent Travel - By Weekday/Weekend

5.3. Economic Exclusion

Building on Church et al's (2000) framework, Oviedo (2021) argues that the economic dimension of TRSE is closely linked to poverty and inadequate income to meet needs, as not only do affordability constraints of transport systems reduce access to different opportunities but also narrow the pool of available modes that can be used.

5.3.1. Affordability Constraints

Affordability is often described as the biggest barrier to access a transport system for LI people (Lau, 2010; Lucas 2011; Salon and Gulyani 2010), because it has an impact on the travel capacity of households, as members make trade-offs to maximise what can be achieved with limited incomes (Guzman and Oviedo, 2018; Oviedo-Hernandez and Titheridge, 2016). Analysing the reported 'cost of service' across modes, it was found (Figure 14) that RH is an expensive service compared to other transport modes, corroborating Sabogal-Cardona et al's (2020) observation that RH is unaffordable as a frequent mode of transport for a significant proportion of the population, given the high poverty rate in LAC.

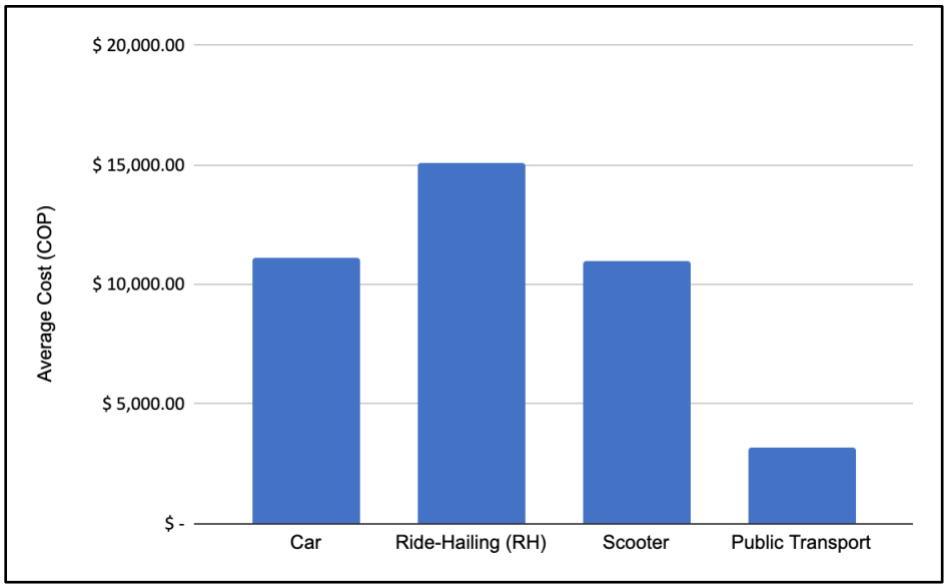

Figure 14 Average reported cost by main mode of travel

These expenditures impede the adoption of RH for LI household members, as the general perception is that the service is not affordable compared to cars or motrobikes and taxis (Figure 9c). Yet 70% of respondents in the survey also agreed that if they could afford it, they would always use RH services (Figure 15).

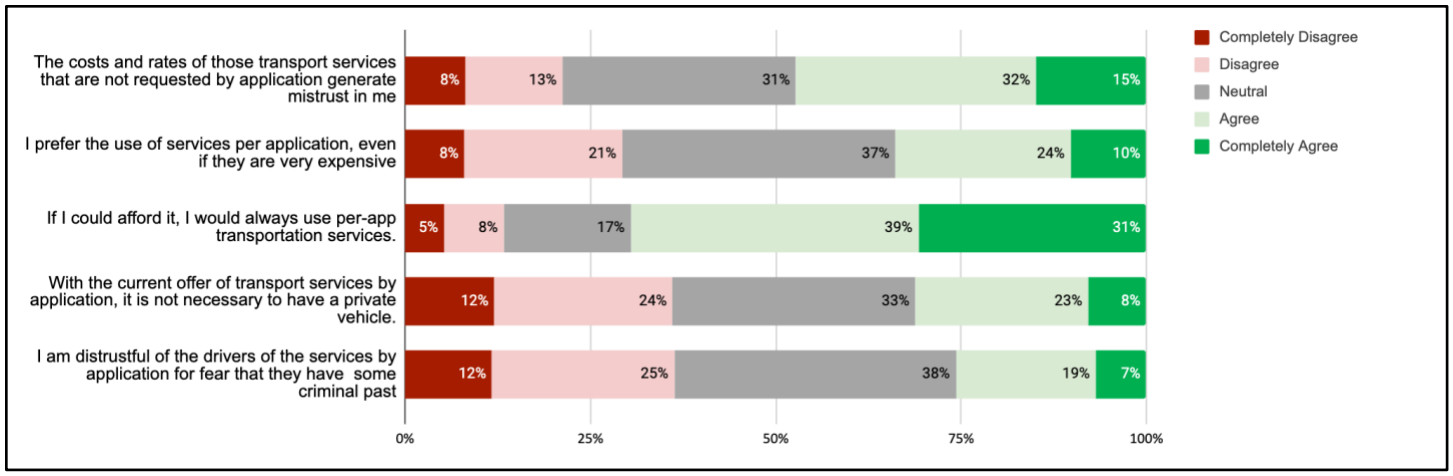

Figure 15 Evaluation of 5 RH-related statements

5.3.2. Available modes

In addition to high financial outlays, travel patterns to access income-raising opportunities also involve long periods of travel to Bogotá. The dominant form of mobility in the area (Figure 16) is public transport (66.7%) with a disproportionately high average travel time of 261 minutes (Figure 17). Although RH has a slightly shorter average travel time (70 minutes) than cars (93 minutes), the latter is still preferred by 11.5% over RH (2.5%).

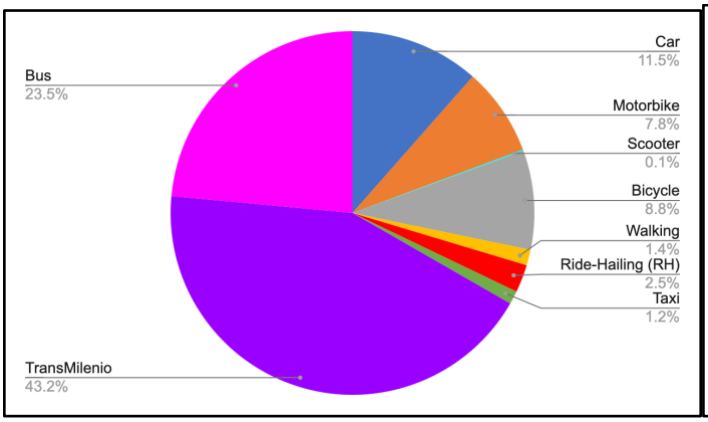

Figure 16 Dominant forms of mobility in the area

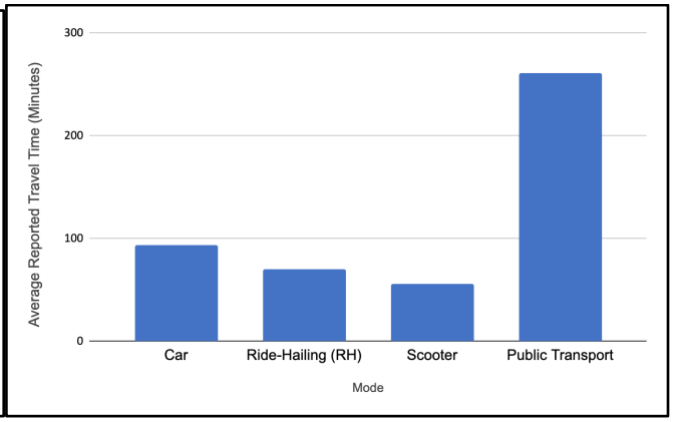

Figure 17 Average travel time by mode

Even though public transport is considered the dominant form of mobility, a major challenge highlighted by Oviedo-Hernandez and Titheridge (2016) is the lack of fare integration. To circumvent this, one of the selling points of RH is that it can be used to complement public transport, which was reported by only 8% of respondents as one of the reasons for respondents to use RH (Figure 11). Moreover, 81% of respondents said that they use RH in practice in combination with public transport either very rarely, rarely or occasionally (Figure 18).

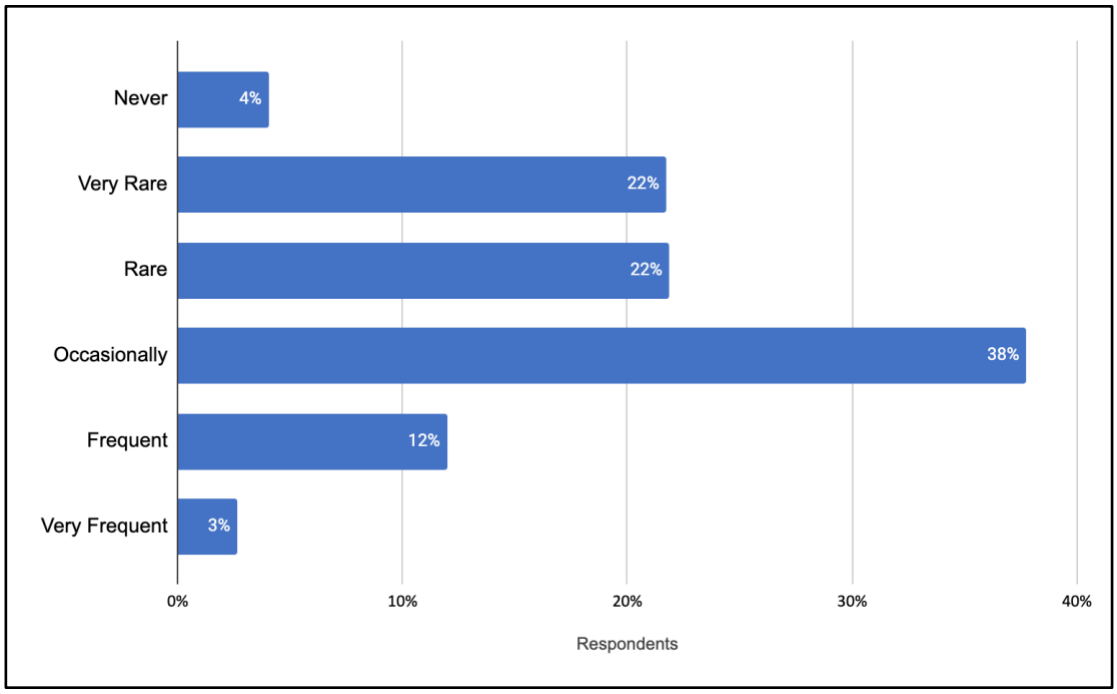

Figure 18 How often people used RH in combination with public transport

Furthermore, Oviedo et al (2020) stress that lower SESs, in contrast to the better-connected HI households closer to the center, have higher travel times, as there are high correlations between income and location. Apart from scooters, the average travel time for public transport, car and RH reported by LI respondents was higher than for the remaining two groups (Figure 12). The absence of suitable options for LI residents' travel has a negative influence on their quality of life, as they are compelled to endure excessive expenditure, discomfort, and less time for other activities owing to the lack of adequate alternatives for their travel (Guzman and Oviedo, 2018). To this end, it was not surprising that even though the availability of RH revolutionized the transport ecosystem, the average reported travel times for LI households remain higher due to their distance from Bogotá's central core (Figure 12).

In addition, travel spending for LI residents is also higher, as it depends on the availability of travel alternatives based on numerous factors including but not limited to infrastructure. In LI neighbourhoods with poor public transport connectivity, despite lower

incomes and limited purchasing power, ownership of a private vehicle is still preferred as an alternative. When asked if RH discourages the use and acquisition of private vehicles, 41% of respondents disagreed (Figure 19) and 54% said they would not consider stopping using their private vehicles despite the availability of RH (Figure 20). Interestingly, however, 42% of respondents said they were unlikely to buy a car in the future after COVID (Figure 21).

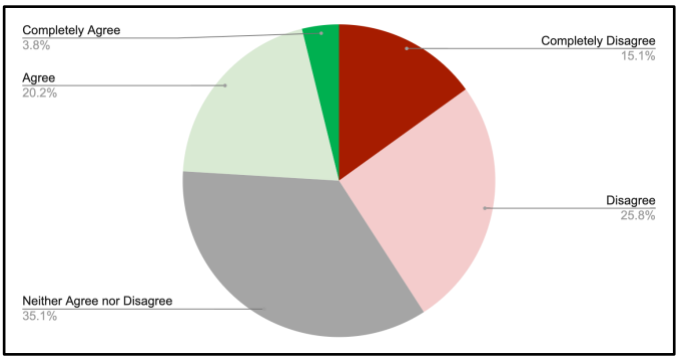

Figure 19 Does use of RH discourage use and acquisition of private vehicles

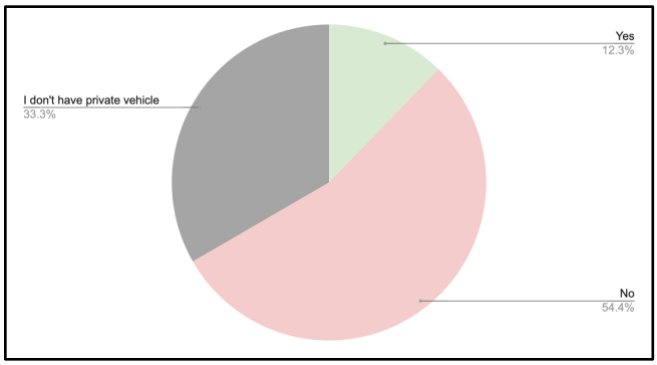

Figure 20 Have respondents considered stopping using their private vehicle

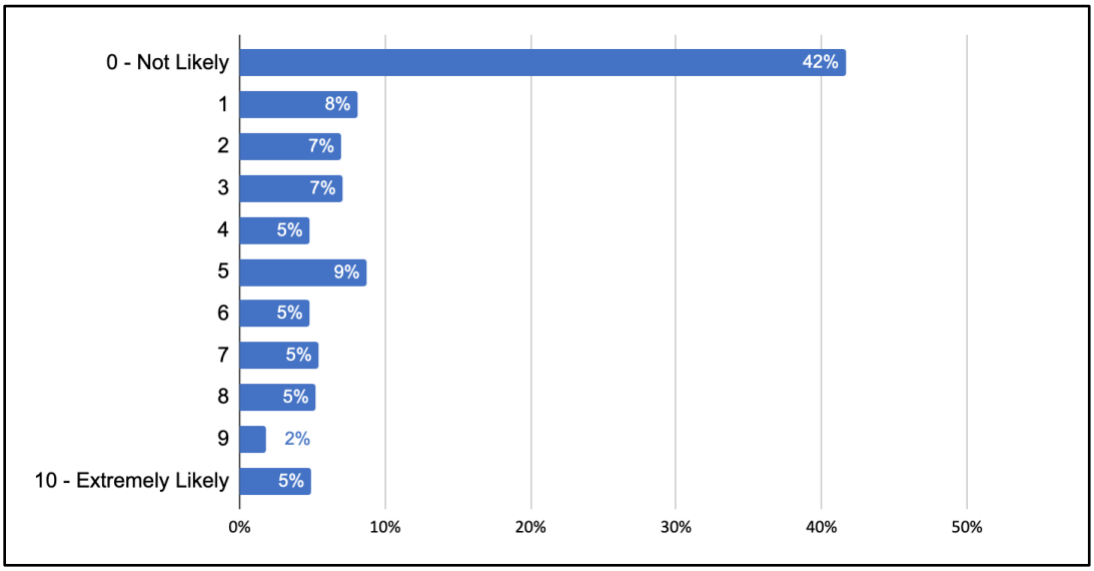

Figure 21 Respondents likely to buy a private vehicle in a post-COVID situation

5.4. Fear-based Exclusion

In addition to spatial and monetary barriers, problems such as crime and fear of personal safety in LI neighbourhoods also significantly reduce residents' interaction opportunities. The fear-based dimension illuminates aspects such as perceived dangers that prohibit the usage of transport services and the travel strategies deployed to overcome the same (Church et al, 2000).

5.4.1. Perceived Dangers

Deficient urban infrastructure in these areas, coupled with the presence of local gangs and thieves and resulting high crime and violence, has led to the elite preferring to isolate themselves in gated communities, thereby increasing spatial polarization (Lizarrage et al., 2001). Therefore, these tensions promote social stigma and unfavorable external impressions, lowering the appeal of these underserved regions even further.

Church et al (2000) highlight how ‘fear of crime’ in public spaces is closely linked to social traits, especially gender, and disproportionately experienced by women. When assessing a series of statements on 'Saftey', more women said they didn't do something out of fear. For example, compared to 48% men, 61% women agreed that they didn't want to wait at a mass transit station because they were afraid of being victims of some form of physical violence or sexual harassment (Figure 22).

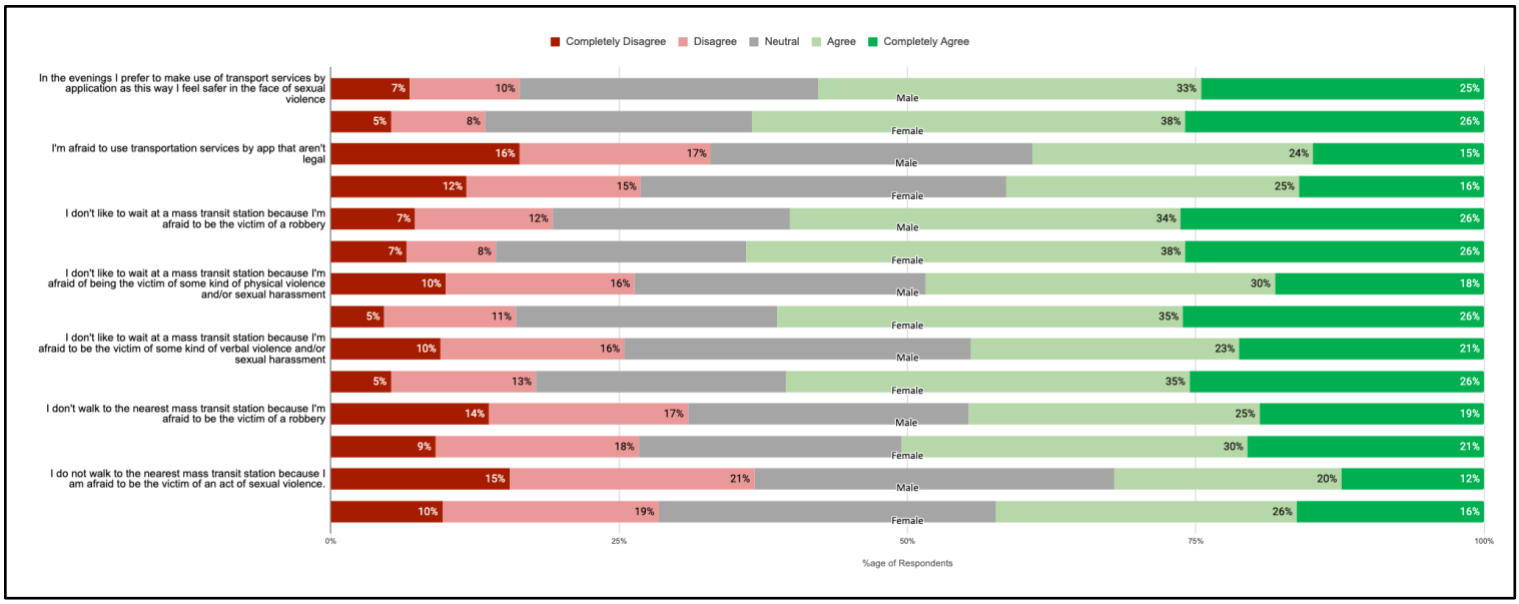

Figure 22 Evaluation of 7 Safety-related statements

5.4.2. Strategies for travelling

Such perceptions of insecurity impact activities and routes, and can ultimately contribute to social exclusion. In this regard, fear heavily influences people's travel strategies to mitigate risks. Sabogal-Cardona et al (2020) note that mode selection is one such strategy. This was also reflected in the reasons for using RH (Figure 11), where safety concerns about being robbed, being a victim of violence, etc. were the most popular reasons for using RH - chosen by 23% of respondents. Closely followed by ‘night time and dark’, the third most popular reason for using RH - selected by 11% respondents. Even when assessing certain characteristics with respect to their main mode of travel (Figure 9d), 61% respondents indicated that cars or motorbikes were secure against theft/robbery, closely followed by approx 50% respondents who considered Taxi and RH to be secure. It is important to note that Colombia's landscape of instability and criminality creates insecurity for both drivers and passengers. Gomez-Morantes et al (2021) discuss the case of "millionaire rides," in which fake drivers or criminal passengers robbing the other party cause mistrust among people.

The perception of insecurity also affects schedules and limits times when it is safe to travel by certain means (Hernandez Oviedo and Dávila, 2016; Oviedo-Hernandez and Titheridge, 2016). Moreover, the non-conventional working hours of many LI residents require them to travel very early in the morning or for night shifts, creating additional challenges that 95% of those who travel late in the night worked around by travelling with companions (Figure 23). Regarding the selection of mode at different hours of the day, the analysis of the trip start time for the main transport modes of the respondents (Figure 24) showed that respondents using RH mainly preferred it for early morning (2%) and late night (3%) trips.

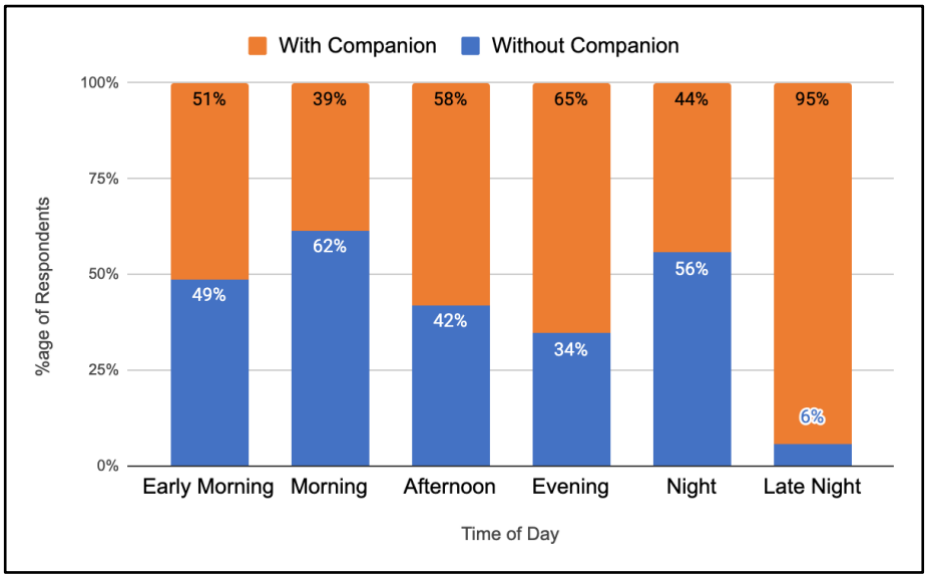

Figure 23 'Start time of trip' mapped to 'number of companions'

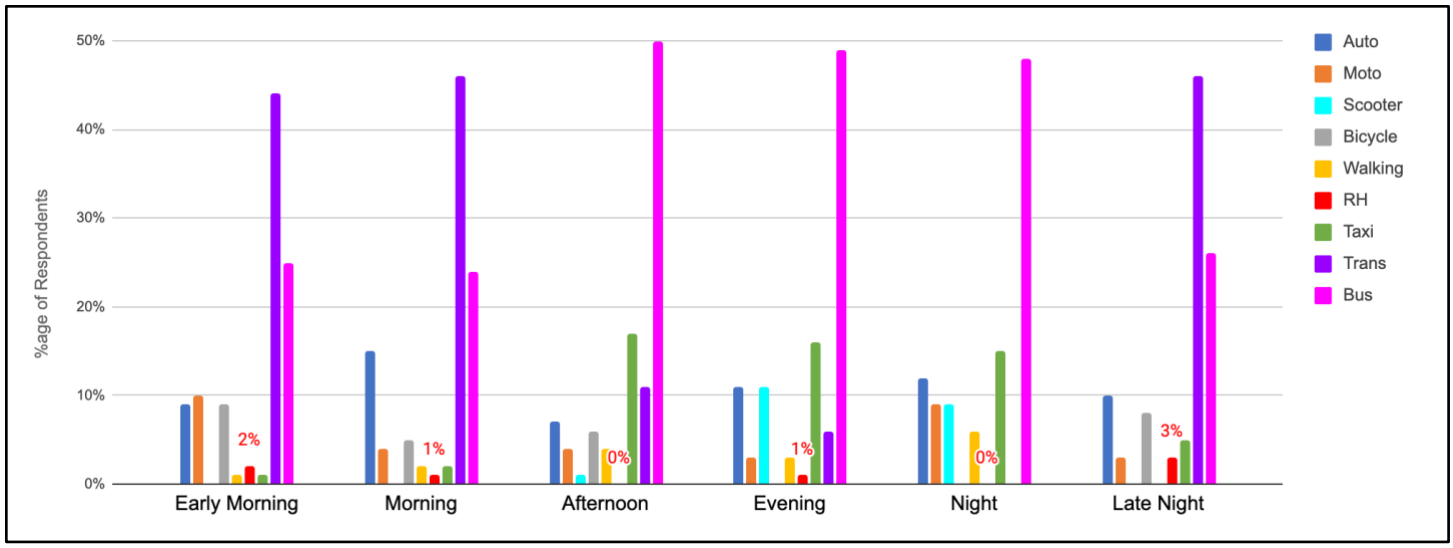

Figure 24 Main Modes of Travel split by Start Time of Trip

In line with Sabogal-Cardona et al's (2020) assessment, the availability of certain security features could also increase RH's appeal to LI groups. When assessing technology-related statements during the survey, 75% of respondents agreed that knowing their location made them feel safe and 70% agreed that being able to share trip details made them feel safe.

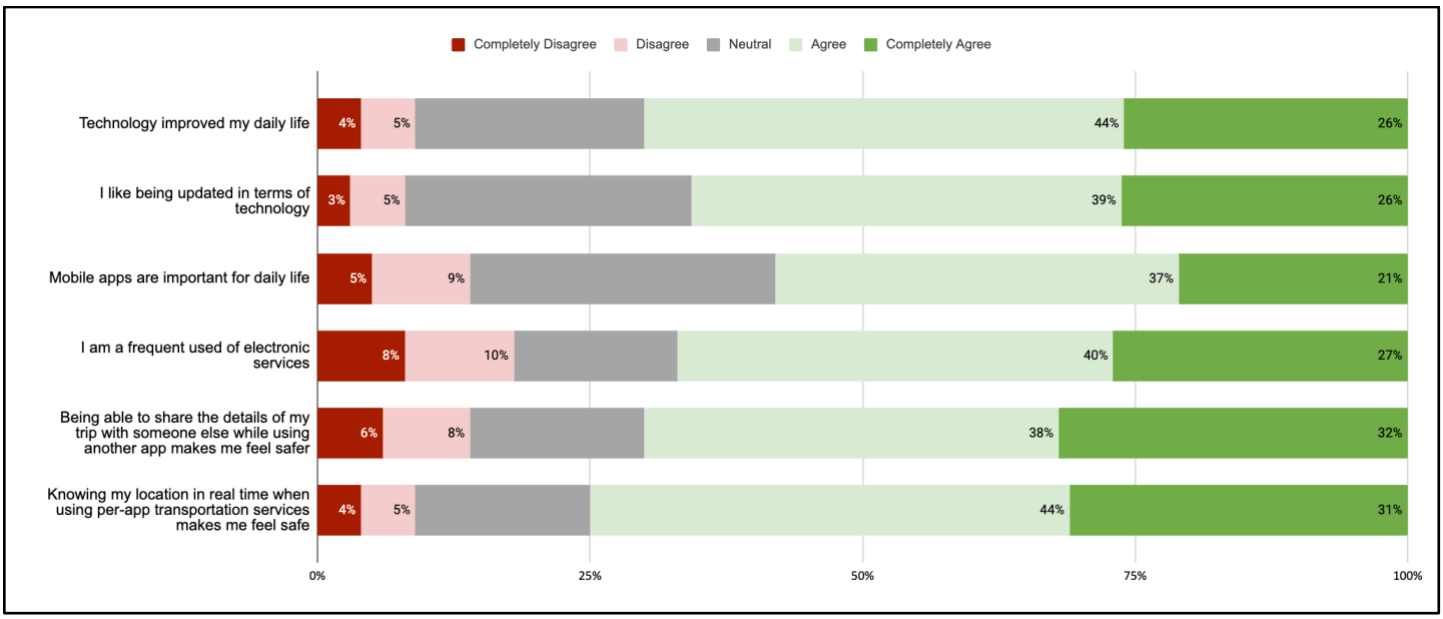

Figure 25 Evaluation of 6 Technology-related statements

5.5. Space Exclusion

Church et al (2000) associate space exclusion with the effect of discrimination, implicit rules of space and power dynamics which might restrict access for certain groups. This dimension is intertwined with the fear-based dimension and overlaps with several of the aspects discussed in the preceding section, since the presence of criminal activities and organizations in the neighbourhood severely restricts the availability of public space for movement.

5.5.1. Implicit rules of space

Hernandez and Titheridge (2016) explain that local criminal gangs physically restrict neighbourhood mobility by imposing tolls in some sections of Soacha, an autonomous municipality in the Bogotá metropolitan region. In addition to these limitations imposed by unofficial authorities, Church et al (2000) emphasize that there may also be implicit rules of space that discourage certain groups from using public transport. For instance, it was noted in the survey (Figure 11) that 9% and 7% respondents preferred using RH for certain scenarios, such as 'carrying suitcases or heavy packages' or 'travelling with children, seniors or people with disabilities' respectively. However, while travelling with companions, cars were the second most preferred mode and only 4% respondents preferred RH over other modes (Figure 26).

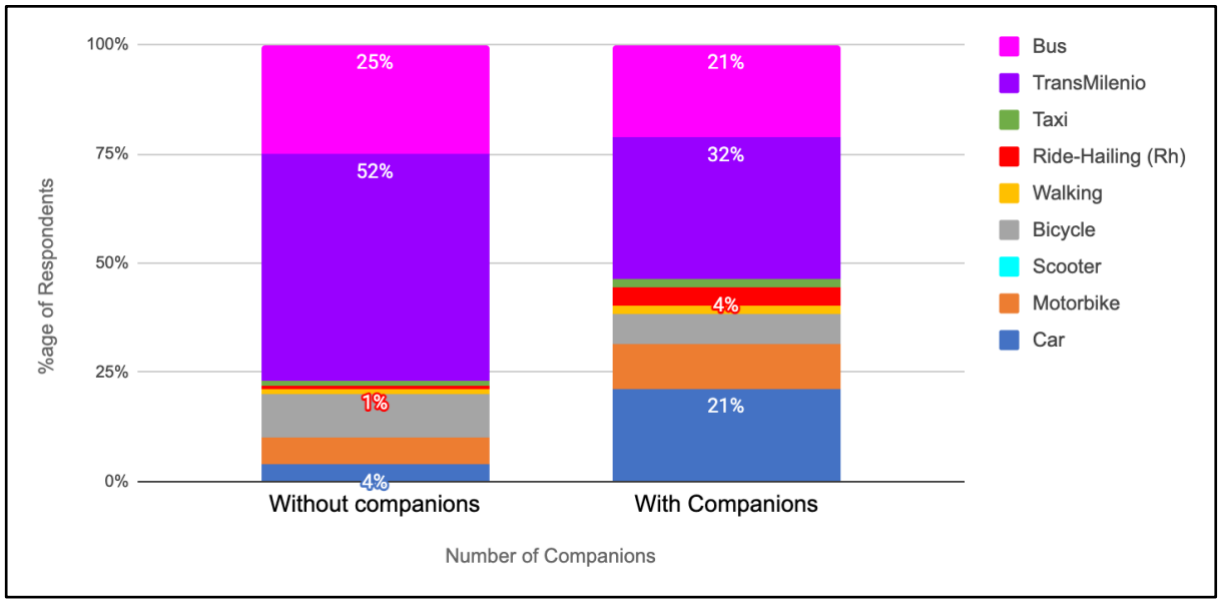

Figure 26 Main Mode of Travel - Mapped to Number of Companions

5.5.2. Power relations

Those with restricted options, on the other hand, are less inclined to leave the house until absolutely essential, and more family members tend to stay at home owing to increased expenses and dangers. On the one hand, RH technology and flexibility can respond to certain obstacles, on the other hand, they could also pose additional challenges in the form of complex power dynamics in relation to drivers. Although the introduction of the above-mentioned safety features has to some extent empowered passengers, drivers continue to exert influence in terms of trip acceptance, route selection, etc. In this regard, Gomez-Morantes et al. (2021) discuss the resource-competitive pressures that contribute to poor practices among drivers, such as aggressive driving to complete trips quicker and rejecting customers who seek low-cost journeys.

5.6. Physical Exclusion

Physical characteristics of the built environment and transport systems can restrict access for individuals who may have psychological and/or physical difficulties. Such barriers, combined

with conditions identified in previous dimensions of TRSE, can affect different groups of people disproportionately who are already individually restricted, including people with disabilities and the elderly, which can practically force them into immobility (Church et al., 2000; Hine, 2003).

5.6.1. Barriers of mode

Many authors, like Poushter (2017), raise questions about the equity implications of RH and warn of the dangers of the digital divide and access barriers to these services, which can act as potential mechanisms of social exclusion. The literature (Garikapati et al, 2016; Dias et al, 2017; McGrath, 2017; Clewlow and Mishra, 2017; Alemi et al, 2018) acknowledges that RH users are mainly young, highly educated and HI transport users, and that their adoption of the service is influenced by levels of engagement with technology. Despite these challenges, the majority of older respondents (33%) used RH at least once per month (Figure 27), however, they travelled for fewer travel purposes such as shopping and health apart from work (Figure 28).

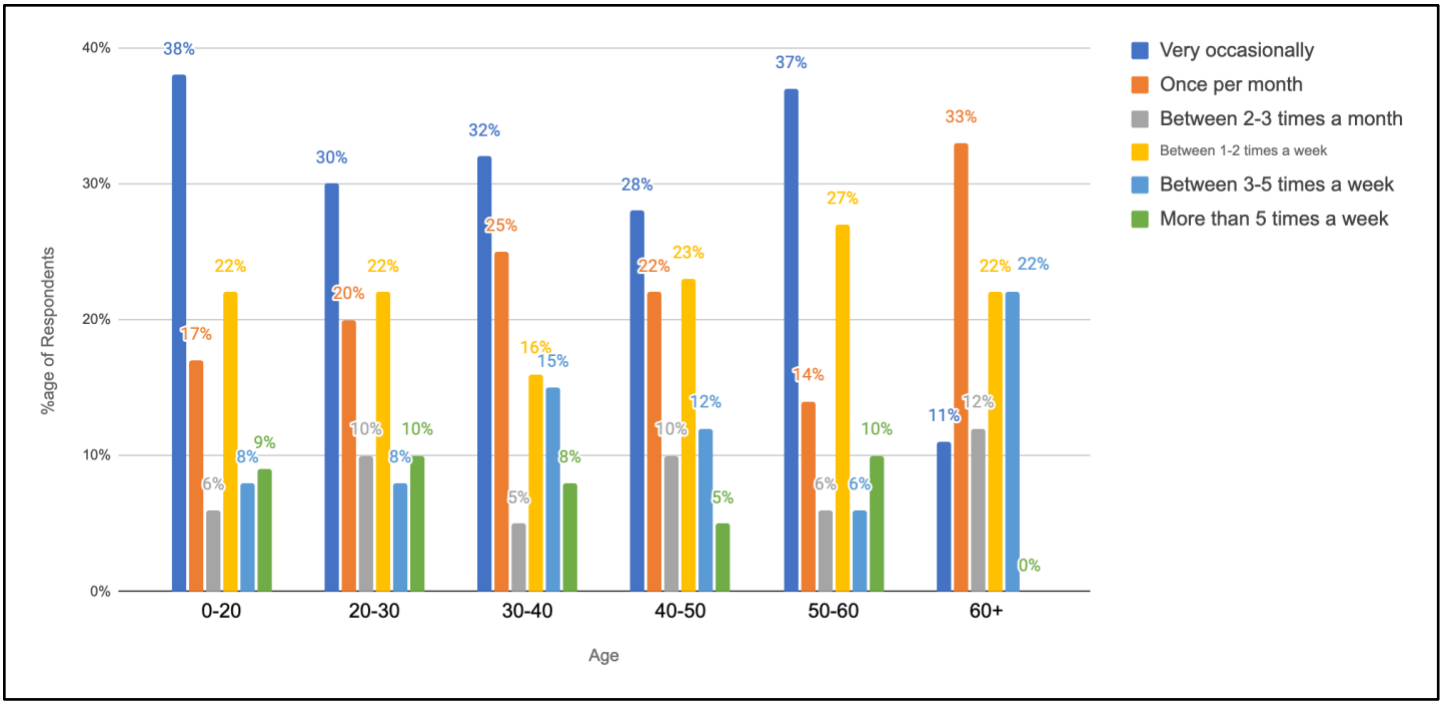

Figure 27 Difference in Frequency of RH use by Age

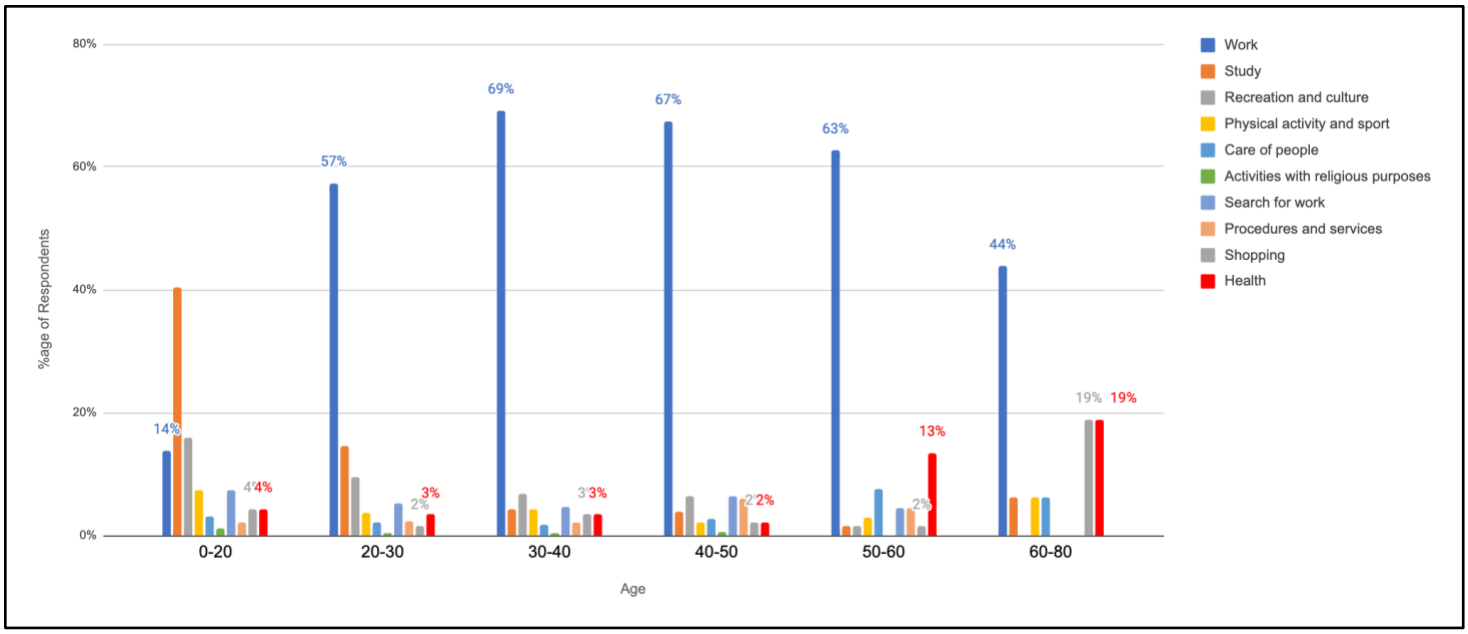

Figure 28 Main Reason for Most Frequent Travel by Age

Transport equity refers to the availability of special transport services adapted to disadvantaged people (Lizarrage et al., 2011). However, RH's dependence on technology and digital literacy could pose additional challenges to these older residents of LI neighbourhoods who are already disadvantaged. Nevertheless, 88% of older respondents rated the characteristic 'ease of access to the service' of RH as good/very good, second only to cars or motorbikes (Figure 29).

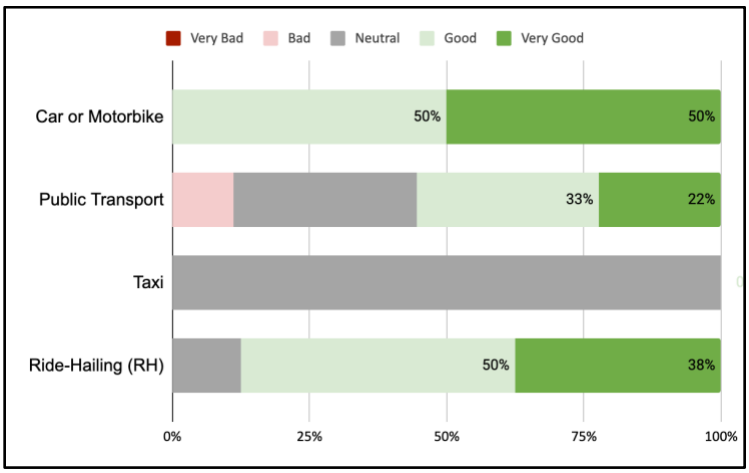

Figure 29 Perception of characteristic 'Ease of access to the service' for various Modes by 60+ age group

5.7. Time-Based Exclusion

The dimension of time-based exclusion illustrates how long travel durations may exclude even more vulnerable groups, such as carers, who are time poor owing to other time-consuming tasks (example, child-care responsibilities) and find it difficult to dedicate time to various commitments (Church et al, 2000).

5.7.1. Responsibilities

Typically, due to social conventions and traditionally defined roles within households, women are imposed with responsibilities related to caring for children and older people, working in the household, shopping, etc., which leads to a paucity of time in general and lesser travel time in particular. Church et al (2000) argue that the difficulties in organising commitments to allow adequate travel time disproportionately affect women linked to the mobility of children and the elderly, who may either need permanent care or accompanying. Disaggregated by gender, it was found for slightly more female respondents that the main reason for the most frequent travel was the care of people, i.e. children, seniors or people with some form of disability (Figure 30).

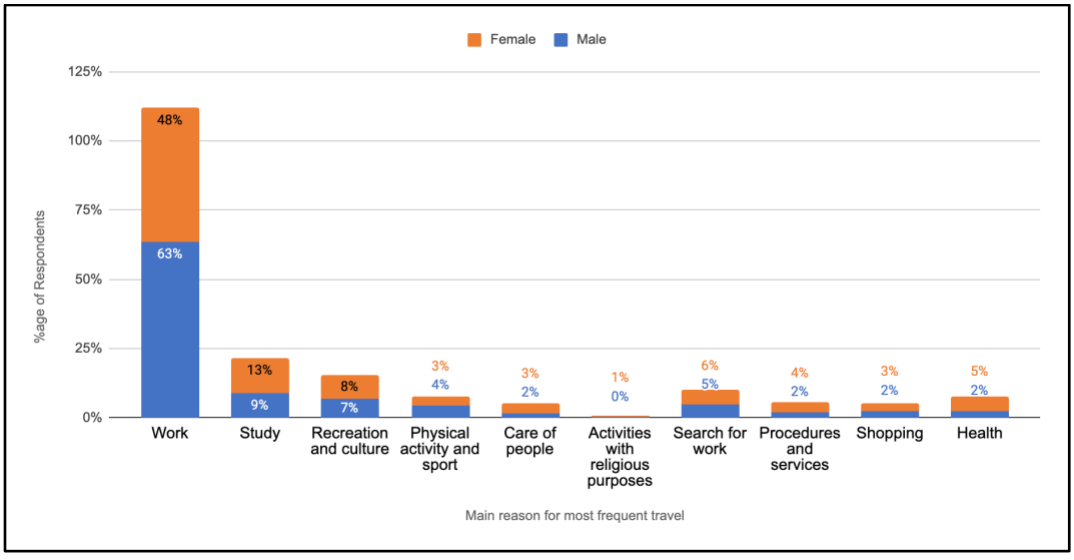

Figure 30 Reasons for Most Frequent Travel - By Gender

In addition to their responsibilities, women's ability to travel is further complicated by their access to slower modes of transport, limited availability of transport services at certain times, and limited access to private vehicles as they are often reserved for working men in the household (Schwanen, 2011; Levy, 2013; Sabogal-Cardona et al, 2020). Women are therefore more likely to be looking for alternative modes of transport. Even in the survey, more men reported having access to a private vehicle (Figure 31) such as a car (14%), a motorbike (12%) or a bicycle (14%) compared to women, 78% of whom relied on public transport more than 54% among men.

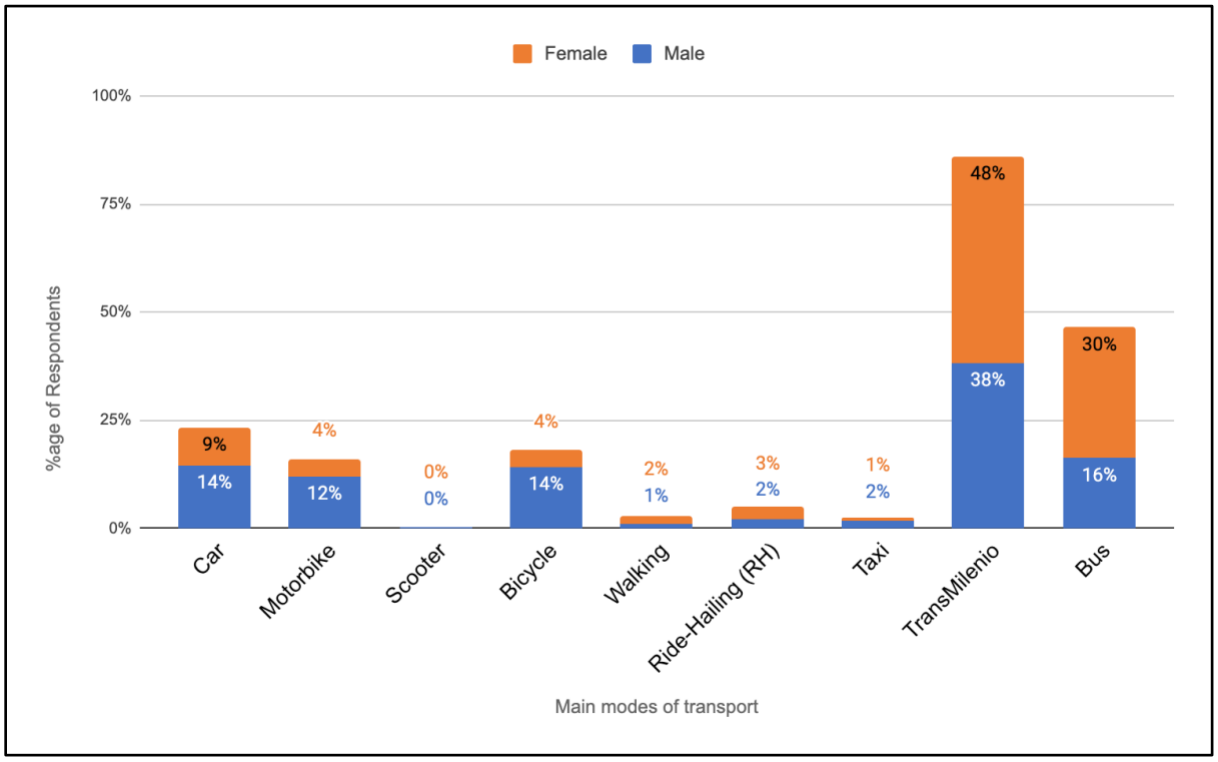

Figure 31 Main mode of transport - By Gender

5.7.2. Perceived need to travel and temporal autonomy

Similar to Oviedo-Hernandez and Titheridge's (2016) findings on travel strategies in the face of limited transport options in the case of Soacha, it was also noticed that the reported purpose of trip had a minor gender imbalance (Figure 30). For example, more men reported

travelling for work (63%) or physical activity and sports (4%), while more women travelled for care of people, religious purposes, shopping and health.

The scholars (ibid.) also noted that control of women's activities was often identified as a problem, leading many women to stay home most of the day during weekdays and even on weekends. Particularly in this study, it was observed that while throughout the day, women continued to prefer public transport for their trips as compared to RH, only those who travelled at night or late night, preferred RH over other modes (Figure 32).

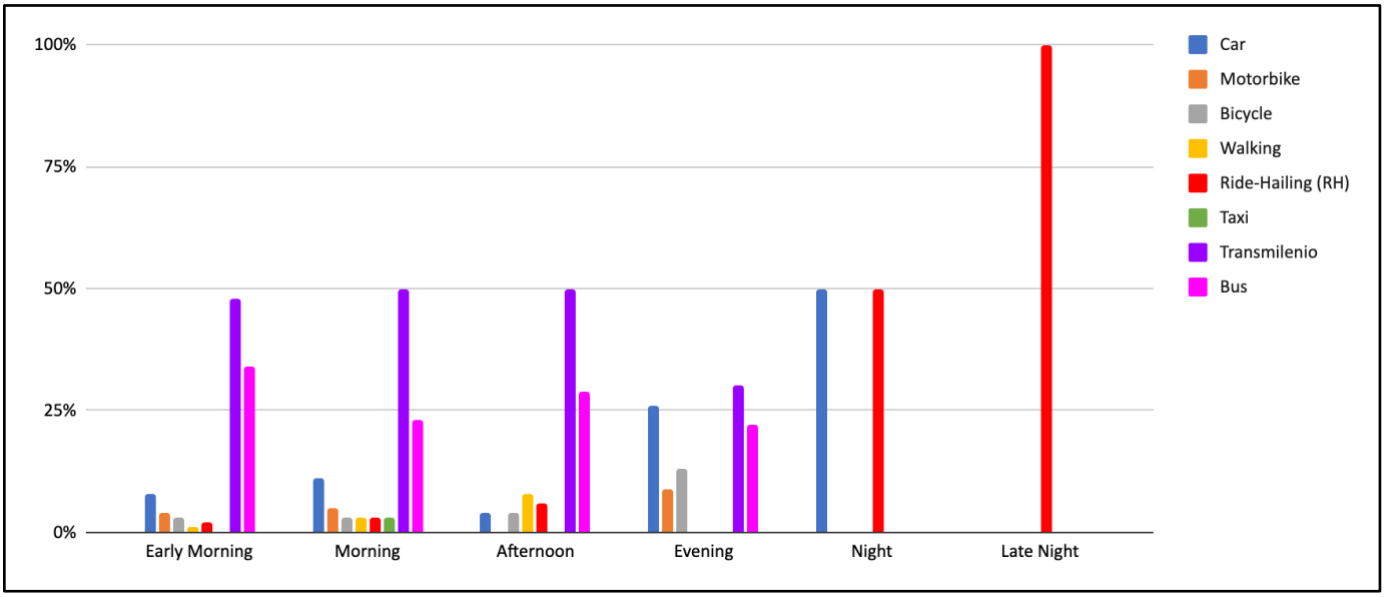

Figure 32 For female respondents, 'Main mode of travel' across different times of the day

The next section seeks to discuss the impact of RH on the travel patterns of LI residents in Bogotá in relation to the seven dimensions of TRSE.

6. Discussion

Over time, scholars (Thibert and Osorio, 2014; Oviedo-Hernandez and Dávila, 2016; Oviedo and Guzman, 2020; Oviedo 2021) have asserted that LAC cities are more spatially and socially segregated, and LI communities are frequently overlooked when it comes to

infrastructure provision. Poor urban planning, high population density, restricted access to facilities, inadequate public transport, and limited local job prospects characterize LI communities. The evidence from the survey also points to the negative effects of Bogotá's urban geography on accessibility and inclusion of LI residents. This section reflects on RH's ability to promote or hinder exclusion when it comes to each of the seven dimensions of TRSE.

First, both, in relation to the geographical dimension of exclusion and exclusion from facilities, LI residents' location disadvantages them, owing to their distance from life-enhancing opportunities and the limited availability of key local facilities. Because they live farther from the city center, socially disadvantaged LI residents who mainly use public transport face longer commute times, greater travel distances, congestion, and generally limited local public transport coverage, which necessitates long walking times. These gaps are especially highlighted in Oviedo, Scorcia, and Scholl's (2021) reflections on conditions that can make RH attractive to certain social groups. Although the use of RH services in LI neighbourhoods is evidently low (Table 1), it can potentially fill these gaps due to its flexibility of route.

Second, in LAC, evidence suggests that transport costs can account for a significant proportion of disposable income in LI populations (Falavigna and Hernandez, 2016). UNCRD-IDB (2011, cited in Oviedo et al. 2021) report that people in Bogotá spend USD 82 million a day on transport. These costs can be a heavy burden for LI households, as disadvantaged populations can spend up to 25% of their income on transport (Bocarejo and Oviedo, 2012). The reportedly high cost of service of RH compared to other modes is therefore perhaps the biggest barrier to adoption, since it is perceived to be unaffordable as a frequent mode of transport. As a result, it continues to be used sparingly for specific use cases. However, the service seems to be a more feasible travel mode than alternatives if residents weigh their decision on the intangible value of

time spent commuting. Having said that, Oviedo-Hernandez and Titheridge (2016) point out that there is a significant willingness among LI residents to sacrifice time to reduce transport costs, therefore, using RH as a standalone might not be prudent, but leveraging RH's ability to complement public transport for last mile connectivity and promoting integrated fares could be particularly meaningful in lowering overall costs.

Third, crime and perceived dangers are common problems in LI neighbourhoods in developing countries, and Oviedo-Hernandez and Titheridge (2016) elaborate how, in Colombia, small-scale drug trading often takes place in peripheral areas with easy access to the markets and poor institutional control. Oviedo (2021) notes that TRSE's spatial and fear-related dimensions have a reciprocal relationship with splintering urbanism, as segregation and disconnection contribute to localizing and concentrating crime in LI neighbourhoods. As Casas et al (2014) argue, the fear-based dimension is particularly important, as people may exclude themselves from transport systems because of the dangers and threats that these systems could pose. Therefore, a system like RH that can help them reduce such risks through technology and other operational aspects is considered an important inclusion in the available options, as reflected in the survey, where safety concerns were the most popular reason for using RH (Figure 11).

Fourth, the dimension of space exclusion relates to various public places and transport systems' design, security, and management techniques that may prohibit particular social groups from using them. On an extreme note, Quinones (2021) reports that women regularly avoid certain clothing when travelling by public transport to avoid gender violence, but there are also other selective spatial barriers imposed by certain transport systems by design that make them unfit for certain purposes. RH could be feasible for such reasons where people must deal with restrictions on other modes. Another key problem in transport planning in these neighbourhoods

is the lack of effective enforcement of regulations, which is compounded by inadequate institutional capacity and corruption. Some of these challenges can be overcome by technological advances by private actors seeking to strengthen supply and demand management. Complex power relationships associated with contextual social and cultural values (Oviedo and Nieto-Combariza, 2021) and notable power inequalities between actors operating on the municipal and national scale, can, however, constrain RH growth and limit the ability of some more marginalized groups to become platform users. As a result, LI residents' mobility strategies continue to face governance and power issues.

Fifth, Oviedo and Guzmán (2021) point out that one of the major flaws in mainstream transport planning methods in the Global South is the propensity to homogenize users based on dominant demographics and standardise their mobility needs. This generalisation results in transport networks that are intended for certain users, mostly working-age males with full physical and cognitive capacities, limiting options for socially disadvantaged groups such as the elderly, women, children, and persons with disabilities. Due to its reliance on technology, RH is at risk of excluding these groups on this front.

Finally, research on time availability as a determinant in social inequalities shows the possibility of 'time poverty', which might disproportionately affect specific groups, with gaps related to gender and domestic work distribution in particular (Turner and Grieco, 2000; Anand and Tiwari, 2007; Levy, 2013). Macedo et al (2021) argue that gender-based issues can increase transport disadvantages, thereby unevenly affecting the pool of opportunities to which men and women have access. In recent years, many authors, such as Kabia et al (2018), have increasingly seen the relationship between transport and poverty through the lens of an intersectional view of exclusion. In this context, Sabogal-Cardona et al (2020) explain how people living in households

with more diverse and intensive mobility needs are ultimately more likely to take RH trips as an alternative, as they cannot take all trips in the same transport mode.

In summary, our findings suggest that on a spectrum of exclusion to inclusion, RH currently has no breakthrough in promoting inclusion, as its usage levels in LI neighbourhoods are severely low compared to other modes. Over time, however, it can become a way to overcome exclusion, especially because of its strengths in relation to fear-based, space and time-based exclusion. While these aspects offer promising ways to shape a more equitable transport landscape in Bogotá in the future, RH's limitations around economic and physical dimensions pose strong barriers that would have to be solved by policy and practice changes jointly driven by both government stakeholders and private players.

The current debate about RH's ability to shape a more equitable transport landscape in identifies an interesting viewpoint on the critical role of governments and policymakers. The next section explores the same.

7. Reflections on Policies

Lucas (2012) stresses that the rationale for taking a social exclusion approach to transport disadvantage is that it connects problems to the actions of major delivery agencies, who have systematically excluded certain populations from the advantages of their policy decisions and practices. Cities may make use of the rise of RH to achieve larger policy goals, such as providing alternatives to vehicle ownership, last-mile services to complement public transport, and so on. At the same time, cities must collaborate closely with RH service providers to minimize negative effects of RH on the transport landscape, congestion, pollution, and the loss of vital services for the disabled and underprivileged.

However, there is presently no clear regulation of RH services in Colombia. To avoid harsh measures such as Uber's ruling, it is imperative that policymakers deploy a balanced governance framework and build multi-stakeholder partnerships to deliver meaningful services between councils, RH service providers and local communities (Church, 2000; Oviedo et al, 2020);Oviedo and Guzmán; 2021). There are many policy levers that the city government can use to create an institutional environment conducive to RH realising its full potential (Shaheen, n.d.; NACTO, n.d.). Of these, the following approaches could be appropriate to improve accessibility and promote inclusion, particularly for underserved LI populations.

First, pricing-focused policies, such as unified fare systems to complement public transport for first/last-mile connectivity and subsidies for passengers travelling to/from LI neighbourhoods.

Second, stringent data sharing agreements and data security policies to ensure the exchange of information, which would be crucial for coordination between modes.

Third, policies to ensure that RH service providers develop safety mechanisms that adequately protect against crime-related concerns that are more common in LI neighbourhoods.

Fourth, accessibility-based policies that require RH players to ensure that drivers provide a minimum level of service to passengers with disabilities and residents of LI neighbourhoods.

Several conclusions emerge from the analysis and reflections, the next and final section will summarise the same.

8. Conclusion

This paper builds on a primary RH-focused dataset made available by IDB to construct an analysis of the links between the use of this mode and conditions of TRSE among LI neighbourhood residents in Bogotá.

The perspective adopted in the paper contributes to current debates in literature, as it reinforces the view that TRSE is a multidimensional construct, and while some characteristics of a transport mode can help disadvantaged groups gain access to opportunities, others can increase their risk of being socially excluded. In this regard, LI populations respond to different dimensions of TRSE by taking into account the need for travel and applying different travel strategies that involve trade-offs between time, costs, security and comfort. The paper also recognizes an intersectional view of exclusion and how additional vulnerabilities encountered by women, older people and people with disabilities can affect individuals and households.

Given the urban structure of cities like Bogotá, it is found that the location can be both a condition of advantage or disadvantage, and that HI groups, despite being closer to the opportunities in the central core of the city, have a higher RH use. By comparison, LI groups rely largely on public transport, despite significantly long travel times, because their location makes it even more expensive to consider alternatives such as RH.

The analysis deepens the interpretation of survey data by applying a descriptive statistical method to draw observations from the specific population of interest in relation to Church et al's (2000) seven dimensions of TRSE and their effects on an exclusion/inclusion spectrum. It provides an understanding of LI residents' use cases, trip times, trip duration etc. for RH services

as compared to other travel modes and highlights its overall positive perception. By assessing socio-economic and trip characteristics, it uncovers several distinctive features of RH and argues that it could complement public transport, increase individual mobility, and combat social exclusion in the long run. This dissertation provides valuable insights to policymakers and transport planners interested in the potential integration of RH into their transport ecosystem by showing how RH can be used to fill gaps in poor public transport infrastructure and problematic first/last-mile connectivity plaguing LI neighbourhoods. These insights can help formulate appropriate policies to harness RH's full potential in shaping equitable urban transport systems.

The tension between opening spaces for contemporary travel options that can meet a tiny fraction of demand and reducing TRSE across the population is a challenge for policymakers in situations like Colombia. The findings of this dissertation offer possible starting points for the development of co-produced solutions between regulators and RH service providers. The irregular frequency of RH trips implies the possibility of multimodality and changes in pricing structures to better meet the demands of LI users. It's worth noting at this point that the policy reflections in section 6 focus on limiting exclusion from the perspective of riders, but that doesn't mean that drivers can't have equity concerns as well.

RH's effects are complicated and largely unknown, so stricter controls are justified until government stakeholders better understand how RH affects urban transport networks and individual travel habits. However, private actors should also be given the opportunity to align themselves more closely with policymakers' goals, and concessions should be made to encourage RH firms to pursue sustainable endeavours. Fortunately, we are witnessing a shift from RH businesses in terms of a crucial consideration - data sharing. For example, in 2017, Uber altered

its historically long-held adversarial approach with local governments to introduce Uber Movement, a stand-alone data-sharing platform.

Findings also point toward further research avenues that build on the specific clusters identified in this research. In the first instance, there is a need to conduct more frequent and exhaustive travel surveys such as this, and it is imperative that RH as a travel model be included in them. This way, Governments can leverage findings to determine which groups are at risk of being excluded from RH along with other modes.

Moreover, many of the effects of RH cannot yet be confirmed with confidence due to its novelty and the resulting lack of available data. For instance, first, many of its intersections with transport inequities have not been investigated in detail. Take, for example, the fear-based dimension of TRSE: While some women regard RH as a safer alternative to walking alone at night, others may refuse to go on a RH journey with a total stranger (driver), thereby limiting their ability to participate in society. Second, the substitutive effects of RH must be studied in more depth. We have assumed RH's capacity to complement public transport in this dissertation and have not looked into the impact it could have on other active modes such as walking and cycling. A useful continuation of this dissertation would be to examine this and the impact of RH on private vehicle ownership. While some of these elements have been examined by researchers in developed countries there is a knowledge gap when it comes to emerging markets that needs immediate attention.

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