Studies on Cycling in Latin American Cities:

Accessibility, Equity, and Gender

By

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Abstract

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Cycling is gaining relevance globally since it is environmentally, economically, and socially sustainable and provides a wealth of health benefits. In Latin American cities, cycling is becoming more popular due to large cycling infrastructure investments implemented in pioneering cities with the purpose of making cycling safer and more attractive. However, despite its growing relevance, studies on cycling in Latin America are still scarce. Most literature on cycling examines North American, European, and Asian cities, and there are relatively few studies that analyze Latin American cities. Furthermore, much of the literature in Latin America examines just a single city. Thus, I address this gap in the literature by developing measures of bicycle accessibility using the concept of level of traffic stress or comfort. I examine the distribution of bicycle accessibility across different socioeconomic groups to understand it from an equity point of view. In addition, theory suggests that higher accessibility should be associated with additional trips; yet there is no evidence of this for bicycle accessibility in Latin America. I also address this limitation in the literature by examining associations between bicycle travel and accessibility. Finally, although many studies have identified differences in self-reported cycling comfort by gender, there is limited research at the individual level understanding differences in behaviors in Latin America. This is important because the social construction of gender identities and roles is largely caused by cultural characteristics and societal expectations. I, therefore, also examine associations between gender and cycling behaviors in large metropolitan areas of Latin America to elucidate city-specific associations between bicycle infrastructure and actual cycling.

This is the first large-scale study analyzing bicycle accessibility, its distribution across different sociodemographic groups, its association with cycling, and gender-specific factors associated with cycling for multiple metropolitan areas in Latin America. The research presented in this dissertation examines cycling in six large Latin American cities: Asuncion (Paraguay), Bogota (Colombia), Buenos Aires (Argentina), Mexico City (Mexico), Santiago (Chile), and Sao Paulo (Brazil). I make three distinct contributions:

- I measure bicycle accessibility by applying the level of traffic stress (LTS) to examine how the level of bicycle accessibility differs among different sociodemographic groups;
- I examine associations between bicycle accessibility and the frequency of cycling trips; and
- I investigate whether gender acts as a modifier of the infrastructure-cycling relationship. Here, gender differences in the environmental and sociodemographic characteristics associated with cycling were examined.

Level of traffic stress (LTS) is a novel measure that has emerged to address cycling comfort concerns. However, onerous data requirements have made calculating the LTS for many cities around the world impractical. I applied a reliable and generalizable method of calculating LTS utilizing open data to examine how sociodemographic characteristics relate to bicycle accessibility in the six metropolitan areas in Latin America. Residents' sociodemographic characteristics were obtained from household travel surveys in each metropolitan area. I examine accessibility to points of interest (POIs) using isochrone metrics based on 10, 20, and 30-minute travel time from home for several types of bicycle networks determined by different values of LTS and topography. The results show that POIs and bicycle infrastructure tend to be concentrated in and around the CBD, with housing submarkets unaffordable to lower-income residents. Accordingly, negative binomial regression models consistently show that income and educational attainment are positively associated with bicycle accessibility across cities. Specifically, high-income individuals enjoy between 1.08 and 6.10 times higher accessibility than low-income individuals. The accessibility index of individuals with college-level education is 1.12 to 4.15 times higher than that of individuals with primary education. The deployment of bicycle infrastructure in high-density, low-income neighborhoods greatly impacted the distribution of accessibility benefits in some cities. The results suggest that conducting equity studies for transportation planning is vital for Latin American cities, to address inequitably distributed access to opportunities.

Although cycling is a sustainable transportation alternative for cities, little is known about how accessibility measures are associated with cycling. I examined how isochrone accessibility is related to the number of cycling trips in the sample cities. The models show mixed results, contrary to theory and previous studies, which have suggested positive associations between accessibility and cycling. Although I found some positive associations between accessibility and cycling, numerous outcomes show the opposite: accessibility's negative associations with cycling. These opposite outcomes are found mostly in cities with a greater spatial mismatch between where cyclists reside and where the potential opportunities are. This trend is observed even after controlling for sociodemographic and physical environmental variables. Furthermore, in most models, the relationship between accessibility and cycling is statistically non-significant. This highlights the complexity of travel behavior and that the relationship between accessibility and cycling is not straightforward. Furthermore, it underscores the importance of interpreting accessibility measures in the context of the location patterns of individuals and uneven cycling infrastructure. On the other hand, the models show that sociodemographic variables better explain cycling trips than accessibility and physical environmental variables.

In Latin America, women's cycling rates are much lower than men's. Despite this difference, few studies have been published on the gender-specific effects of factors associated with cycling in this region. I address this gap by investigating gender differences in the environmental and sociodemographic characteristics associated with cycling in the sample cities. Specifically, I examined the factors associated with self-reported bicycle mode choice and cycling distances. I found that increased bicycle lane infrastructure, measured as the total km of bicycle lanes within a 500 m radius from home, is associated with more cycling and longer cycling distances, for both women and men. What is striking about the results is that individuals with dependent children, particularly women, tend to cycle more. This finding was unexpected because some scholars suggested that child caring is one of the main obstacles to women's bicycle use. Nonetheless, women's lower rate of driver's licenses and limited access to motorized modes compared to men's, and women's higher trip rates during the child-raising period may explain this result. Furthermore, older women cycle significantly less than both women of other ages and their male counterparts. Thus, expanding the comfortable and protected cycling network to include nonwork destinations can increase women's cycling rates, meet the needs of women who engage in household care-focused activities, and address the wider gender gap in cycling at older ages. Because cyclists in these cities tend to have lower incomes and no access to automobiles, investments in cycling infrastructure not only address the current gender gap in cycling, but are also likely to favor disadvantaged individuals.

Latin America is a highly unequal region in terms of the spatial distribution of accessibility benefits. The spatial mismatch between where cyclists live and where opportunities are is evident in some cities, because of socioeconomic segregation and a non-diverse cycling population. For urban regulations and policies, conducting equity studies is vital to change this situation. Furthermore, providing cycling infrastructure for a diversity of people, including women and older people, is important to increase overall cycling shares in this region.

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1 INTRODUCTION

1.1 IMPORTANCE OF CYCLING

Increasing bicycle use for short-distance trips can greatly improve global sustainability. The transport sector accounts for roughly one-quarter of greenhouse gas (GHG) emissions, and this sector is responsible for 57% of global oil demand (UN, 2021). Half of the GHG emissions are from passenger cars (McCollum et al., 2018), and the global demand for passenger transport is forecasted to triple by 2050 (International Transport Forum, 2019). Technological strategies, such as fuel efficiency improvement and electric vehicles, are insufficient to achieve the CO_2 emission reduction target (Hill et al., 2019; Milovanoff et al., 2020). The emissions of cycling are negligible compared to driving; thus, the modal shift from driving to cycling can significantly reduce emissions.

Cycling can also offer health benefits by increasing physical activity. Cycling is associated with the reduction of obesity (Grøntved et al., 2016; Oja et al., 2011; Rasmussen et al., 2018), body mass index (BMI) (Dons et al., 2018; Flint & Cummins, 2016), cardiovascular risks (Celis-Morales et al., 2017; Nordengen et al., 2019; Oja et al., 2011), cancer risks (Celis-Morales et al., 2017), hypertension (Grøntved et al., 2016), hypertriglyceridemia (Grøntved et al., 2016), impaired glucose tolerance risks (Grøntved et al., 2016), and all-cause mortality (Celis-Morales et al., 2017; Kelly et al., 2014; Ried-Larsen et al., 2021). Furthermore, bicycle commuters are more likely to achieve weekly levels of physical activity than other people (Celis-Morales et al., 2017). In the Netherlands, cycling prevents roughly 6,500 deaths per year and extends the life expectancy of the population by half a year, which is equivalent to more than 3% of the gross domestic product of the nation (Garrard et al., 2021).

Beyond the effects of physical activities, cycling improves mental health. Regular cycling tends to improve cognitive function and well-being (Leyland et al., 2019), increase life satisfaction, and reduce psychological distress (Ma et al., 2021). The positive effects of cycling on mental health were observed for an e-bike group as well as pedal cyclists (Leyland et al., 2019). These indicate that not only physical activities but the outdoor environment may provide positive effects on cyclists' mental health. Compared to other transport modes, cycling shows the most robust positive health effects, such as good self-perceived health, better mental health, and fewer feeling of loneliness (Avila-Palencia et al., 2018).

Moreover, cycling can reduce health inequalities among different income groups (Garrard et al., 2021). Relative poverty is associated with higher mortality (Fritzell et al., 2015), though these health inequalities can be addressed with higher cycling. Regular cyclists can achieve proper levels of physical activity without dedicating exclusive time to sports at a significantly low cost. In cities with high rates of cycling, diverse population groups cycle, such as women and older people (Garrard, 2021; Goel et al., 2021). The establishment of cycling as a safe, appealing, and convenient transport mode can expand the health benefits of cycling to socioeconomically disadvantaged groups. Furthermore, cycling can improve community livability and air quality, and reduce traffic accidents, noise pollution, and health risks associated with climate change (Garrard et al., 2021).

1.2 Importance of Latin America

Cycling has recently gained relevance in Latin America due to different factors: the promotion of policy-making for sustainability, top-down and bottom-up efforts, and regional economic changes (Pardo et al., 2021). Studies on cycling are now of increased importance in this region. Bogota is leading the way with its increasing cycling culture. Bogota started investing in bicycle infrastructure in 1974 (IDRD, 2022). Currently, the city contains more than 500 km of bicycle lanes. The cycling rate in Bogota has steadily increased in the last decades. The use of bicycles from 2011 to 2015 increased by 38.5%, and from 2015 to 2019, it increased by 39.1%. In Bogota, the cycling share is the highest in the region at 7.4% (Steer - CNC, 2019). In Sao Paulo, nearly 500 km of bicycle lanes were constructed from 2007 to 2017. In the last decade, the cycling share increased by 24% in the metropolitan region (METRO, 2017), adding up to a 0.9% cycling share. In Mexico City, more than 400 km of bicycle lanes are available, and from 2007 to 2017, the cycling share has more than doubled to 2.2% (INEGI, 2017). Despite the progress, compared to other transport modes, cycling shares in Latin America are still low. Especially women's cycling shares are significantly low (Goel et al., 2021). To increase cycling share, more studies on cycling to identify factors that are associated with cycling in this region are needed.

Considering the distributional and equity consequences of policies is crucial in Latin America because this region is highly unequal. According to the Regional Human Development Report of UNDP (2021), Latin America is the third most unequal region in the world, next to Sub-Saharan Africa and the Caribbean. Despite gradual reductions of multidimensional poverty and Gini indices in the 2000s, income inequality in this region remains high, and progress has recently slowed down. What is striking is that Latin American countries have higher Gini indices than others at similar levels of per capita gross domestic product (GDP) and human development indices (UNDP, 2021).

The report of UNDP (2021) shows that inequality is multidimensional in Latin America. Particularly, education opportunities are still unequally distributed in this region; educational attainment increases as income level rises. The Program for International Student Assessment (PISA) test results show that students who are the poorest 5% scored half of the richest 5% (UNDP, 2021). The education gap across income groups in Latin America is slightly greater than in the rest of the regions and substantially greater than in the Organization for Economic Cooperation and Development (OECD). PISA data indicate that Latin America is one of the regions with the highest segregation by socioeconomic status in schools (UNDP, 2021). In Latin America, the intergenerational correlation of educational attainment stagnated at 0.50, confirming that children's educational attainment in adulthood can still be predicted by parental education (UNDP, 2021). Furthermore, income mobility is considerably lower in Argentina, Brazil, Chile, and Peru compared to high-income countries in the world (Corak, 2016).

Moreover, studies reveal high gender inequality in Latin America, which is primarily rooted in gender role biases. Bustelo et al. (2020) argue that despite the progress made during the last 50 years, increasing women's participation rate from 20% to 60%, the progress has stalled since the early 2000s. Women tend to have lower wages and lower-quality jobs than men (Bustelo et al., 2020). Gender inequality in labor force participation could be the most detrimental since it reproduces economic dependence and the persistence of gender role biases. The report of UNDP (2021) shows that the labor force participation of women is 32% lower than that of men, and what is more, among women in the poorest 20%, women's labor force participation is 42% lower than men's. This gender gap decreases with educational attainment; women with tertiary education have higher participation in the labor force. Women spend considerably more time than men in care activities and domestic chores, and this gap decreases with income. However, the time that men devote to household chores remains constant across income groups (UNDP, 2021).

1.3 RELEVANCE OF ACCESSIBILITY FOR PLANNING

Understanding the difference between mobility and accessibility is crucial for sound transportation planning. Mobility refers to the ease of movement which focuses on velocity, or the ability to get from one place to another, which in practice mostly means "drive around" (Handy, 2002, 2005; Handy & Yantis, 1997). Accessibility refers to the ease of accessing diverse activities and the potential for interaction (Handy, 2002, 2005; Hansen, 1959), which depends on where activities are located. More choices in both potential destinations and modes represent higher accessibility (Litman, 2020a).

A mobility enhancement will increase accessibility if land uses are held constant, and there is no induced demand, since the cost of travel decreases. However, when road improvement causes dispersed land uses or travel demand growth, then accessibility may decrease. This pattern is observed in many metropolitan areas worldwide. Mobility-based planning often leads to the vicious circle of sprawling patterns of development and a decrease in accessibility, with sparse transit service, destinations beyond walking distance, and increasing car dependence. Accessibility planning reduces the need to drive, bringing destinations within walking distance, improving transit, and encouraging the use of active transportation and online services. Accessibility-improving strategies include compact and mixed land-use development, transportation-demand management, telecommunication technologies, and community-scale public and active transport.

Martens (2017) argues that the ease of reaching opportunities is more important than wealth since it is a prerequisite to obtaining income, wealth, and social positions. Accessibility is a social good, as it is a human product, and its distribution depends on the rules of the institutions of society (Martens, 2017). Wachs and Kumagai (1973) assert that accessibility is an important social indicator that highlights the relative condition in space, in time, or across population segments, of urban living, which differs from mobility-based planning that is usually applied in transportation planning and evaluation. Accessibility-based tools can provide equity analyses considering the distribution of benefits from transportation services, gauging the ability to reach destinations, accounting for location, and the effect of mode simultaneously. Accessibility metrics are considered as appropriate tools for equity analyses for fair distributions of transportation (Martens, 2017; Martens & Golub, 2018).

Despite these changes, the trend of increasing vehicle travel demand is still constant, and land-use and transportation planning are still largely mobility-centered. The growth of travel demand today, mostly consisting of single-occupancy vehicle travel, greatly surpasses the increase of road capacity expansion through road building and demand management strategies. Mobility-centered planning prioritizes aspects that are at odds with environmental sustainability. However, traffic impact analyses and level-of-service are still broadly used and required in many countries.

A radical change, the shift of the goal of planning, from mobility to accessibility, from motorized to non-motorized transport modes, with a special emphasis on social equity, should be achieved.

1.4 ACCESSIBILITY EQUITY STUDIES

Access to opportunities continues to be largely unequal in Latin America, despite its improvement over time. The human opportunity index (HOI), which measures how gender, the place of residence, and education of the head of household can affect basic opportunities of a child, shows that access to essential opportunities, such as education, water, electricity, and sanitation is far from universal in Latin America (World Bank, 2014). The Great Gatsby curve illustrates that Latin America is a region with the highest degree of inequality of opportunity, together with Africa, and the inequality of opportunity is positively associated with income inequality in the region (Equalchances, 2018). Incorporating equity analysis in transportation studies, and identifying inequities in access to potential opportunities in urban space, is vital for this region.

In transportation planning, equity studies started to gain focus after the civil rights movement in the 1950s and 1960s in the United States. Since then, scholars have debated different dimensions of social equity. In 1959, Kaplow and Musgrave argued about horizontal and vertical equity. They defined horizontal equity as "the requirement that equals be treated alike" and vertical equity as "requiring an appropriate pattern of differentiation among unequals" (Repetti & McDaniel, 1993). In transportation, horizontal equity refers to the uniform distribution of benefits and costs between individuals considered equal in ability and need, based on egalitarian theories. Vertical equity is concerned with the distribution of benefits and costs between individuals that have different skills or needs (Litman, 2020b; Santos et al., 2008).

Vertical equity is also called social justice or social inclusion (Litman, 2020b), which inherits the principle of advocacy and equity planning started by Davidoff (1965), giving priority to economically and socially disadvantaged groups to compensate for inequities. Kain (1968) 's spatial mismatch theory constituted a critique of existing social structure, land use, and transportation planning that strengthens and makes intransigent the forms of inequality. Kain (1968) argued the mismatch between the location of low-income households and the location of their employment opportunities. He found that this mismatch contributed to their high unemployment rates. The causes of this issue are segregation (Feagin, 1998; Jackson, 1980), which reduced accessibility to job possibilities for particular subgroups. From the 1970s, with the growth of equity and environmental concerns, highway revolts, urban sprawl and urban renewals, the subsequent rise of New Urbanism, and the 3D tenets (density, diversity, and design), numerous scholars have been notifying decision-makers to focus on accessibility in place of mobility, to provide better access to destinations. However, in transportation planning, mobility measures have been used over the world.

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Given the importance of these topics, the objective of this dissertation is to understand the differences in bicycle accessibility by income and education in Latin American cities, the relationship between isochrone accessibility and cycling frequencies, and gender differences in factors associated with cycling in the sample cities. In this dissertation, six Latin American cities are analyzed: Asuncion (Paraguay), Bogota (Colombia), Buenos Aires (Argentina), Mexico City (Mexico), Santiago (Chile), and Sao Paulo (Brazil). The key questions for this dissertation are: 1) How different is bicycle accessibility between different income and educational attainment groups? 2) What is the strength of the association between isochrone accessibility and cycling? 3) What are the gender differences in factors associated with cycling in Latin American Cities?

My intention is to first understand how equitably distributed bicycle accessibility is in the sample cities, particularly to understand the differences in the level of bicycle accessibility between low- and high-income groups and between low- and high-educational attainment groups. Secondly, understand whether isochrone accessibility is positively associated with cycling and what is the strength of the association based on the evidence from the sample cities. If there is a significant association between accessibility and cycling, it will further incentivize accessibility-oriented planning to promote the use of active modes. Lastly, identify gender-specific factors associated with cycling in the sample cities, given that women's cycling rates are significantly low compared to men's in this region. To increase overall cycling shares in this region, analyzing cycling and improving the cycling environment based on evidence is important.

The following sections of the dissertation consist of four chapters: first, an overview of travel behavior in the sample cities; second, a study on differences in bicycle accessibility by income and education; third, an examination of the relationship between isochrone accessibility and cycling; fourth, analyses of gender differences in factors associated with cycling.

The chapter "Overview of Travel Behavior in Six Latin American Cities" shows detailed summary statistics of travel behavior, sociodemographic characteristics, and their cross-tabulations of the sample cities to provide a basic foundation on which other chapters build. Firstly, data sources of the transportation survey data of the sample cities and data harmonization are described. Secondly, modal split, distance traveled per capita, travel purposes, and the rate of driver's license holders by income and gender are explained. Furthermore, the use of motorized modes by gender is analyzed. Lastly, origins, destinations, and desire lines of bicycle trips are shown and analyzed based on household income by neighborhood.

The chapter "Differences in Bicycle Accessibility by Income and Education in Six Latin American Cities" examines the effect of sociodemographic variables on the level of bicycle accessibility. Firstly, the characteristics, strengths, and weaknesses of different types of accessibility measures used for cycling and the rationale for choosing isochrone accessibility are explained. In addition, the measurement of the level of traffic stress (LTS) is described. Secondly, a literature review of equity studies on bicycle accessibility is conducted. Thirdly, equity in bicycle accessibility is examined based on a series of negative binomial regressions. The outcomes of different types of bicycle accessibility, classified by the level of traffic stress (LTS), bicycle lanes, and slope, are analyzed.

The chapter "Is Isochrone Accessibility Associated with Cycling? Evidence from Five Large Latin American Cities" analyzes the strength of the association between isochrone accessibility and cycling. Firstly, a literature review of how accessibility, physical environment, and sociodemographic factors are associated with cycling is shown. Secondly, a series of zero-inflated negative binomial regressions were conducted. Here, how different types of isochrone accessibility measures, physical environmental factors, and sociodemographic factors are associated with cycling frequencies are analyzed.

The chapter "Gender Differences in Factors Associated with Cycling in Latin American Cities" examines gender-specific factors associated with cycling mode choice and cycling distances. Firstly, a literature review of gender-specific factors that are associated with cycling is presented. Secondly, a series of logit regressions and OLS regressions are conducted, and their outcomes are analyzed to identify gender-specific factors associated with bicycle mode choice and cycling distances, respectively.

Finally, overall conclusions are discussed in detail, including summaries of the main research findings and recommendations for further research work.

2 OVERVIEW OF TRAVEL BEHAVIOR IN SIX LATIN AMERICAN CITIES

2.1 INTRODUCTION

Understanding overall travel behavior and having a contextual perspective are important for the analysis of bicycle use in this region. Cycling is still limited in Latin America compared to other transport modes, despite its growing relevance. The shift from auto dependency to active transport is crucial to achieve sustainable urban development. However, increasing car use is a common urban issue because of environmental, social, and economic reasons. Latin American cities showed an average car rate increase of 30% from 2010 to 2015 (Delclòs-Alió et al., 2023). The average annual car ownership growth in Latin American cities is higher than in Western cities (Roque & Masoumi, 2016). Car dependency is one of the major urban issues in Latin America. Although in Latin American cities, transit shows an important modal share, ranging from 20% to 58% (Moscoso et al., 2020), transit users often face deficient and overloaded transit systems due to the rapid urban population growth (CAF, 2019) and underinvestment in transit systems (Yañez-Pagans et al., 2019). In this region, the walking share is also relatively high, ranging from 10% to 40%. Most low-income people are dependent on transit and walking, especially those who walk the most are low-income women (Moscoso et al., 2020). Nevertheless, transit deficiencies and accessibility inequality encourage the increased use of automobiles and motorcycles.

In this chapter, an overview of travel behavior in the sample cities is presented. First, the data sources for travel survey data for the sample cities are explained, together with the data harmonization. Second, travel behavior by income and gender is analyzed based on modal split, distance traveled, travel purposes, and the rate of driver's license holders. Third, the densities of origins and destinations, and desire lines of bicycle trips were examined. The purpose of this chapter is to understand the overall travel patterns of people, in order to have a broader view when analyzing bicycle use in this region.

2.2 DATA SOURCES

The travel survey data used in this chapter and the following chapters are: 1) Asuncion, INE (2022); 2) Bogota, Steer - CNC (2019); 3) Buenos Aires, PTUBA (2010); 4) Mexico City, INEGI (2017); 5) Santiago, UAH (2012); and 6) Sao Paulo, METRO (2017). The original sample sizes are: 7,316 (Asuncion), 66,820 (Bogota), 70,321 (Buenos Aires), 200,117 (Mexico City), 60,054 (Santiago), and 86,318 (Sao Paulo). All survey data cover individuals' travel behavior and sociodemographic information. In these surveys, information on all members of the randomly selected households was collected in person. The respective study areas of the six metropolitan areas are: 1) the City of Asuncion and ten municipalities, 2) Bogota DC and 18 municipalities, 3) the City of Buenos Aires and 27 *partidos*, 4) Mexico City and 60 municipalities, 5) 45 *comunas* in the Province of Santiago and surroundings, and 6) 39 municipalities in the Sao Paulo State. Observations with missing sociodemographic or travel information, and all responses of individuals under the age of six, and individuals living outside metropolitan areas were dropped. The final sample sizes are: 6,607 (Asuncion), 62,396 (Bogota), 64,157 (Buenos Aires), 185,312 (Mexico City), 55,264 (Santiago), and 81,393 (Sao Paulo).

The six cities apply different income classifications. In this study, the income data were harmonized into three groups: low, middle, and high. Santiago and Sao Paulo provide continuous monthly household income data; thus, they were divided into tertiles. The cut points are 421,948 CL$ and 781,719 CL$ for Santiago, and 2,600 R$ and 4,800 R$ for Sao Paulo. Asuncion provides continuous individual income data. I first calculated the total monthly income for each household, and then I compared the minimum salary (2,289,324 Gs) and the tertiles of household income (cut points: 2,500,000 Gs and 5,800,000 Gs). In Asuncion, more than one-third of households are earning nearly the minimum salary. Thus, I decided to apply for the first cut point of 4,500,000 Gs, twice the minimum salary, and for the second cut point, 9,000,000 Gs, four times the minimum salary. The percentages of the population that correspond to the income groups are 56%, 27%, and 16%, respectively. Bogota and Buenos Aires provide categorical monthly household income data; thus, I reclassified them into three groups. The cut points for Bogota became 1,500,000 COL$ and 4,900,000 COL$, and the percentages of the population that correspond to the income groups are 45%, 34%, and 21%, respectively. The average monthly income of the three groups in Buenos Aires is 1,320 AR$, 2,590 AR$, and 5,770 AR$, and the percentages of the population are 29%, 40%, and 31%, respectively. Mexico City provides four socioeconomic strata without numerical data, and I reclassified them into three income groups, and the percentages of population added up to 60%, 29%, and 11%, respectively (for more details on data harmonization, see Supplemental Table A1).

For trip data, I extracted home-based outbound trips that occurred during a weekday from each survey. These were classified into work and nonwork trips based on the purpose of the trip. Work trips included commutes to work or study and other work/study-related trips. Any other trips were classified as nonwork trips. To obtain trip distances, the Euclidean distance (km) of each trip was calculated on the basis of the coordinates of the origin and the destination of the trip. The breakdown of travel purposes was harmonized as follows: work, study, recreation/social, personal/HH chores, health care, shopping, and others. ‘Recreation, social’ makes up all social gatherings, from meeting friends to sports, cultural, religious, or political assemblies. ‘Personal, HH chores’ are all personal and household chores, including picking up or dropping off someone.

2.3 TRAVEL BEHAVIOR BY INCOME

The following is a description of travel behavior by income, based on modal split, distance traveled, travel purposes, and the rate of driver’s license holders. Corresponding survey weights provided by the survey entities were applied to compute the tables listed below to make them representative of the population. Differences in travel behavior among the three income groups were examined for the sample cities, focusing on commonalities across cities in order to find general trends of travel behavior of different income groups in this region.

2.3.1 Modal Split by Income

In the sample cities, the most used modes are transit, walking, and auto (Table 1). In all cities, auto mode share increases as income level increases. The opposite is true for walking share; it decreases as income level increases. Similarly, transit share increases as income level decreases, though with some exceptions. In Buenos Aires, Mexico City, and Santiago, middle-income people's transit share is slightly higher than that of low-income people. For low-income people, transit (34.3% to 42.2%) and walking (24.6% to 44.2%) show the highest shares, except in Asuncion. For middle-income people, transit share is the highest (34.0% to 44.4%), except in Asuncion. In Asuncion, the auto mode share is the highest for all income groups, at 39.1, 39.1, and 72.0%, respectively. For high-income people, auto (26.1% to 72.0%) and transit (27.3% to 47.1%) show the highest shares, except in Asuncion and Sao Paulo, where the walking share is the second highest in place of transit and next to auto, at 10.1% and 24.1%, respectively.

When comparing work trips to nonwork trips, for all income groups, the shares of transit, motorcycle, and bicycle modes are higher in work trips (Table 2 & 3). In contrast, the shares of auto, taxi, and walking modes are higher in nonwork trips. In work trips, middle-income people's transit share is the highest among the income groups. While in nonwork trips, transit share decreases as income level increases. In nonwork trips, walking share becomes the highest among lower income groups in many cases.

Regarding bicycle use, for all income groups, cycling is one of the modes with the lowest share in the sample cities. Similar to walking share, bicycle share decreases as income level increases, except in Asuncion, where high-income people's cycling share is the highest. In most cases, cycling share is slightly higher in work trips than in nonwork trips.

In total, the number of trips increases as income level increases (Table 7). This trend is clearer in work trips. Bogota is an exception, where middle-income people's number of trips is the highest, especially for work trips. Work trips are more frequent than nonwork trips, except for low-income people in Santiago, who make more nonwork trips.

2.3.2 Distance Traveled (Km) per Capita by Income

In the sample cities, the transit mode's distance traveled per capita (1.4 to 3.6 km) is the highest for all income groups, with some exceptions (Table 4). In Mexico City and Sao Paulo, the distance traveled by auto is the highest for low-income groups, at 2.9 and 3.2 km, respectively. In Asuncion, the distance traveled by auto is the highest for all income groups, at 2.6, 1.1, and 1.5 km, respectively.

Table 1. *Total trips - Modal split by income*

	Asuncion			Bogota			Buenos Aires			Mexico City			Santiago			Sao Paulo		
Mode	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High
Transit	16.3%	15.6%	8.9%	34.3%	34.3%	28.0%	41.4%	44.3%	47.1%	40.8%	41.9%	27.3%	42.2%	44.4%	33.1%	35.6%	34.0%	22.7%
Auto	39.1%	39.1%	72.0%	4.3%	15.0%	27.6%	11.7%	21.9%	26.1%	11.5%	20.2%	45.4%	16.1%	25.0%	43.8%	13.9%	27.8%	44.5%
Motorcycle	12.8%	16.9%	4.6%	4.8%	5.8%	3.2%	1.6%	1.3%	1.1%	2.2%	1.1%	0.9%	0.3%	0.7%	0.6%	2.2%	3.2%	2.5%
Taxi	2.2%	3.2%	2.8%	2.0%	4.1%	6.4%	1.3%	2.9%	3.6%	3.0%	4.6%	4.5%	8.4%	6.4%	4.6%	0.6%	0.7%	1.9%
Bicycle	0.5%	0.1%	0.8%	7.7%	5.8%	4.4%	3.7%	3.5%	2.3%	3.0%	1.5%	1.1%	4.3%	3.4%	3.2%	1.3%	0.7%	0.8%
Walking	29.1%	24.9%	10.1%	44.2%	31.4%	25.5%	38.5%	24.6%	18.6%	38.9%	30.1%	19.0%	24.6%	15.8%	12.2%	41.7%	28.8%	24.1%
Other	0.0%	0.1%	0.9%	2.7%	3.6%	4.9%	1.8%	1.5%	1.2%	0.7%	0.6%	1.8%	4.0%	4.2%	2.6%	4.7%	4.7%	3.5%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 2. *Work trips - Modal split by income*

	Asuncion			Bogota			Buenos Aires			Mexico City			Santiago			Sao Paulo		
Mode	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High
Transit	20.5%	21.2%	11.9%	39.9%	42.2%	34.8%	43.4%	48.6%	53.6%	49.7%	50.7%	32.7%	50.7%	52.8%	41.8%	33.0%	34.2%	24.2%
Auto	38.6%	34.9%	69.7%	4.0%	12.7%	24.9%	11.3%	21.6%	25.0%	12.1%	21.0%	45.8%	15.3%	21.9%	37.8%	11.2%	26.3%	44.1%
Motorcycle	16.9%	19.9%	5.7%	7.3%	7.9%	4.7%	1.8%	1.6%	1.3%	2.2%	1.2%	1.0%	0.4%	0.9%	0.7%	2.6%	3.6%	2.9%
Taxi	1.5%	3.5%	1.9%	1.4%	3.0%	5.8%	0.9%	1.9%	2.3%	2.5%	3.7%	3.7%	4.2%	3.8%	3.9%	0.2%	0.3%	1.4%
Bicycle	0.8%	0.2%	0.5%	9.3%	6.8%	4.7%	3.6%	3.6%	2.3%	3.1%	1.6%	1.2%	5.8%	4.2%	3.4%	1.3%	0.7%	0.8%
Walking	21.7%	20.1%	8.9%	33.2%	21.1%	15.8%	36.6%	20.4%	13.8%	29.4%	21.0%	13.0%	15.2%	9.8%	8.2%	45.8%	29.2%	22.2%
Other	0.0%	0.2%	1.3%	5.1%	6.2%	9.3%	2.4%	2.3%	1.7%	1.0%	0.9%	2.7%	8.4%	6.6%	4.1%	5.8%	5.7%	4.5%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 3. *Nonwork trips - Modal split by income*

	Asuncion			Bogota			Buenos Aires			Mexico City			Santiago			Sao Paulo		
Mode	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High
Transit	10.7%	6.0%	3.7%	29.1%	26.0%	21.3%	38.5%	37.7%	35.9%	25.3%	26.3%	17.7%	35.1%	31.6%	20.3%	43.8%	33.4%	18.0%
Auto	39.9%	46.5%	75.9%	4.6%	17.4%	30.3%	12.2%	22.3%	28.0%	10.5%	18.8%	44.7%	16.9%	29.9%	52.6%	22.2%	34.2%	45.7%
Motorcycle	7.1%	11.8%	2.6%	2.4%	3.7%	1.8%	1.3%	0.9%	0.8%	2.1%	0.9%	0.7%	0.2%	0.3%	0.3%	1.0%	1.4%	1.4%
Taxi	3.1%	2.6%	4.3%	2.6%	5.3%	7.0%	2.0%	4.5%	5.8%	3.9%	6.3%	6.1%	11.9%	10.5%	5.6%	2.2%	2.4%	3.6%
Bicycle	0.0%	0.0%	1.4%	6.3%	4.6%	4.0%	3.9%	3.3%	2.2%	2.7%	1.4%	0.9%	3.1%	2.2%	3.0%	1.0%	0.7%	0.7%
Walking	39.1%	33.0%	12.2%	54.5%	42.2%	34.9%	41.3%	30.9%	26.9%	55.4%	46.2%	29.7%	32.6%	25.0%	18.0%	28.7%	27.4%	30.2%
Other	0.0%	0.0%	0.0%	0.6%	0.9%	0.5%	0.8%	0.4%	0.4%	0.1%	0.2%	0.2%	0.3%	0.6%	0.3%	1.1%	0.5%	0.4%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

In most cases, auto marks the second largest distance traveled (0.5 to 2.8 km). Bogota is an exception, where the distance traveled by foot is the second highest for middle- and high-income people, at 0.8 and 0.5 km, respectively. In other cases, the walking mode's distance traveled (0.08 to 0.35 km) is the third or the fourth largest, surpassing that of the other faster modes. Low-income people travel longer distances by auto than middle- and high-income people on both work and nonwork trips, while middle-income people's distance traveled by auto is the shortest. Overall, middle- and high-income people walk longer distances than low-income people. The distance traveled by transit mode of low-income people is shorter than that of high-income people on both work and nonwork trips.

Distance traveled per capita of nonwork trips is shorter than work trips for all transport modes, except taxi and walking mode (Table 5 & 6). In many cases, the distance traveled by walking for nonwork trips is larger than for work trips. The taxi mode shows mixed results. Transit marks the highest decrease in nonwork trips, compared to work trips, in all income groups, followed by auto.

Regarding cycling, the distance traveled by bicycle is among the lowest in all cities, in both work and nonwork trips. For all income groups, the distance traveled by bicycle for nonwork trips is shorter than for work trips. In Bogota, Mexico City, and Sao Paulo, the middle-income group marks the longest distance traveled by bicycle. In Asuncion and Santiago, the low-income group travels the longest distance by bicycle. In Buenos Aires, the high-income group's distance traveled by bicycle is the highest among the income groups.

In total, the distance traveled increases as income level increases (Table 8). This trend is clearer in work trips. Bogota is an exception, where middle-income people travel the longest distances, especially on work trips. For all income groups, the distance traveled for work trips is longer than for nonwork trips.

2.3.3 Travel Purposes by Income

The total for all modes shows that work is the most frequent travel purpose, except in Buenos Aires (Table 9). For the low-income group in Buenos Aires, study is the most frequent travel purpose, followed by work. In most cities, study and personal/HH chores are the second and third most frequent travel purposes, followed by shopping and recreation. Health care is the least frequent travel purpose. Overall, the share of trips to work increases as income level increases. The shares of trips to study, personal/HH chores, and shopping of low-income people are higher than those of middle- and high-income people. Recreation and health care show mixed results.

In bicycle mode, the share of trips to work is higher than the total of all modes (Table 10). While the shares of cycling to study and healthcare is lower than the total. Personal/HH chores, recreation/social, and shopping show mixed results. For low-income people, the share of personal/HH chores is higher than for middle- and high-income people. For middle-income people, the share of cycling to work is higher than for low- and high-income people. For high-income people, the share of cycling to recreation/social activities is higher than for low- and middle-income people.

Table 4. *Total trips - Distance traveled (km) per capita by mode and income*

	Asuncion			Bogota			Buenos Aires			Mexico City			Santiago			Sao Paulo		
Mode	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High
Transit	0.488	0.737	1.449	1.494	1.640	1.893	3.247	2.337	2.853	2.500	3.586	3.357	2.847	2.635	3.196	2.591	2.933	3.366
Auto	2.668	1.099	1.517	0.848	0.122	0.407	1.614	0.521	1.135	2.884	0.758	1.279	2.832	0.600	1.117	3.167	0.657	1.590
Motorcycle	0.216	0.403	0.497	0.180	0.266	0.358	0.058	0.055	0.059	0.047	0.062	0.051	0.046	0.018	0.052	0.234	0.130	0.252
Taxi	0.051	0.055	0.099	0.107	0.024	0.060	0.132	0.052	0.086	0.191	0.095	0.154	0.141	0.180	0.134	0.128	0.024	0.035
Bicycle	0.020	0.006	0.010	0.142	0.224	0.203	0.041	0.060	0.060	0.027	0.043	0.029	0.070	0.056	0.059	0.018	0.023	0.014
Walking	0.077	0.103	0.222	0.351	0.782	0.526	0.134	0.284	0.172	0.106	0.199	0.161	0.091	0.111	0.083	0.152	0.230	0.169

Table 5. *Work trips - Distance traveled (km) per capita by mode and income*

	Asuncion			Bogota			Buenos Aires			Mexico City			Santiago			Sao Paulo		
Mode	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High
Transit	0.427	0.575	1.344	1.357	1.456	1.730	2.568	1.677	2.130	2.083	2.975	2.789	2.255	1.645	2.453	2.177	2.211	2.826
Auto	1.921	0.756	1.033	0.674	0.096	0.306	1.154	0.401	0.822	2.152	0.550	0.963	1.803	0.292	0.660	2.466	0.425	1.237
Motorcycle	0.177	0.360	0.415	0.168	0.245	0.320	0.049	0.048	0.051	0.038	0.048	0.044	0.040	0.011	0.044	0.210	0.117	0.239
Taxi	0.030	0.022	0.063	0.085	0.016	0.042	0.058	0.020	0.032	0.117	0.050	0.088	0.076	0.082	0.068	0.069	0.005	0.014
Bicycle	0.011	0.006	0.010	0.102	0.184	0.170	0.032	0.044	0.046	0.020	0.034	0.022	0.048	0.044	0.049	0.015	0.018	0.012
Walking	0.037	0.043	0.113	0.167	0.343	0.243	0.072	0.169	0.100	0.048	0.099	0.079	0.045	0.041	0.041	0.105	0.177	0.133

Table 6. *Nonwork trips - Distance traveled (km) per capita by mode and income*

	Asuncion			Bogota			Buenos Aires			Mexico City			Santiago			Sao Paulo		
Mode	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High
Transit	0.062	0.162	0.105	0.138	0.184	0.164	0.679	0.660	0.724	0.417	0.611	0.568	0.592	0.989	0.743	0.414	0.722	0.540
Auto	0.746	0.344	0.484	0.174	0.026	0.101	0.460	0.120	0.313	0.732	0.208	0.315	1.029	0.307	0.457	0.701	0.232	0.354
Motorcycle	0.039	0.043	0.081	0.012	0.021	0.039	0.009	0.007	0.008	0.009	0.014	0.007	0.006	0.006	0.008	0.023	0.012	0.014
Taxi	0.021	0.034	0.036	0.021	0.009	0.018	0.075	0.032	0.054	0.074	0.045	0.065	0.065	0.098	0.066	0.060	0.019	0.020
Bicycle	0.008	0.000	-	0.040	0.040	0.034	0.008	0.016	0.015	0.007	0.008	0.007	0.022	0.012	0.010	0.003	0.005	0.002
Walking	0.041	0.060	0.109	0.184	0.439	0.283	0.062	0.115	0.072	0.057	0.099	0.083	0.046	0.070	0.042	0.047	0.053	0.036

Table 7. *Summary of trips by all modes - Number of trips per capita by income*

	Asuncion			Bogota			Buenos Aires			Mexico City			Santiago			Sao Paulo		
	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High
Total	0.577	0.707	0.744	0.578	0.584	0.541	0.608	0.620	0.667	0.922	0.958	0.976	0.597	0.671	0.890	0.824	0.983	1.233
Work	0.334	0.450	0.474	0.383	0.425	0.395	0.447	0.464	0.525	0.593	0.614	0.626	0.284	0.418	0.544	0.628	0.791	0.930
Nonwork	0.243	0.257	0.270	0.195	0.159	0.146	0.161	0.156	0.141	0.329	0.343	0.351	0.313	0.253	0.346	0.196	0.192	0.303

Table 8. *Summary of trips by all modes - Distance traveled (km) per capita by income*

	Asuncion			Bogota			Buenos Aires			Mexico City			Santiago			Sao Paulo		
	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High
Total	2.403	3.801	3.555	3.212	3.692	3.513	3.316	4.360	5.179	4.766	5.053	5.821	3.709	4.789	6.203	4.160	5.608	6.476
Work	1.760	2.985	2.638	2.485	3.036	2.936	2.396	3.226	3.967	3.779	4.005	4.521	2.218	3.455	4.428	3.074	4.639	5.222
Nonwork	0.643	0.816	0.917	0.727	0.655	0.577	0.920	1.134	1.213	0.987	1.048	1.300	1.491	1.335	1.775	1.085	0.969	1.254

Table 9. *All modes - Disaggregated travel purposes by income*

	Asuncion			Bogota			Buenos Aires			Mexico City			Santiago			Sao Paulo		
Purpose	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High
Work	49.1%	56.1%	56.0%	29.0%	34.0%	34.8%	27.6%	38.0%	48.2%	39.0%	43.1%	42.7%	26.8%	43.3%	46.2%	40.5%	49.8%	50.7%
Study	8.6%	7.3%	7.5%	19.2%	17.2%	14.8%	33.1%	22.4%	15.0%	24.5%	20.7%	21.1%	19.0%	17.1%	13.3%	35.5%	30.7%	24.8%
Personal, HH chores	8.4%	6.8%	12.6%	23.7%	20.6%	19.4%	20.0%	18.7%	16.4%	15.6%	13.4%	12.7%	20.4%	15.4%	15.5%	8.1%	5.7%	5.9%
Recreation, social	18.2%	14.8%	14.7%	11.3%	13.4%	15.7%	6.9%	8.0%	8.3%	4.6%	6.3%	8.8%	9.2%	7.6%	8.7%	5.1%	6.1%	10.5%
Health care	3.7%	2.0%	2.2%	5.6%	5.7%	5.6%	4.1%	4.4%	4.3%	2.2%	2.6%	2.9%	6.9%	4.4%	3.0%	5.4%	3.7%	3.7%
Shopping	11.6%	12.6%	6.9%	10.8%	8.8%	9.3%	7.7%	7.6%	7.0%	13.5%	13.0%	10.7%	15.3%	10.5%	10.1%	5.3%	4.1%	4.5%
Other	0.4%	0.3%	0.2%	0.4%	0.3%	0.4%	0.7%	0.9%	0.8%	0.6%	1.0%	0.9%	2.5%	1.7%	3.2%	-	-	-
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 10. *Bicycle mode - Disaggregated travel purposes by income*

	Asuncion			Bogota			Buenos Aires			Mexico City			Santiago			Sao Paulo		
Mode	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High
Work	95.2%	100%	40.9%	41.9%	46.7%	39.1%	46.4%	51.1%	55.2%	51.8%	53.4%	52.8%	52.5%	64.8%	51.7%	66.2%	74.3%	65.0%
Study	1.3%	-	-	16.1%	14.0%	14.3%	12.6%	11.0%	8.7%	15.0%	13.3%	16.6%	8.7%	10.2%	11.2%	15.4%	7.5%	13.8%
Personal, HH chores	-	-	-	22.5%	18.2%	22.4%	25.7%	20.7%	16.6%	13.8%	10.6%	8.6%	11.9%	7.3%	7.2%	8.3%	3.3%	7.8%
Recreation, social	-	-	28.2%	12.2%	15.3%	17.4%	7.6%	6.0%	8.0%	6.2%	8.0%	11.3%	13.1%	8.7%	15.4%	4.9%	8.9%	10.2%
Health care	-	-	-	1.4%	0.7%	1.4%	0.1%	1.2%	0.7%	0.9%	0.1%	2.1%	1.8%	0.9%	0.2%	0.5%	0.7%	0.4%
Shopping	3.5%	-	20.7%	5.6%	4.5%	5.1%	7.0%	9.7%	10.9%	11.9%	14.0%	7.3%	10.3%	6.5%	6.6%	4.7%	5.3%	2.8%
Other	-	-	10.2%	0.3%	0.5%	0.3%	0.7%	0.3%	NaN	0.5%	0.6%	1.4%	1.8%	1.5%	7.8%	-	-	-
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

2.3.4 Rate of Driver's License Holders by Income

In Asuncion, Bogota, Buenos Aires, and Santiago, the rate of motorized driver's license holders increases as income level increases (Table 11). The rate is 17% to 45% for low-income people, 28% to 51% for middle-income people, and 40% to 63% for high-income people. In the survey data of Mexico City and Sao Paulo, driver's license information is unavailable. Here, 'motorized' includes motorcycles and automobiles. The rate of driver's license holders is calculated for the population with the minimum driving age in each city.

Table 11. *Rate of motorized driver's license holders by income*

	Asuncion			Bogota			Buenos Aires			Santiago		
	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
Driver's license holders	45%	51%	63%	20%	37%	53%	18%	28%	40%	17%	29%	51%

2.4 TRAVEL BEHAVIOR BY GENDER

In this section, a description of travel behavior by gender, based on modal split, distance traveled, travel purposes, the rate of driver's license holders, and the use of motorized modes are presented. For the tables below, corresponding survey weights provided by the survey entities were applied to make them representative of the population. Differences in travel behavior among men and women were examined for the sample cities, focusing on commonalities across cities in order to find general trends of travel behavior for each gender in this region.

2.4.1 Modal Split by Gender

In total, women's transit share (17.2% to 47.8%) is higher than that of men (12.8% to 43.3%) in the six cities, except Mexico City (Table 12). Moreover, women's mode shares of taxi (1.4% to 8.6%) and walking (20.3% to 42.1%) are higher than men's mode shares of taxi (0.7% to 3.7%) and walking (13.0% to 30.3%). On the other hand, for women, the shares of auto (10.2% to 42.8%), motorcycle (0.2% to 6.5%), and bicycle (0.2% to 3.1%) are lower than men's shares of auto (15.4% to 46.9%), motorcycle (0.9% to 17.5%), and bicycle (0.6% to 10.2%) in all cities.

Regarding common trends among both genders, transit is the most frequently used mode in work trips in all cities, except in Asuncion, where auto marks the highest share for both genders. While in nonwork trips, transit significantly reduces its share for women (10.7% to 39.9%) and for men (5.3% to 32.4%), whereas walking share increases substantially for women (26.9% to 55.7%) and for men (21.5% to 37.0%) (Table 13 & 14). Despite the differences, in the three trip types, the modal shares of transit, auto, and walking are the highest, while motorcycle, taxi, and bicycle are the lowest in all cities, except in Asuncion, where men use more frequently motorcycle than transit in the three trip types.

In terms of bicycle use, for both genders, cycling is one of the modes with the lowest shares in all cities, except in Bogota, where although the bicycle share among women is low (3.1%), men's share is relatively high (10.2%), placing it in the fourth most used mode by men. In all cities, women's cycling share is significantly lower than that of men.

Table 12. *Total trips - Modal split by gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Mode	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Transit	17.2%	12.8%	35.3%	30.5%	47.8%	41.0%	35.9%	43.3%	40.3%	38.0%	34.3%	25.7%
Auto	42.8%	46.9%	10.2%	15.4%	14.2%	28.0%	14.9%	23.3%	25.5%	35.3%	23.2%	31.8%
Motorcycle	6.5%	17.5%	2.1%	8.1%	0.3%	2.4%	1.2%	2.2%	0.2%	0.9%	0.6%	4.3%
Taxi	3.4%	2.0%	4.0%	3.1%	3.5%	1.9%	4.6%	2.8%	8.6%	3.7%	1.4%	0.7%
Bicycle	0.3%	0.6%	3.1%	10.2%	2.1%	4.2%	1.3%	3.4%	1.8%	5.4%	0.2%	1.6%
Walking	29.5%	20.2%	42.1%	29.0%	30.7%	20.7%	41.4%	24.2%	20.3%	13.0%	34.8%	30.3%
Other	0.4%	0.1%	3.3%	3.6%	1.3%	1.7%	0.7%	0.9%	3.2%	3.6%	5.4%	5.6%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 13. *Work trips - Modal split by gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Mode	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Transit	23.4%	16.4%	46.6%	34.0%	55.4%	44.3%	48.5%	47.2%	52.1%	44.5%	33.4%	25.6%
Auto	41.3%	44.5%	8.9%	13.2%	13.1%	25.9%	16.5%	21.6%	20.8%	31.9%	20.7%	30.4%
Motorcycle	8.6%	20.1%	3.1%	10.3%	0.3%	2.5%	1.1%	2.2%	0.2%	1.1%	0.7%	4.9%
Taxi	2.6%	2.0%	3.0%	2.7%	2.3%	1.4%	4.1%	2.3%	5.5%	2.9%	0.7%	0.4%
Bicycle	0.5%	0.6%	3.7%	10.7%	1.7%	4.2%	1.2%	3.2%	2.2%	5.6%	0.2%	1.6%
Walking	22.9%	16.3%	27.9%	23.2%	25.1%	19.6%	27.3%	22.4%	12.2%	9.0%	37.4%	30.3%
Other	0.7%	0.1%	6.8%	5.8%	2.2%	2.1%	1.3%	1.1%	6.8%	5.0%	6.9%	6.8%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 14. *Nonwork trips - Modal split by gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Mode	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Transit	10.7%	5.3%	27.1%	25.7%	39.9%	32.4%	23.1%	28.6%	30.8%	24.5%	37.2%	26.1%
Auto	44.3%	51.8%	11.2%	18.5%	15.4%	33.6%	13.4%	29.4%	29.3%	42.6%	31.0%	37.3%
Motorcycle	4.3%	11.9%	1.3%	5.1%	0.3%	2.1%	1.2%	2.3%	0.1%	0.5%	0.5%	2.0%
Taxi	4.1%	2.0%	4.7%	3.7%	4.8%	3.3%	5.0%	4.7%	11.1%	5.5%	3.5%	2.0%
Bicycle	0.1%	0.4%	2.7%	9.4%	2.4%	4.3%	1.4%	3.8%	1.5%	5.0%	0.2%	1.4%
Walking	36.5%	28.6%	52.3%	37.0%	36.7%	23.7%	55.7%	31.0%	26.9%	21.5%	26.9%	30.3%
Other	0.0%	0.0%	0.7%	0.6%	0.5%	0.6%	0.1%	0.2%	0.3%	0.5%	0.8%	0.9%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

In total, including all modes, women travel less often to work (0.28 to 0.68 trips) than men (0.45 to 0.83 trips) (Table 20). In nonwork trips, the opposite is true; women travel more frequently to nonwork destinations (0.20 to 0.47 trips) than men (0.09 to 0.23 trips). Regarding total trips, I found mixed results. In Bogota and Mexico City, women's total trip frequencies are greater than men's. Whereas in other cities, women travel less often than men.

2.4.2 Distance Traveled (km) per Capita by Gender

Women travel shorter distances than men by auto, motorcycle, and bicycle, while women travel longer distances than men by walking and taxi (Table 15). Women's per capita distance traveled by auto (0.25 to 1.14 km), motorcycle (0.008 to 0.10 km), and bicycle (0.003 to 0.08 km) are considerably shorter than men's distance traveled by auto (0.47 to 2.15 km), motorcycle (0.07 to 0.71 km), and bicycle (0.01 to 0.33 km). At the same time, women's per capita distance traveled by walking (0.09 to 0.72 km) and taxi (0.05 to 0.15 km) are higher than men's distance traveled by walking (0.09 to 0.48) and taxi (0.03 to 0.15 km), with exceptions in Bogota and Asuncion. Transit shows mixed results. Women travel longer distances using transit in Bogota and Sao Paulo, though in the rest of the cities, men travel longer distances by transit.

On nonwork trips, both genders tend to travel shorter distances than on work trips (Table 16 & Table 17). Particularly, transit shows greater reductions in distance traveled in nonwork trips. Despite the reduction, transit shows the highest distance traveled in total, work, and nonwork trips in all cities among both genders, with some exceptions. In Bogota, walking surpasses transit in nonwork trips for both genders. In Asuncion, auto is the highest for the three trip types for both genders. In Santiago, auto surpasses transit in nonwork trips among men.

Bicycle shows one of the lowest distance traveled per capita in all cities in the three trip types. Furthermore, cycling is one of the modes that have the greatest gender gap in distance traveled per capita. Women cycle substantially shorter distances than men.

In total, including all modes, women travel shorter distances (2.18 to 4.53 km) than men (3.72 to 5.97 km) (Table 21). Particularly in work trips, women's per capita distance traveled (1.43 to 3.41 km) is shorter than that of men (3.09 to 5.10 km). At the same time, women travel longer distances in nonwork trips (0.74 to 1.82 km) than men (0.53 to 1.24 km) in all cities.

2.4.3 Travel Purposes by Gender

The breakdown of travel purposes shows that work trips are the most frequent in all cities for both genders, followed by study, personal/HH chores, and shopping (Table 18). Women's work trip rates are considerably lower (26% to 42%) than men's (39% to 61%). While women's trip rates for personal, HH chores (7% to 26%), health care (3% to 7%), and shopping (5% to 18%) are higher than men's trip rates for personal, HH chores (6% to 17%), health care (1% to 4%), and shopping (4% to 7%) in all cities. As these tables show, women engage in more nonwork trips than men, especially in household and caring duties.

Table 15. *Total trips - Distance traveled (km) per capita by mode and gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Mode	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Transit	0.760	1.042	1.740	1.657	2.661	3.035	2.816	3.974	2.675	3.149	3.068	2.969
Auto	1.123	1.832	0.253	0.475	0.566	1.736	0.846	1.574	1.143	2.154	1.023	2.150
Motorcycle	0.107	0.718	0.105	0.484	0.008	0.112	0.022	0.094	0.010	0.073	0.039	0.378
Taxi	0.069	0.065	0.050	0.054	0.108	0.073	0.146	0.104	0.153	0.150	0.063	0.036
Bicycle	0.004	0.014	0.087	0.332	0.022	0.089	0.013	0.062	0.025	0.105	0.003	0.036
Walking	0.113	0.151	0.728	0.481	0.203	0.176	0.214	0.133	0.097	0.092	0.190	0.190

Table 16. *Work trips - Distance traveled (km) per capita by mode and gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Mode	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Transit	0.569	0.970	1.541	1.523	1.793	2.538	2.127	3.528	1.696	2.632	2.408	2.465
Auto	0.700	1.358	0.187	0.379	0.298	1.384	0.551	1.250	0.483	1.557	0.679	1.730
Motorcycle	0.080	0.637	0.093	0.443	0.005	0.099	0.014	0.079	0.006	0.062	0.033	0.352
Taxi	0.025	0.044	0.034	0.042	0.039	0.035	0.074	0.067	0.050	0.106	0.026	0.018
Bicycle	0.003	0.013	0.060	0.282	0.014	0.070	0.007	0.051	0.018	0.081	0.003	0.029
Walking	0.050	0.072	0.268	0.285	0.098	0.123	0.078	0.095	0.035	0.052	0.144	0.145

Table 17. *Nonwork trips - Distance traveled (km) per capita by mode and gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Mode	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Transit	0.191	0.072	0.198	0.134	0.868	0.497	0.689	0.446	0.979	0.517	0.660	0.504
Auto	0.423	0.474	0.066	0.096	0.268	0.352	0.296	0.324	0.660	0.597	0.343	0.421
Motorcycle	0.027	0.081	0.012	0.040	0.003	0.013	0.008	0.015	0.003	0.011	0.006	0.026
Taxi	0.044	0.021	0.016	0.012	0.069	0.038	0.071	0.037	0.103	0.044	0.037	0.019
Bicycle	0.001	0.002	0.027	0.050	0.008	0.018	0.005	0.010	0.008	0.023	0.0004	0.007
Walking	0.063	0.079	0.460	0.197	0.105	0.053	0.137	0.037	0.063	0.040	0.046	0.045

Table 18. *All modes - Disaggregated travel purposes by gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Travel Purpose	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Work	42.4%	60.6%	25.8%	39.0%	28.9%	50.0%	29.5%	53.8%	28.8%	51.5%	38.2%	50.1%
Study	8.8%	7.3%	16.3%	19.2%	22.5%	22.4%	20.9%	25.2%	15.6%	16.2%	37.4%	30.1%
Recreation, social	18.6%	14.9%	12.9%	12.9%	8.4%	7.2%	6.4%	4.8%	9.1%	7.8%	6.6%	7.1%
Personal, HH chores	9.3%	8.2%	25.6%	17.4%	23.9%	12.1%	21.4%	6.6%	20.9%	12.8%	6.8%	6.1%
Health care	5.2%	1.1%	7.0%	4.0%	5.7%	2.7%	3.0%	1.7%	6.4%	2.6%	5.6%	3.1%
Shopping	15.4%	7.5%	12.1%	7.2%	9.7%	4.9%	18.1%	7.0%	16.0%	7.1%	5.4%	3.5%
Other	0.3%	0.4%	0.4%	0.4%	0.9%	0.7%	0.7%	0.8%	3.1%	1.9%		
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 19. *Bicycle mode - Disaggregated travel purposes by gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Travel Purpose	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Work	83.5%	73.7%	31.9%	47.0%	28.8%	62.4%	26.2%	63.8%	38.0%	62.2%	37.1%	70.4%
Study		1.1%	17.8%	14.2%	13.8%	9.3%	19.4%	12.7%	16.0%	8.0%	41.4%	11.2%
Recreation, social	16.5%	7.0%	11.2%	14.9%	8.0%	6.5%	7.7%	6.6%	12.9%	12.4%	7.7%	7.1%
Personal, HH chores			32.6%	17.0%	38.1%	12.1%	29.3%	5.4%	19.0%	5.2%	9.8%	6.3%
Health care			1.2%	1.1%	0.3%	1.0%	1.4%	0.5%	2.2%	0.5%	0.5%	0.5%
Shopping		13.1%	4.5%	5.4%	10.3%	8.6%	15.4%	10.6%	7.4%	7.9%	3.5%	4.4%
Other		5.1%	0.8%	0.2%	0.6%	0.2%	0.6%	0.5%	4.5%	3.7%		
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Blank space indicates no data was available in the corresponding category.

Table 19 shows travel purposes by gender of bicycle trips. Contrary to Table 18, work trips are not the most frequent among women in Bogota, Buenos Aires, and Mexico City, surpassed by personal/HH chores, and in Sao Paulo, surpassed by study purposes. While for men, work trips are the most frequent in all cities. For women, cycling for personal/HH chores is considerably higher than that for men. Interestingly, the share of study purposes among women is higher than men's for bicycle mode in all cities, while in Table 18, which includes all modes, I found mixed results for study purposes. Furthermore, the share of health care is significantly small compared to Table 18, which is reasonable because cycling requires good health conditions.

2.4.4 Rate of Driver's License Holders and the Use of Motorized Modes by Gender

In all cities, women's share of motorized driver's license holders is only half or almost one-third of men's share. It is clear from this data that women have less access to automobiles and motorcycles, which was also highlighted by the mode split. These data reflect women's limitations on traveling and their dependency on transit, taxi, and nonmotorized modes. In Table 23, the share of auto and motorcycle use as a driver or passenger is shown. In the survey data of Bogota and Mexico City, these data were absent. In the four cities, women's share of auto or motorcycle use 'as a passenger' is higher than men's. In contrast, women's share of auto or motorcycle use 'as a driver' is lower than men's.

To interpret these data, distinguishing between women's limitations and preferences is important. Whether women 'prefer' not to drive wheeled modes or whether there are greater 'constraints' for women to use these modes. Taken together, these tables suggest that overall 'driving' environments are not considered favorable by women in the sample cities, perhaps due to their higher risk averseness. Further studies will need to be undertaken to confirm this idea.

Table 20. *Summary of trips by all modes - Number of trips per capita by gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Total	0.551	0.721	0.574	0.572	0.593	0.674	0.957	0.921	0.697	0.772	0.915	1.037
Work	0.281	0.492	0.353	0.453	0.392	0.576	0.487	0.730	0.329	0.534	0.687	0.831
Nonwork	0.270	0.228	0.221	0.119	0.201	0.098	0.470	0.191	0.368	0.238	0.228	0.206

Table 21. *Summary of trips by all modes - Distance traveled (km) per capita by gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Total	2.186	3.826	3.183	3.723	3.513	5.251	4.082	5.974	4.202	5.919	4.530	5.970
Work	1.438	3.098	2.388	3.186	2.268	4.310	2.874	5.102	2.382	4.669	3.418	4.929
Nonwork	0.748	0.729	0.794	0.537	1.246	0.941	1.209	0.871	1.821	1.249	1.112	1.041

Table 22. *Rate of motorized driver's license holders by gender*

	Asuncion		Bogota		Buenos Aires		Santiago	
	Women	Men	Women	Men	Women	Men	Women	Men
Driver's license holders	16%	33%	10%	22%	8%	23%	11%	22%

Note: The rate of motorized driver's license holders was calculated for the population with the minimum driving age.

Table 23. *Share of auto and motorcycle use as a driver or passenger by gender*

	Asuncion		Buenos Aires		Santiago		Sao Paulo	
	Women	Men	Women	Men	Women	Men	Women	Men
Auto - as a driver	24%	48%	17%	52%	26%	45%	23%	46%
Auto - as a passenger	19%	9%	19%	12%	16%	12%	19%	12%
Motorcycle - as a driver	12%	68%	-	-	12%	79%	6%	85%
Motorcycle - as a passenger	12%	8%	-	-	6%	3%	7%	2%

2.5 BICYCLE TRIPS: ORIGINS AND DESTINATIONS

In most cities, the highest densities of bicycle trip origins are clustered outside of the city center (Fig. 1). In Asuncion and Buenos Aires, bicycle trip origins are concentrated in suburban areas, outside of the city. In Bogota, bicycle trip origins are clustered in the northwest and southwest outskirts of the city. In Mexico City, the highest density of bicycle trip origins is located in the eastern areas of the city, which extends to the eastern suburban areas. In Santiago, bicycle trip origins are clustered in the northeastern areas of the city. Sao Paulo is an exception, where the density of bicycle trip origins near the city center is the highest.

Regarding bicycle trip destinations, in most cities, they are clustered in the same areas as the origins (Fig. 2). This is due to the bicycle mode's overall short travel distances. In most cities, cyclists travel within neighboring areas. In Buenos Aires, Mexico City, Santiago, and Sao Paulo, the average cycling distances are the shortest, with 2.3, 1.9, 2.8, and 2.8 km, respectively (Fig. 3). In these cities, the density maps of origins and destinations are quite similar. I can also see in the desire line map that most cycling trips are within nearby areas in these cities (Fig. 3), while Bogota is an exception. Bogota's average travel distance for cycling trips is 4.7 km, the highest of the sample cities (Table 24). The density maps show that the cluster of bicycle trip origins in the northwest area disappeared from the destinations' map, and instead, a new cluster in the north of the city center appeared in the destinations' map. In the desire line map of Bogota, I can see that most cycling distances are longer than in other cities. In the case of Asuncion, the sample size is the smallest, particularly cycling data, and it is reflected in the desire line map. However, I can see that most cycling trips are concentrated in the outer areas of the city and the suburban areas.

Table 24. *Average travel distance (km) of cycling trips*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD
Cycling distance (km)	3.2	4.1	4.7	7.0	2.3	4.5	1.9	3.5	2.8	3.4	2.8	2.6

In Buenos Aires, Bogota, and Mexico City, the biggest clusters of cycling trips are located in lower-income areas (Fig. 4). In Asuncion, cycling trips are clustered across high- to low-income areas. In Santiago, most cycling trips are located in northeastern high-income areas. In Sao Paulo, the highest density of cycling trips is found around the city center, which is high-income areas, and it extends to the east area, where low-income areas are found.

Fig. 1. *Kernel density estimate (KDE) of bicycle trip origins*

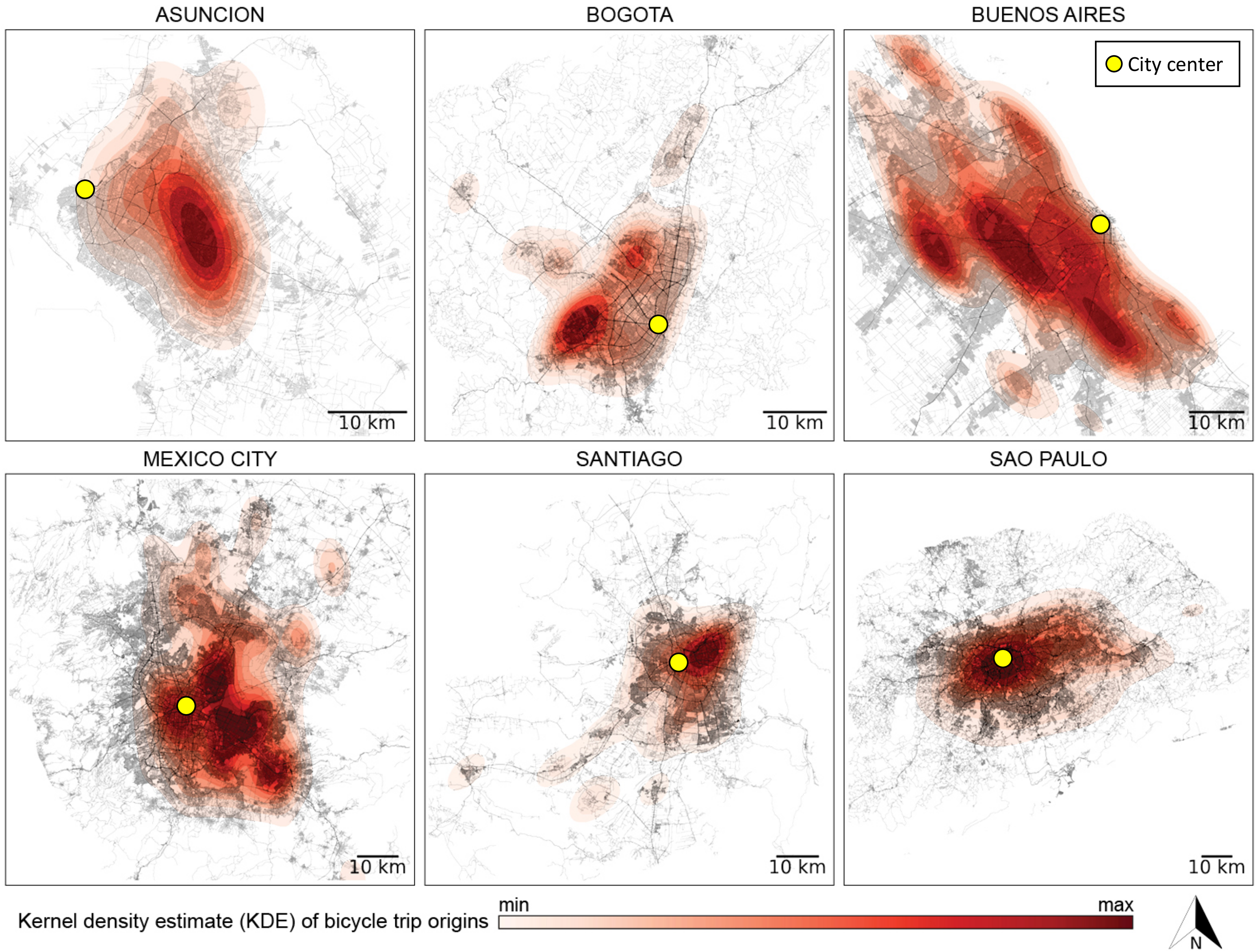


Fig. 2. *Kernel density estimate (KDE) of bicycle trip destinations*

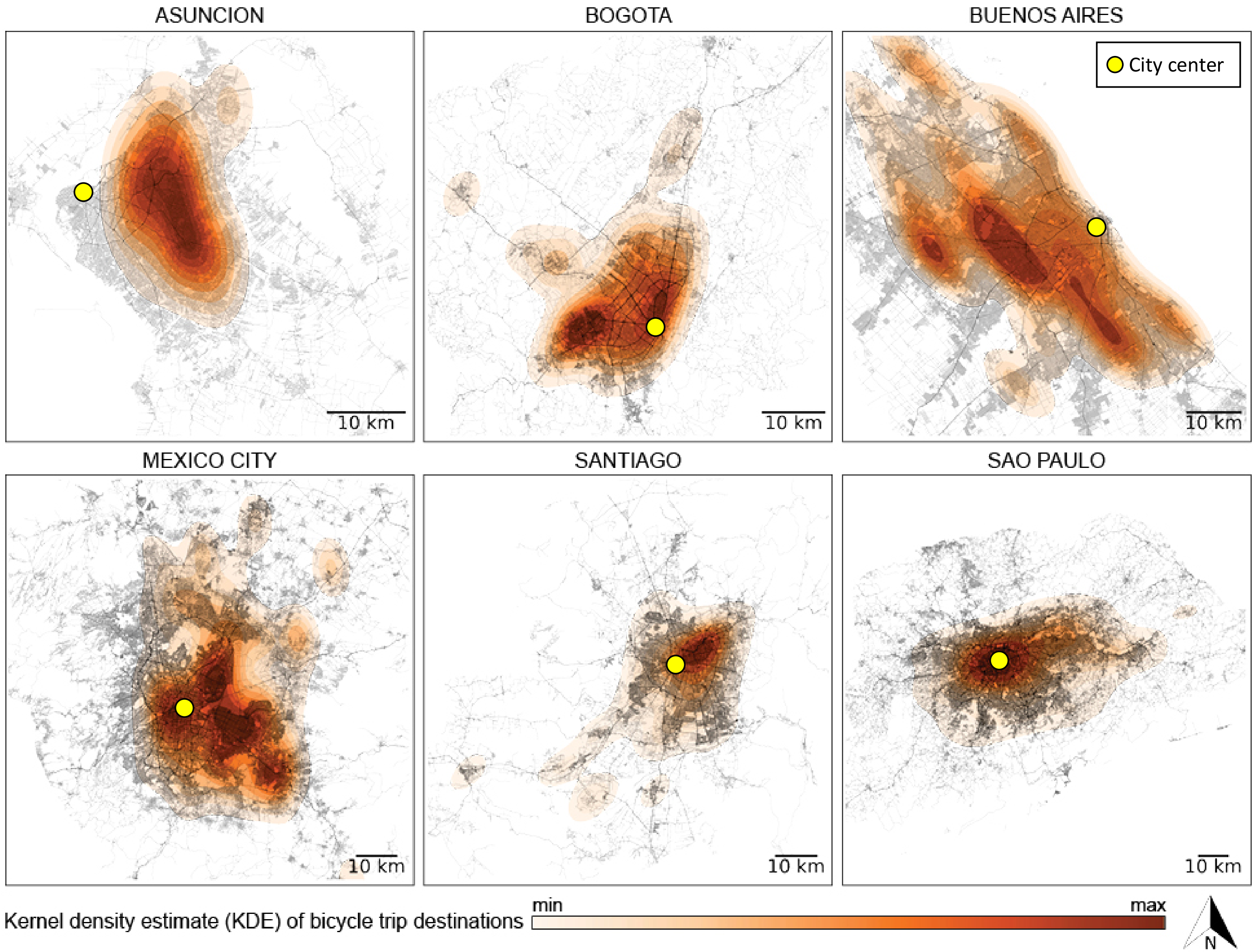


Fig. 3. *Desire lines of bicycle trips by flow intensity*

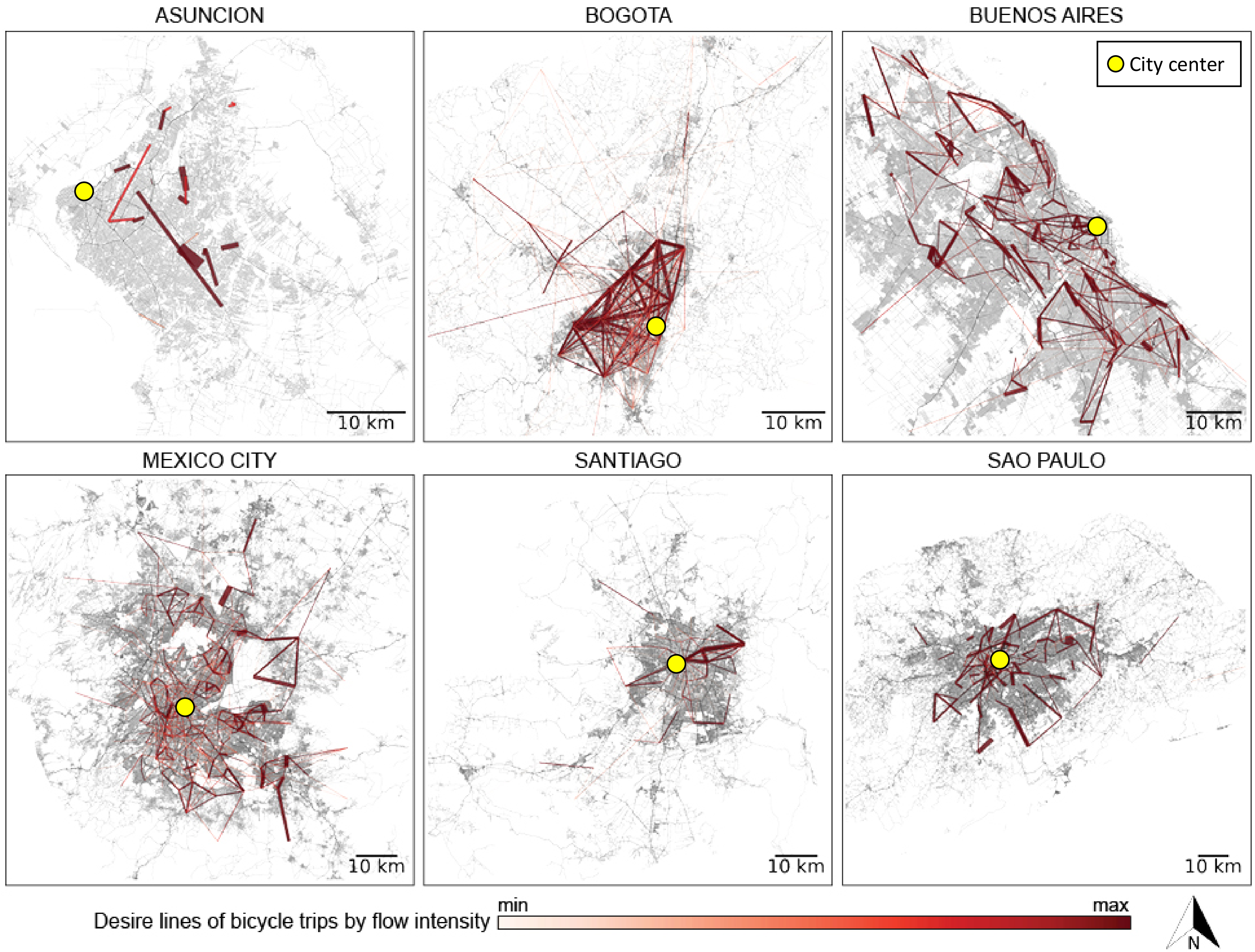
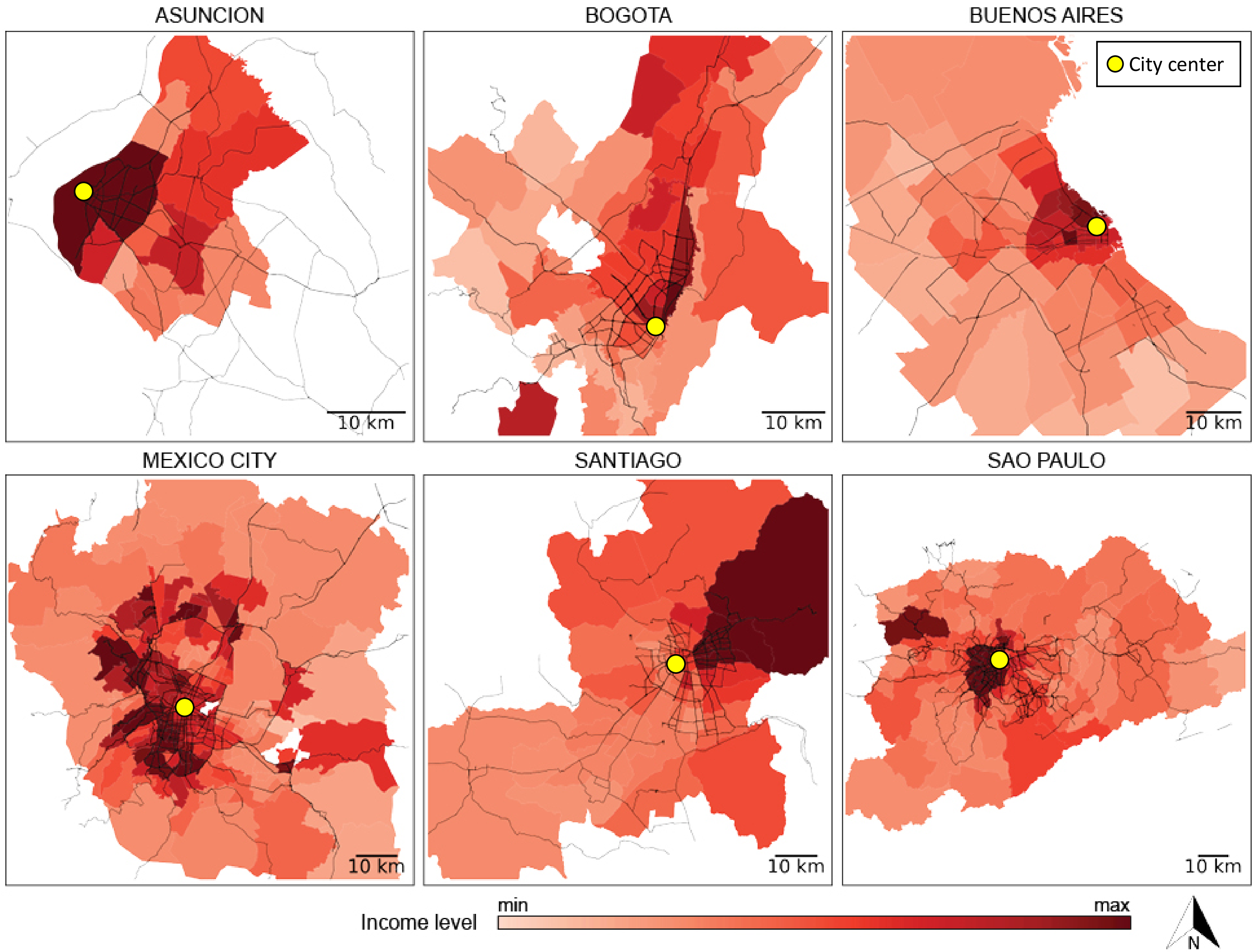


Fig. 4. *Household income level*



2.6 SUMMARY

This chapter has described the overall travel behavior of the sample cities, including different transport modes, focusing on differences between income groups and gender. Here, general descriptive statistics of the data were provided, to have a broader view for the interpretations of the analysis results in the next chapters. Comparisons to other cities and regions are made in the discussion sections in subsequent chapters.

In the sample cities, the most used modes are transit, walking, and auto, while motorcycle, taxi, and bicycle are the least used modes. Auto mode share increases as income level increases in both work and nonwork trips. Similarly, the rate of motorized driver's license holders increases as income level increases. However, distance traveled shows different trends. The distance traveled by auto of low-income people is the longest, while that of middle-income people is the shortest among the income groups in both work and nonwork trips.

Walking share decreases as income level increases in both work and nonwork trips. Again, the trends of distance traveled differ from those of modal share. Middle- and high-income people walk longer distances than low-income people on both work and nonwork trips.

In work trips, middle-income people's transit share is the highest among the income groups. While in nonwork trips, transit share decreases as income level increases. On the other hand, the distance traveled by transit of low-income people is shorter than that of high-income people on both work and nonwork trips.

When comparing work trips to nonwork trips, for all income groups, the shares of transit, motorcycle, and bicycle are higher in work trips, while the shares of auto, taxi, and walking are higher in nonwork trips. In terms of distance traveled per capita, similar trends are observed, except for auto and taxi modes. People travel longer distances by auto to work than to nonwork destinations. The taxi mode shows mixed results. Transit marks the highest decrease in both mode share and distance traveled on nonwork trips, compared to work trips, for all income groups.

In total, including all modes, the number of trips increases as income level increases. Similarly, distance traveled increases as income level increases. For all income groups, work trips are more frequent than nonwork trips, and the distance traveled for work trips is longer than for nonwork trips.

The breakdown of travel purposes shows that work is the most frequent travel purpose, followed by study, personal/HH chores, shopping, and recreation. The least frequent travel purpose is health care. Overall, the share of trips to work increases as income level increases. The shares of trips to study, personal/HH chores, and shopping of low-income people are higher than those of middle- and high-income people. Recreation and health care show mixed results.

Regarding bicycle use, for all income groups, cycling is one of the modes with the lowest shares, and shortest distance traveled in the sample cities. Similar to walking share, bicycle share decreases as income level increases. In terms of cycling distances by income, I found mixed results. For all income groups, cycling share and distances in work trips are higher than nonwork trips. For low-income people, cycling for personal/HH chores is more frequent than for middle- and high-income people. For middle-income people, the share of cycling to work is higher than for low- and high-income people. For high-income people, the share of cycling to recreation/social activities is higher than for low- and middle-income people.

Women's transit share is higher than that of men. On the other hand, the distance traveled by transit shows mixed results. Furthermore, women's mode shares and travel distances of taxi and walking are higher than those of men. While women's mode shares and travel distances of auto, motorcycle, and bicycle are lower than those of men. Similarly, women's share of driver's license holders and their use of motorized modes as a driver is significantly lower than those of men.

Regarding common trends among both genders, transit is the most frequently used mode in work trips. Both genders travel longer distances to work than nonwork destinations. In nonwork trips, transit significantly reduces its share and travel distances for both genders, whereas walking share and distances increase substantially.

In total, including all modes, women travel shorter distances than men. Particularly in work trips, women travel less often and shorter distances than men. In nonwork trips, the opposite is true; women travel more frequently and longer distances than men, especially for personal/HH chores, health care, and shopping. The breakdown of travel purposes, including all modes, shows that work trips are the most frequent in all cities for both genders, followed by study, personal/HH chores, and shopping.

Bicycle is one of the modes that have the greatest gender gap in mode share and distance traveled. Women cycle substantially less and shorter distances than men. For men, cycling to work is the most frequent in all cities, while for women, cycling for personal/HH chores is the highest instead of work trips in some cities, because cycling for personal/HH chores of women is considerably higher than that of men.

Regarding cycling origins, the highest densities of bicycle trip origins are clustered outside of the city center, except in Sao Paulo. In terms of bicycle trip destinations, they are clustered in the same areas as the origins, due to the overall short travel distances, except in Bogota, where the average cycling distance is the highest. Cycling origins are clustered at lower income areas in Buenos Aires, Bogota, and Mexico City, at high-income areas in Santiago, and across high- to low-income areas in Asuncion and Sao Paulo.

3 DIFFERENCES IN BICYCLE ACCESSIBILITY BY INCOME AND EDUCATION IN SIX LATIN AMERICAN CITIES

3.1 INTRODUCTION

In this chapter, I apply a reliable and generalizable method of calculating the Level of traffic stress (LTS) utilizing open data to examine how sociodemographic characteristics relate to bicycle accessibility in the six metropolitan areas in Latin America. LTS is a novel measure that has emerged to address cycling comfort concerns. I measured isochrone accessibility to points of interest (POIs) by bicycle from home for several types of bicycle networks, defined based on LTS, bicycle lanes, and slope. This is the first large-scale study examining bicycle accessibility equity using LTS for multiple metropolitan areas in Latin America.

Bicycle accessibility is especially concerning in Latin America, because the biggest socioeconomic problem in this region is inequality. Latin America is known as one of the most unequal regions of the world. In terms of access to opportunities, some studies claimed inequity among different socioeconomic groups, indicating that higher-income neighborhoods have greater access to bicycle infrastructure than lower-income neighborhoods (Parra et al., 2018; Teunissen et al., 2015; Tucker & Manaugh, 2018), and demonstrating positive correlations between income and employment accessibility (Mora et al., 2021; Pritchard et al., 2019). Understanding existing accessibility disparities and gaps is crucial to evaluate previous policy decisions and to guide future investments and planning policy.

3.2 LITERATURE REVIEW

3.2.1 Measuring Bicycle Accessibility

Accessibility is defined as “the ease with which citizens may reach a variety of opportunities for employment and services” (Wachs & Kumagai, 1973) and “the potential of opportunities for interaction” (Hansen, 1959). The use of the term “potential” reflects that although individuals do not actually access all the available opportunities, it is valuable to have a variety of alternatives as an “option value” (Litman, 2020a). In transportation planning, accessibility is a vital tool for assessing social equity and promoting active transport modes. Martens (2017) considers accessibility as a primary social good that every rational individual desires to have. The use of accessibility as a vital planning evaluation tool is consistent with people’s travel purposes.

There are several types of accessibility measures used in transportation planning. To date, there is little agreement regarding theoretical concepts and methodological aspects of accessibility measures (Handy & Niemeier, 1997; Vale et al., 2016; Martens & Golub, 2018; Miller, 1999). Here, I review three types of common measures of bicycle accessibility: 1) gravity-based measures, 2) cumulative opportunity measures, and 2) bikeability index. Because the level of accessibility is susceptible to the measure of accessibility used (Handy & Niemeier, 1997; Neutens et al., 2010; Talen & Anselin, 1998), selecting a suitable measure is critical to understanding results and drawing conclusions.

Gravity-based and cumulative opportunity measures are broadly used in accessibility studies for different transportation modes. Gravity-based measures consist of the magnitude of opportunities (e.g., the number of stores) multiplied by an impedance function that incorporates travel time or distance (Hansen, 1959). This formula was derived from the denominator of the gravity model for trip distribution (Handy & Niemeier, 1997). It considers the trade-off between the benefits derived from activities at destinations and travel costs to reach those destinations (Goodwin & Hensher, 1978). This measure integrates people's preference assumptions through the impedance function and distance-decay parameter. Different impedance functions can be applied to gravity-based measures, such as the reciprocal function (Hansen, 1959), the negative exponential function (Handy & Niemeier, 1997), and the modified Gaussian function (Ingram, 1971). The distance-decay parameter is incorporated in the impedance function, reflecting the relative importance of the travel length in destination selection. It primarily affects the intensity of the peaks and lows of accessibility (Kwan, 1998).

One weakness of gravity measures is the difficulty in interpreting and communicating the findings to the general public. Transportation planners are familiar with this measure due to the widespread use of the gravity model for trip distribution. However, aspects of the gravity-based measures, such as impedance function and distance-decay parameter, are difficult to generalize and communicate. To obtain an accurate distance-decay parameter, a calibrated trip-distribution model is needed, which requires travel survey data. Furthermore, this measure does not show whether the higher accessibility is driven by a greater number of opportunities or proximity, or both (Handy & Niemeier, 1997). Additionally, the interpretation of the value of accessibility should be conducted in a relative manner through normalization and not through direct comparison (El-Geneidy & Levinson, 2006).

The second measure commonly used in bicycling studies is cumulative opportunities, also known as isochrones, which are a variant of gravity-based measures. It consists of a similar formula, though this measure's impedance function is binary, where 1 (one) is assigned if the travel time to a destination is less than the predetermined threshold travel time; otherwise, 0 (zero) is given (Wachs & Kumagai, 1973; Wickstrom, 1971). In contrast with gravity-based measures, cumulative opportunity measures are easier to compute, interpret, communicate, and less data-intensive (Geurs & van Wee, 2004). A calibrated trip-distribution model is not needed because the distance-decay parameter is not required.

The biggest advantage of this measure is that the outcome is straightforward to communicate and interpret: the total number of reachable opportunities within a predetermined threshold travel time. However, due to this simplicity, there are some weaknesses. This measure equally weights all opportunities within the threshold travel time regardless of their travel time differences. Also, this measure is susceptible to the choice of thresholds, and there is no clear rule on how to select cut-offs. Nevertheless, cumulative opportunity measures tend to be similar to gravity-based measures when travel time is equal to or less than 30 minutes (El-Geneidy & Levinson, 2006). Both gravity-based measures and cumulative opportunity measures capture the combined effect of transport and land use. The transport component is the impedance function. The land-use component is the measure of opportunities, such as the number of jobs, square footage of stores (Handy & Niemeier, 1997; Hansen, 1959), the frequency of bus service (El-Geneidy & Levinson, 2006), or the parcel area multiplied by a building-height (Kwan, 1998).

The concept of bikeability emerges to account for the qualities of the built environment to support bicycle use. In the 2000s, researchers began to develop bikeability measures based on walkability measures that started in the 1990s. Both walkability and bikeability measures consist of a weighted additive function using variables related to walking or cycling behavior. The values of these variables are usually scaled from 0 to 100. Then, they are summed with respective weights estimated from survey data. The common variables used in bikeability measures are the number of bicycle lanes, cycling rates, topography, street connectivity, land use, amount of motorized traffic, number of potential destinations, and trip distance (Dill & Carr, 2003; Nelson & Allen, 1997; Sener et al., 2009; Winters, Brauer, et al., 2010; Winters, Teschke, et al., 2010).

Similar to gravity-based measures, the drawback of the bikeability index is its data intensiveness because relevant survey data is required to develop the index. The selection of variables and the determination of weights are the most challenging part of this measure. Multicollinearity is a prevalent issue for these measures, as many contain correlated elements (Krizek, 2003; Vargo et al., 2012). In addition, as this is a composite measure, the resulting single index hides the contributing factors behind it.

Both gravity-based measures and cumulative opportunity measures could be developed for different types of bicycle networks. However, measuring the ease of cycling to destinations is not common when implementing these measures. Similarly, in bikeability measures, the resulting single index corresponds to the entire catchment area and does not evaluate each route to destinations. To resolve this issue, I considered the application of the level of traffic stress (LTS).

LTS measures the level of discomfort that cyclists feel close to traffic, and it is assigned to each segment of the road network. It is usually classified into four levels using decision trees where ‘1’ means that cyclists feel little traffic stress and ‘4’ means that cyclists feel great traffic stress (Harvey et al., 2019). Different scholars have developed various LTS classification methods. The original LTS developed by Mekuria et al. (2012) consists of eighteen variables: number of lanes per direction and width of the road, width and alignment of bicycle lanes, width and turnover rate of vehicle parking, speed limit, bicycle lane blockage, traffic signal, median refuge, number of lanes and speed of cross street island, centerline miles, zoning category, number, length, and speed of right-turn lanes. Other scholars developed LTS methods that use fewer variables, such as Conveyal (2015), Lowry et al. (2016), People for Bikes (2017), and Furth (2017). Among them, the LTS method proposed by Conveyal (2015) is the simplest, which uses only four variables: road type, total number of vehicle lanes, posted speed limit, and presence of bicycle lanes.

The challenging part of LTS is the selection of variables and the construction of the decision tree. Harvey et al. (2019) applied seven LTS methods in Portland, Oregon, and Austin, Texas, and they found that the LTS levels of the road segments were often distinct among different methods. However, based on bicycle users’ satisfaction data, they found that a few variables consistently affect cyclists’ comfort level: bicycle lanes, street size, and traffic volume. LTS was conceived by Mekuria et al. (2012) to identify potential islands of bicycle-friendly locations disconnected from the rest of the city. Measuring both accessibility and LTS is critical because considering destinations is precisely the way to identify and prioritize islands that would gain significant access if better connected.

3.2.2 Previous Research on Equity in Bicycle Accessibility

The greatest number of bicycle accessibility-related articles comes mainly from North America, Asia, and Europe (Arellana et al., 2020). There are several equity studies on bicycle accessibility, and they primarily focus on the distribution of bicycle infrastructure and the ease of access to destinations.

In North America, there is contradictory evidence regarding disparities in the distribution of bicycle accessibility across advantaged and disadvantaged groups. Braun et al. (2019) examined access to bicycle lanes in 22 cities in the US. Their study suggests that block groups with lower educational levels, lower income, and greater rates of Latino inhabitants tend to have lower access to bicycle lanes. Flanagan et al. (2016) found that census tracts characterized by low-income or low home value and low educational attainment attract less cycling infrastructure investments in Portland, OR, and Chicago, IL. Fuller & Winters (2017) analyzed eight cities in Canada, and they found that low-income areas had fewer bicycle lanes than others. Kent and Karner (2019) found that Afro-American inhabitants were least likely to have high or very high cumulative opportunities by bicycle in Baltimore, MD. Conversely, Winters et al. (2018) identified that low-income areas had higher access to bicycle infrastructure than high-income areas in Kelowna and Victoria, mid-sized Canadian cities. Also, Houde et al. (2018) found that from 1991 to 2016 in Montreal, low-income individuals continuously enjoyed high bicycle accessibility, and seniors and recent immigrants experienced an increase in bicycle accessibility. Chen and Wang (2020) suggest that block groups with greater rates of low-income, non-white and zero-vehicle ownership tend to cluster in city cores and enjoy high overall cumulative opportunities by bicycle in Fresno, CA, and Cincinnati, OH. Similarly, Wang and Lindsey (2017) found that some car-less Afro-American households below the poverty level in Minneapolis, MN tend to have high bicycle accessibility because they live in the periphery near cycling infrastructure and job centers.

In Latin America, several scholars conducted equity evaluations of bicycle accessibility, and all of them indicate social inequity in the distribution of bicycle accessibility. Teunissen et al. (2015) identified that low-income individuals have the lowest access to bicycle lanes than middle and high-income individuals in Bogota. Tucker and Manaugh (2018) found that in Rio de Janeiro and Curitiba, the wealthiest quintile neighborhoods have 6.2 times and 2.5 times, respectively, more length of bicycle lanes per person area than the lowest income quintile neighborhoods. In both cities, the higher income quintiles have more accessible stores within 7 km on lower-stress routes. Pritchard et al. (2019) measured the potential impacts of bike-and-ride on employment accessibility in Sao Paulo using a gravity-based measure, and they found a positive correlation between income and employment accessibility. Rosas-Satizábal et al. (2020) showed that accessibility inequity is significantly large in Bogota. Nearly 90% and 78%, respectively, of the clusters of women and men, have access to only 30% of employment and study opportunities. Mora et al. (2021) examined job accessibility via bicycle lanes within 500m in Santiago, Chile. They argue that only 46% of low-income households can access employment locations, compared to 60% and 74% of high and middle-income households.

I found four studies that apply both LTS and accessibility measures. Among them, three studies come from North America and one from Latin America. Imani et al. (2019) computed cumulative job opportunities on LTS networks in Toronto. They showed that only at LTS <= 3, cyclists can access a relatively sizeable number of jobs, where cyclists' safety has to be compromised. Similarly, Murphy and Owen (2019) found that in Seattle, Minneapolis-St. Paul, Miami, and Washington, DC, the number of accessible jobs increased 37% to 60% when the network was changed from LTS <= 2 to LTS <= 3. Kent and Karner (2019) analyzed accessibility to supermarkets, banks, pharmacies, and public libraries within a 2-mile network distance, including only LTS 1 and LTS 2, in Baltimore, MD. In Latin America, Tucker and Manaugh (2018) developed a greatly simplified LTS using only one variable, the road type retrieved from Open Street Map (OSM), and they applied it to Rio de Janeiro and Curitiba.

Prior research suggests that the distribution of bicycle accessibility in Latin America tends to be unequal, often favoring socially advantaged groups, and studies have focused on individual cities. Understanding how bicycle accessibility is distributed among different socioeconomic groups is crucial to improve current sustainable planning and policies. To this end, it is vital to evaluate both accessibility and cycling comfort levels, to ensure safe travels to valued destinations. Equity studies of bicycle accessibility that consider these two aspects are essential, though scarce in Latin America. Additionally, the use of open data sources such as Open Street Map (OSM) is not common in this region when examining bicycle accessibility. In this study, I apply cumulative opportunity measures to points of interest (POI) using four types of bicycle networks classified by LTS, slope, and bikeways. Our objective is to understand the degree to which bicycle accessibility is unequal among different socioeconomic groups in six metropolitan cities in Latin America: Asuncion, Bogota, Buenos Aires, Mexico City, Santiago, and Sao Paulo. Our goal is to identify practical implications for future transportation planning in this region.

3.3 METHODOLOGY

3.3.1 Dataset Preparation

I reclassified common sociodemographic variables of the household travel survey data into harmonized categories. Individual variables consist of gender (women vs. other), age (< 18, 19-64, ≥ 65 years), activity status (student, employed, unemployed, housekeeper/family worker), and education (≤ primary, secondary, ≥ college). Household variables comprise income (low, middle, high), single-parent household, number of dependent children (< 15 years), and household size. A single-parent household was identified when a household was composed only of a head of household with one or more dependent children (for more details on data harmonization, see Supplemental Table A1).

The road network for each metropolitan area containing road types, vehicle speed limits, and bicycle lane data was extracted from Open Street Map (OSM) using OSMnx (Boeing, 2017). For the extraction of road networks, the boundary of the survey area provided by each survey entity was used, with an exterior buffer width of 7.5 km, which I added to calculate the accessibility index in the edge area. The slope for each road segment was calculated using the elevation data at a 30-meter resolution provided by the US Geological Survey (USGS-EROS, 2017). The average slope for each road segment was computed by dividing the difference between the elevations of its endpoints (rise) by its segment length (run).

The POIs in the study areas were used to identify opportunities in space, which are urban amenities consisting of commercial, educational, transportation, financial healthcare, entertainment, culture, and public service facilities. I extracted points, polylines, and polygons tagged as “amenities” from OSM via the Overpass API (Overpass, 2021). I compiled them as a POI file after converting polylines and polygons into points using their centroids. Duplicate records were removed based on establishment coordinates and names.

3.3.2 Bicycle Network Types

In this study, I decided to apply Conveyal’s LTS, one of the simplest methods. A recent comparison concluded that the Conveyal method was appropriate for lower-data situations and had strong performance relative to other methods (Harvey et al., 2019).

Table 25. *Conveyal’s LTS classification rules*

Road Type	*Number of Vehicle Lanes*	*Speed Limit (km/h)*	*Bicycle Lane*	*LTS*
Residential, living street, cycleway, path, track				1
Unclassified, tertiary, service, motorway	0-3	0-39		2
Unclassified, tertiary, service, motorway	0-3	40 or more	1=Yes	2
Unclassified, tertiary, service, motorway	0-3	40 or more	0=No	3
Unclassified, tertiary, service, motorway	4 or more			3
Secondary, primary, trunk			1=Yes	3
Secondary, primary, trunk			0=No	4

Notes: 1 = little stress. 4 = great stress.

Nonetheless, I had to exclude the number of vehicle lanes from the LTS decision tree, because of the high rates of missing data: 64% (Asuncion), 73% (Bogota), 79% (Buenos Aires), 84% (Mexico City), 75% (Santiago), and 86% (Sao Paulo). To understand the impact of excluding this component, I computed the percentage of unclassified, tertiary, and service roads and motorways with four or more vehicle lanes among the existing values: 0.1% (Asuncion), 0.3% (Bogota), 1.9% (Buenos Aires), 0.3% (Mexico City), 0.2% (Santiago), and 17% (Sao Paulo). These affect the definition of LTS 3 based on Conveyal’s LTS (Table 25), though based on the fairly low rates, I estimate that the impact of excluding this element from the LTS classification is modest.

Regarding the speed limit, if they were not specified, corresponding local regulations were applied based on street categories. However, “unclassified” roads with missing speed limit data posed some difficulty. In our study areas, the “unclassified” roads with missing speed limit data add up to 4.5% (Asuncion), 21.8% (Bogota), 5.0% (Buenos Aires), 9.3% (Mexico City), 5.7% (Santiago), and 13.0% (Sao Paulo). Given that important amounts of speed limit data are available, ranging from 78.2% to 95.5%, I decided to keep this component. The missing speed limit data were filled by applying the upper quartile of the existing values of unclassified roads, assuming a pessimistic scenario for cyclists. Finally, the LTS classification rules used for this study are shown in Table 26.

Table 26. LTS classification rules

Road Type	*Speed Limit (km/h)*	*Bicycle Lane*	*LTS*
Residential, living street, cycleway, path, track			1
Unclassified, tertiary, service, motorway	0-39		2
Unclassified, tertiary, service, motorway	40 or more	1=Yes	2
Unclassified, tertiary, service, motorway	40 or more	0=No	3
Secondary, primary, trunk		1=Yes	3
Secondary, primary, trunk		0=No	4

Notes: 1 = little stress. 4 = great stress.

Then, I built four types of bicycle networks, composed exclusively of the segments that met the following conditions: 1) street segments with LTS ≤ 3; 2) street segments with LTS ≤ 2; 3) street segments with LTS ≤ 2 and slope < 6%; and 4) street segments with separated bicycle lanes. The maximum slope of 6% was chosen based on bicycle infrastructure design manuals (CHIPS, 2021).

3.3.3 Accessibility Index

In this study, I applied isochrone accessibility and LTS. Measuring isochrone accessibility using a network that only includes lower-stress streets for cyclists responds to their critical needs: access to destinations with safe and pleasant travel. The accessibility index used for this study is an isochrone measure. Compared to other accessibility measures, it requires less data, is simpler to operationalize and easier to interpret, and its results are straightforward to visualize and communicate. Specifically, our accessibility index is the number of reachable POIs within a threshold network travel time from home (Equation 1). The drawback of isochrone is that it is sometimes sensitive to the choice of thresholds (Pereira, 2019). Therefore, I computed accessibility for three travel time thresholds: 10, 20, and 30 minutes.

Equation 1. *Isochrone or cumulative opportunity measure*

$$A_i = \sum_{j=1}^{J} B_j a_j$$

Where
A_i = accessibility measured at point i.
a_j = number of POI in j.
B_j = binary value equal to 1 if j is within the predetermined threshold travel time and 0 otherwise.

To compute these measures, I used Pandana 0.6.1 (Foti & Waddell, 2012). First, I calculated the number of reachable POIs within a threshold network travel time by bicycle with an average speed of 15 km/h for each network node in the bicycle network. Then, the accessibility index of the nearest network node was assigned to each individual, based on their household location, using the KD-tree algorithm (Virtanen et al., 2020).

3.3.4 Statistical Models to Examine Equity in Bicycle Accessibility

Negative binomial regressions were estimated with the accessibility indices as the dependent variables and sociodemographic variables as the explanatory variables for each city. Statistically significant coefficients for sociodemographic characteristics would indicate systematic differences in bicycle accessibility. I also conducted weighted regression analyses for a sensitivity test, though I found little difference in the coefficients' estimates with respect to the unweighted models. Furthermore, most weighted models produced greater standard errors. In regression analysis, the use of weights is still under debate because weights can generate an inefficient estimator without reducing bias (Bollen et al., 2016; Winship & Radbill, 1994), and a low reported degree can excessively influence estimates (Avery et al., 2019). Thus, for this study, I used unweighted datasets for simplicity. Finally, I computed variance inflation factors (VIFs) to detect multicollinearity among the explanatory variables. All models were estimated using Stata/MP (version 16.0).

3.4 RESULTS

3.4.1 Bicycle Lanes and POI

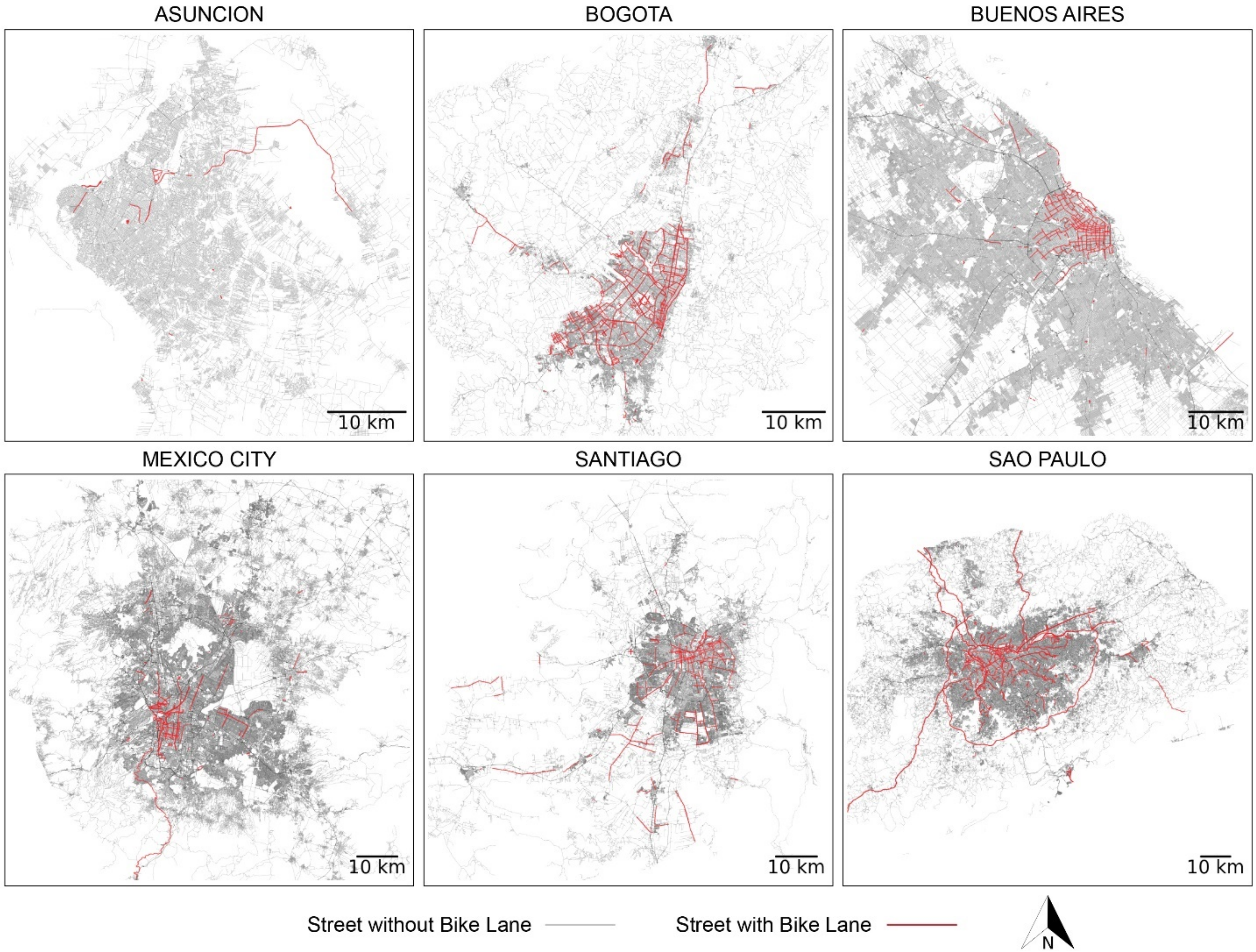
The summary statistics of roads, bicycle lanes, and POI data in the metropolitan areas, together with population, area, and population density, are listed in Table 27. The bicycle lane rates (total bicycle lane length / total road length), based on the extracted data, are as follows: 0.5% (Asuncion), 3.1% (Bogota), 0.8% (Buenos Aires), 0.8% (Mexico City), 1.9% (Santiago), and 3.2% (Sao Paulo). The extracted POI sizes of the metropolitan areas are as follows: 13,137 (Asuncion), 45,681 (Bogota), 70,275 (Buenos Aires), 31,467 (Mexico City), 34,489 (Santiago), and 42,722 (Sao Paulo). In all metropolitan areas, there is one establishment per 175 to 211 residents, except in Mexico City and Sao Paulo, where there is one establishment per 648 and 487 residents, respectively. The number of POIs is relatively low in these two cities, and this posed a data limitation in our study (see Discussion section).

Table 27. *Population, area, and extracted OSM data of the sample cities*

Description	*Asuncion*	*Bogota*	*Buenos Aires*	*Mexico City*	*Santiago*	*Sao Paulo*
1. Population	2.3 million	9.3 million	14.8 million	20.4 million	6.5 million	20.8 million
2. Area (km^2)	2,540	3,728	3,620	7,859	6,344	7,946
3. Population density (pers./km^2)	906	2,495	4,088	2,596	1,025	2,618
3. Total road length (km)*	13,946	20,656	43,013	68,321	25,815	55,981
4. Total bicycle lanes (km)*	74	619	329	462	497	1795
5. % bicycle lanes (4/3)	0.5%	3.0%	0.8%	0.7%	1.9%	3.2%
6. Total number of POIs*	13,137	45,681	70,275	31,467	34,489	42,722
7. Population per POIs (1/6)	175	204	211	648	188	487

*Includes the 7.5 km buffer around the city perimeter. Source: Open Street Maps.

Fig. 5. *Spatial distribution of separated bicycle lanes*

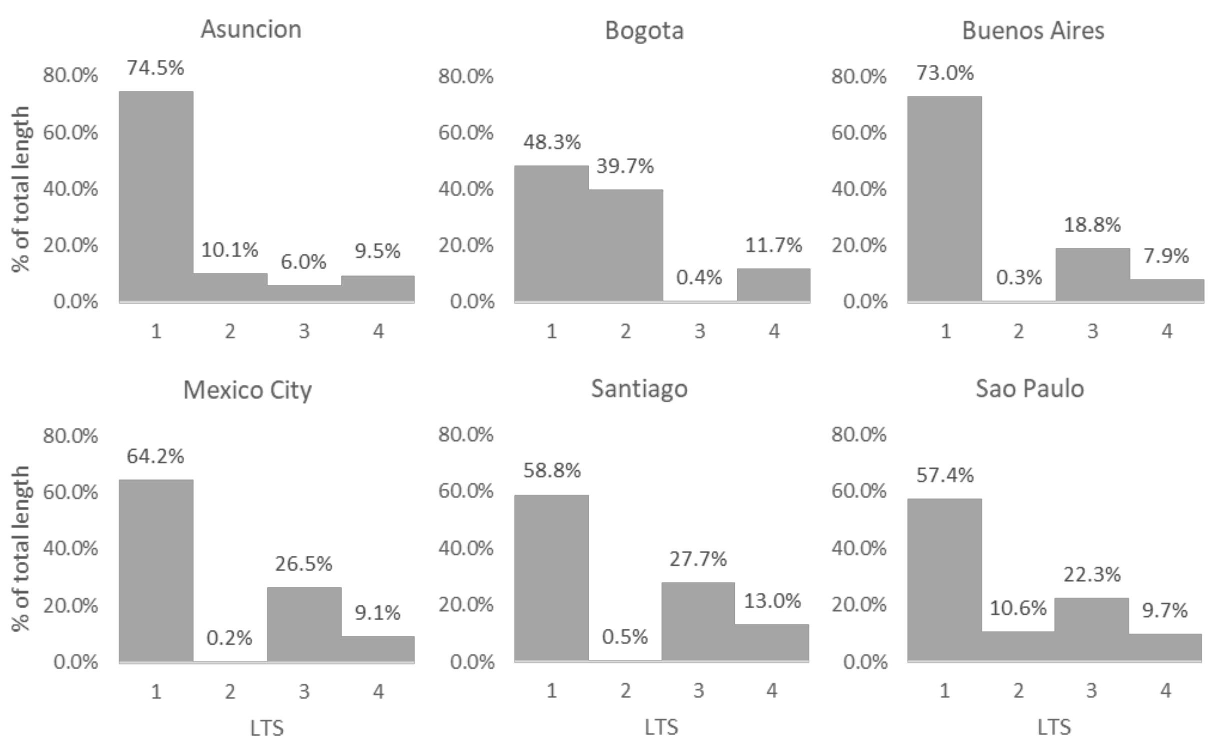


Cities with relatively high bicycle lane rates, such as Bogota, Santiago, and Sao Paulo, show greater bicycle network coverage over the metropolitan area (Fig. 5). Buenos Aires and Mexico City, which have relatively low bicycle lane rates, offer limited bicycle network coverage, concentrated around the downtown area. Asuncion has the lowest rate, with lanes located in a few parks and boulevards.

3.4.2 LTS Distribution and Slope

In all metropolitan areas, the frequency of LTS 1 is the highest (Fig. 6). This reflects that the roads in these metropolitan areas are primarily residential, and secondary and primary roads are less frequent. In Bogota, the proportion of LTS 2 is higher than in other cities due to its highest amount of unclassified roads (22.1%) and also, due to its overall lower speed limits. Specifically, in Bogota, the speed limit for residential areas, school areas, and other areas with considerable volumes of pedestrians and cyclists is 30 km/h, in contrast to the other cities where it is 40 km/h. In Bogota, LTS 2 is prevalent in outer areas, while in Buenos Aires, Mexico City, and Sao Paulo, LTS 3 is predominant in fringe areas (Fig. 7). In all the metropolitan areas, most LTS 4 roads cluster around the downtown area and extend to outer areas.

Fig. 6. *LTS distribution in the sample cities*



Regarding street slopes, the terrain is mostly flat in Asuncion and Buenos Aires, and slopes greater than 6% are not frequent in these metropolitan areas. In Bogota, Mexico City, and Santiago, a portion of the city is bordered by hills, where steeper slopes are dominant. Sao Paulo is primarily hilly, and slopes greater than 6% appear with high frequency (Fig. 8).

Fig. 7. *Level of traffic stress (LTS) maps of the sample cities*

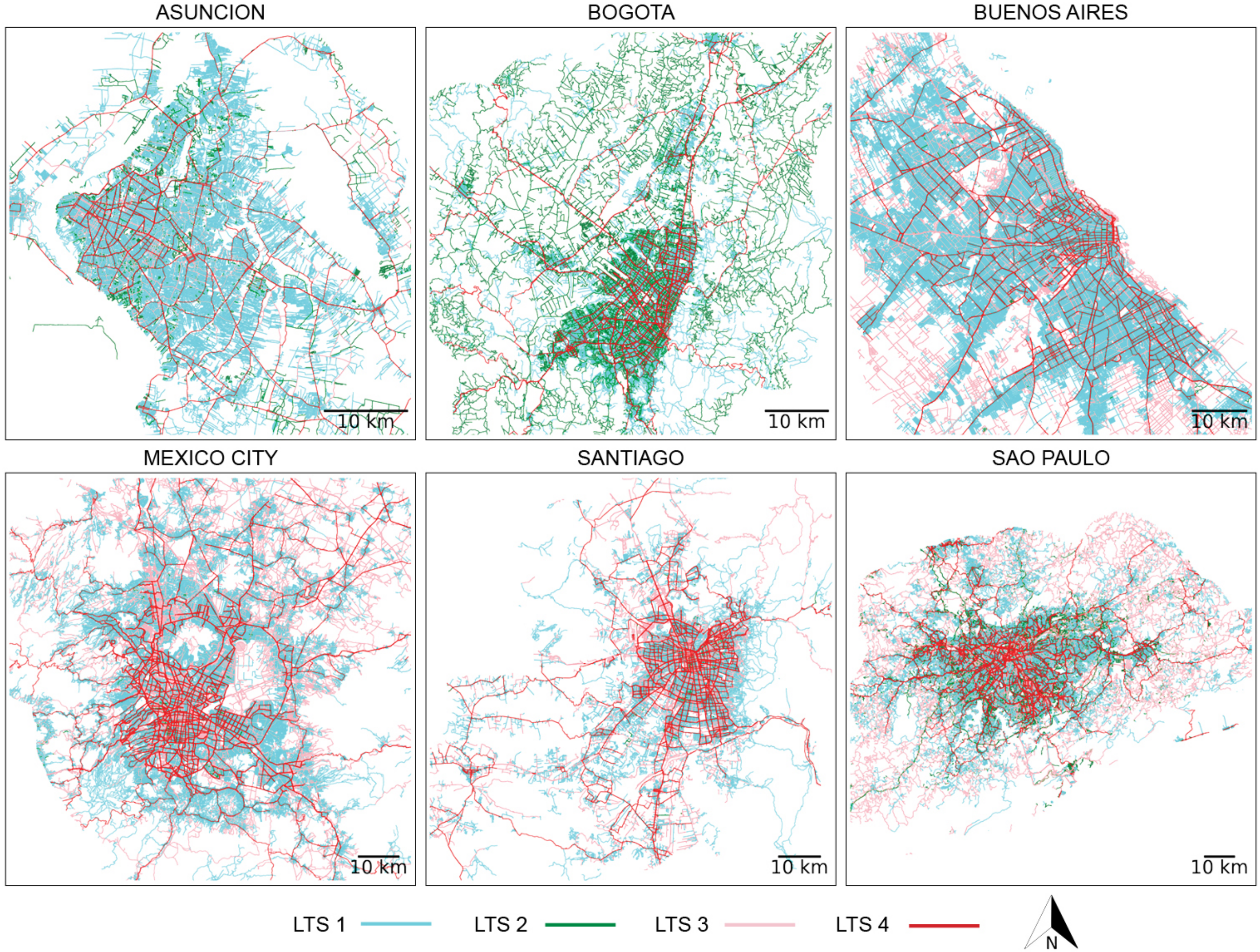
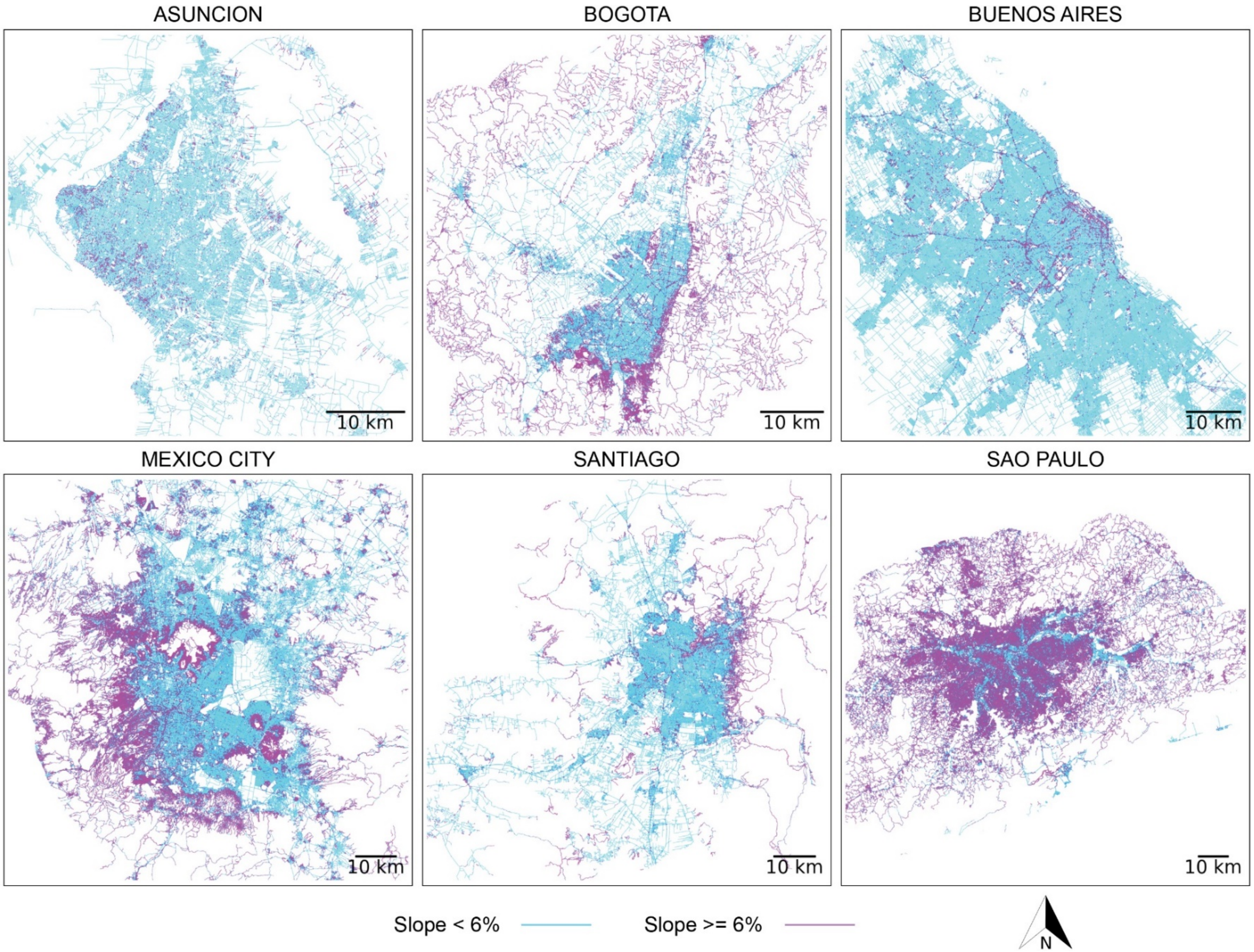


Fig. 8. *Street slope maps of the sample cities*



3.4.3 Equity in Bicycle Accessibility

3.4.3.1 Spatial Distribution of Bicycle Accessibility Index

Our accessibility measures show that POIs are mostly clustered around the central business district (CBD) in the sample cities. In Fig. 9 and Fig. 10, the visualizations of the accessibility measures of the two least stressful bicycle networks, bicycle-lane-only and LTS ≤ 2 and slope < 6% networks with a 10-minute threshold, are presented (see Supplemental Fig. A1-A12 for other accessibility types). In the bicycle-lane-only network, the highest accessibility values are found in city centers. In Buenos Aires, Mexico City, Santiago, and Sao Paulo, the areas with higher accessibility are limited to the CBD and surroundings. In Bogota, I can observe a greater network of higher accessibility places. In Asuncion, bicycle lanes are scarce; therefore, the number of reachable POIs is also significantly low. Overall, the limited areas with high bicycle accessibility indicate that bicycle networks in these six metropolitan areas are still mostly fragmented.

In the network LTS ≤ 2 and slope < 6%, cities with flat terrain show broader high accessibility areas, while cities with steeper terrain show reduced areas with high accessibility. In Sao Paulo, roads with slopes greater than 6% are abundant; thus, overall accessibility values are significantly lower than in other metropolitan regions. In contrast, Asuncion and Buenos Aires have relatively flat terrain; thus, their higher-accessibility areas are considerably larger than those in other metropolitan regions.

3.4.3.2 Regression Analysis Results

In this section, in order to identify factors that are associated with bicycle accessibility, negative binomial regressions were conducted. I interpret the results of the regression models emphasizing coefficients with low p-values that are consistent across cities. Tables 28-29 provide the summary statistics for the independent variables and the dependent variables, respectively. Regarding accessibility measures, the number of accessible POIs decreases as the bicycle network gets smaller, from LTS ≤ 3 to the bicycle-lane-only network. Similarly, the number of accessible POIs decreases as the threshold travel time decreases. At the same time, this variation becomes smaller as the bicycle network becomes smaller. The extreme case is Asuncion, where the bicycle-lane-only network is the smallest among the sample cities.

In all regressions, the VIFs of the explanatory variables were less than 5, except for the variable “age” in Buenos Aires, with a VIF that ranged from 6.73 to 6.83. However, I decided to keep this variable since its collinearity is fairly moderate. The significance of the overdispersion parameters suggests that the negative binomial models fit better than the Poisson models.

McFadden’s pseudo R-squared statistics suggest that the best fit in predicting the reachable POI number mostly occurs when the bicycle-lane-only network is used. Regarding the travel time thresholds, “10 min” resulted in the lowest pseudo R-squared in most models, followed by 20 min and then by 30 min. That is, the models with the lowest stress networks and shortest travel time better explain the relationship between bicycle accessibility and sociodemographic characteristics.

Fig. 9. *10-min POI accessibility via a bicycle-lane-only network*

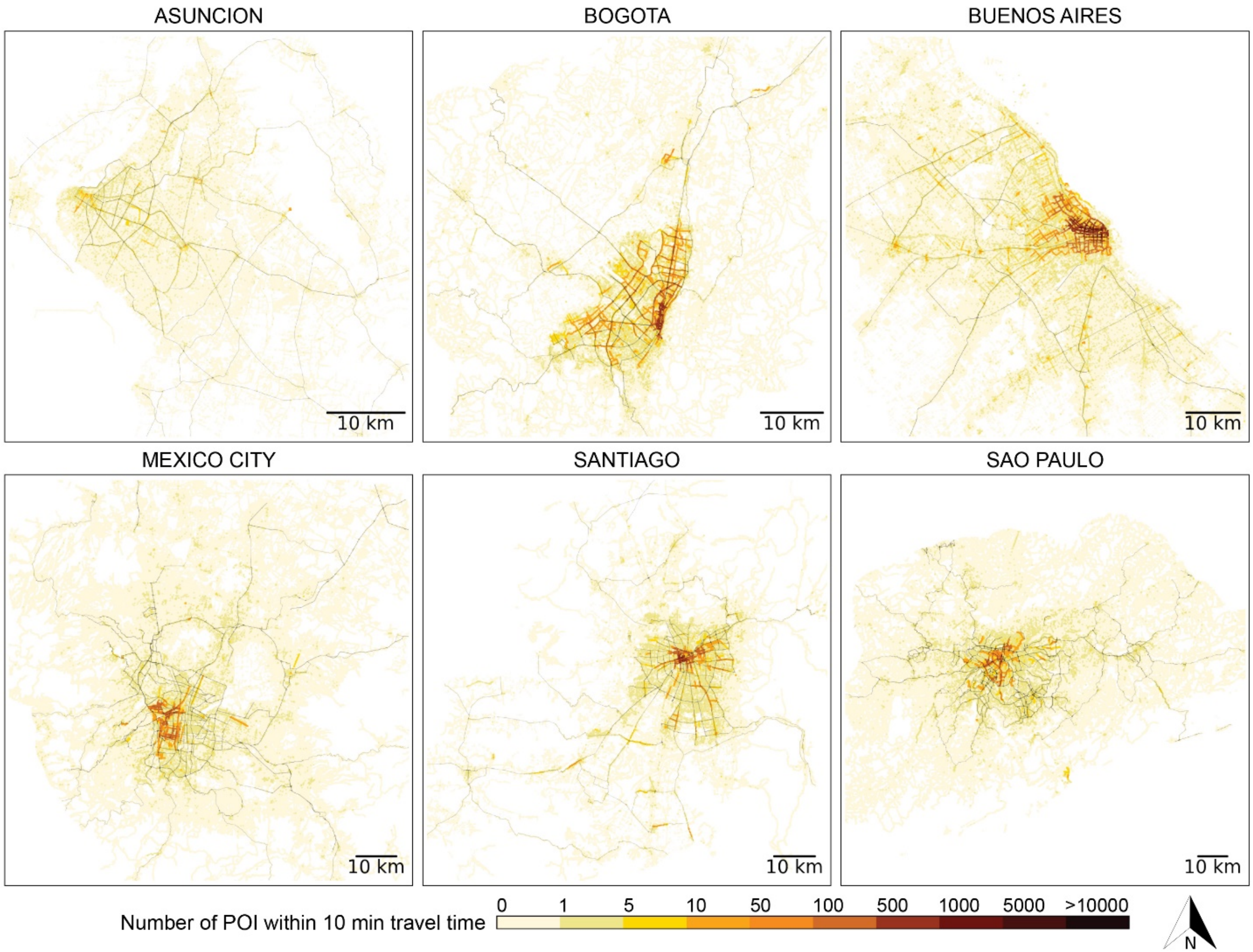


Fig. 10. *10-min POI accessibility via a bicycle network defined by LTS ≤2 and slope <6%*

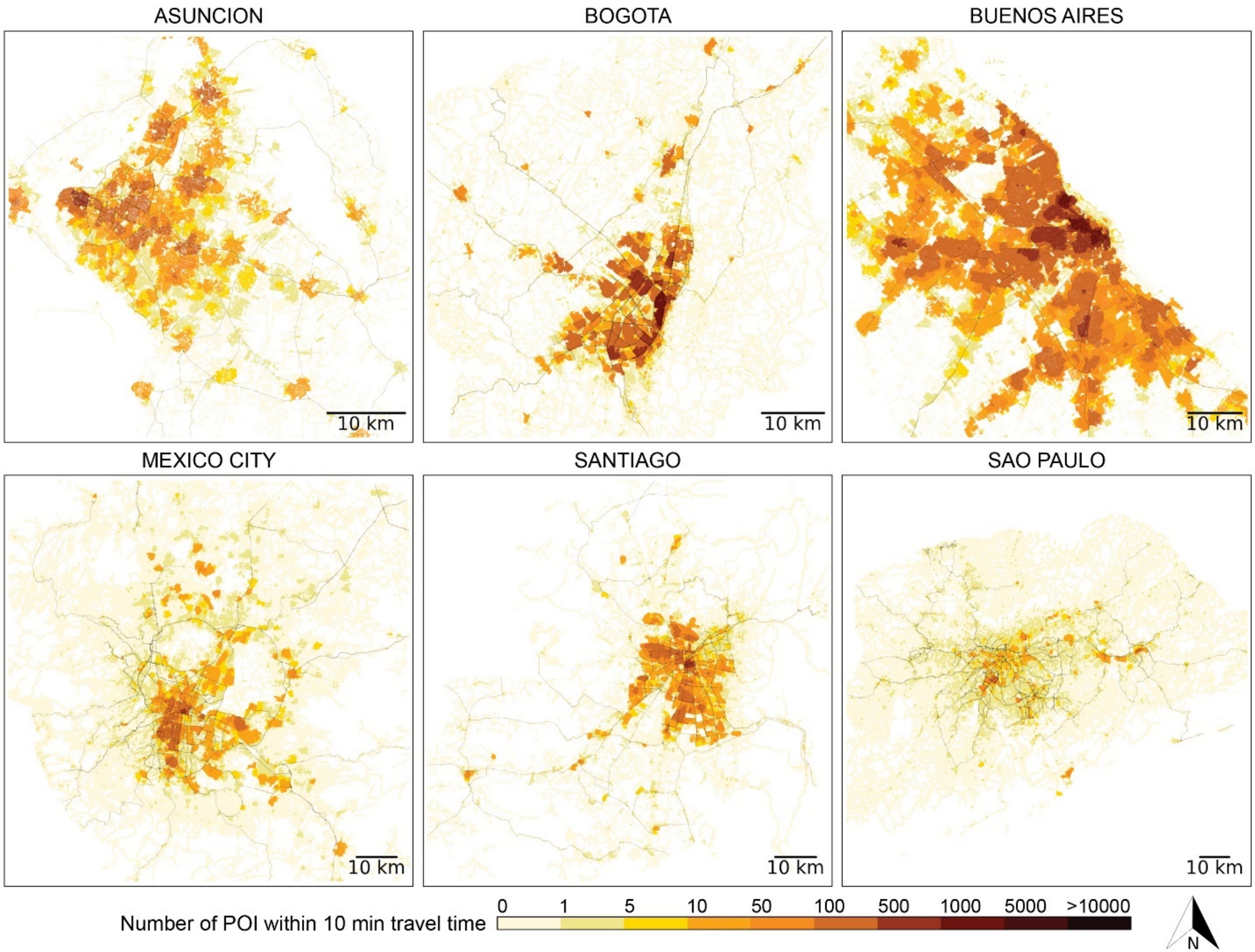


Table 28. *Socioeconomic characteristics – Statistics overview*

			Asuncion N = 6,607		Bogota N = 62,396		Buenos Aires N = 64,157		Mexico City N = 185,312		Santiago N = 55,264		Sao Paulo N = 81,393	
	Variable		n	%	n	%	n	%	n	%	n	%	n	%
Individual var.	Gender	Women	3,326	50%	33,159	53%	32,962	51%	96,110	52%	29,354	53%	43,316	53%
		Men	3,281	50%	29,237	47%	31,195	49%	89,202	48%	25,910	47%	38,077	47%
	Age (yrs)	<18	1,295	20%	10,675	17%	13,465	21%	35,632	19%	9,298	17%	11,796	14%
		18-64	4,638	70%	43,788	70%	41,663	65%	131,246	71%	38,031	69%	57,582	71%
		>=65	674	10%	7,933	13%	9,029	14%	18,434	10%	7,935	14%	12,015	15%
	Activity	Student	2,048	31%	13,879	22%	8,849	14%	44,397	24%	13,748	25%	13,179	16%
		Employed	3,624	55%	29,308	47%	31,061	48%	90,611	49%	53,399	97%	41,244	51%
		Unemployed	734	11%	5,436	9%	12,631	20%	15,517	8%	1,865	3%	21,168	26%
		Hkpr/Fam wkr	768	12%	10,749	17%	7,739	12%	27,238	15%	8,518	15%	5,994	7%
	Income	Low	3,705	56%	27,674	44%	18,371	29%	109,195	59%	18,336	33%	27,347	34%
		Middle	1,807	27%	21,670	35%	26,926	42%	55,039	30%	18,388	33%	27,033	33%
		High	1,095	17%	13,052	21%	18,860	29%	21,078	11%	18,540	34%	27,013	33%
	Education	Primary	1,958	30%	20,624	33%	40,496	63%	52,435	28%	16,184	29%	32,803	40%
		Secondary	2,928	44%	22,092	35%	13,868	22%	87,943	47%	25,520	46%	28,045	34%
		Superior	1,721	26%	19,680	32%	9,793	15%	44,934	24%	13,560	25%	20,545	25%
HH var.	Single-parent household		260	4%	2,536	4%	3,113	5%	5,292	3%	1,691	3%	3,067	4%
	Number of children	0	3,327	50%	34,199	55%	31,577	49%	92,562	50%	35,938	65%	51,213	63%
		1	1,802	27%	17,036	27%	14,043	22%	45,517	25%	10,796	20%	18,253	22%
		2	979	15%	8,850	14%	10,881	17%	32,415	17%	6,466	12%	8,984	11%
		3 or more	499	8%	2,311	4%	7,656	12%	14,818	8%	2,064	4%	2,943	4%
	Household size	1	246	4%	3,577	6%	3,267	5%	6,044	3%	2,148	4%	6,082	7%
		2	746	11%	9,710	16%	11,134	17%	21,856	12%	8,075	15%	19,754	24%
		3	1,217	18%	15,084	24%	12,283	19%	33,956	18%	11,920	22%	22,063	27%
		4	1,653	25%	16,692	27%	15,194	24%	48,979	26%	14,624	26%	19,360	24%
		5 or more	2,745	42%	17,333	28%	22,279	35%	74,477	40%	18,497	33%	14,134	17%

Table 29. *POI isochrones – Statistics overview*

Isochrone		Asuncion				Bogota				Buenos Aires				Mexico City				Santiago				Sao Paulo			
		Mean	SD	Max	Min	Mean	SD	Max	Min	Mean	SD	Max	Min	Mean	SD	Max	Min	Mean	SD	Max	Min	Mean	SD	Max	Min
LTS ≤ 3	10 min	151	207	1460	0	441	663	4120	0	374	515	3515	0	74	184	1404	0	214	301	2458	0	217	410	2244	0
	20 min	534	531	2527	0	1497	1955	8258	0	1395	1703	8980	0	265	610	4190	0	706	852	4917	0	770	1342	6039	0
	30 min	1059	920	3980	0	3024	3608	12439	0	2936	3218	15944	0	546	1148	6192	0	1454	1577	7085	0	1446	2325	8634	0
LTS ≤ 2	10 min	90	145	1188	0	421	624	3992	0	269	432	2670	0	30	101	804	0	71	127	1291	0	99	238	1583	0
	20 min	301	386	1897	0	1452	1898	8054	0	909	1412	7885	0	83	295	2498	0	184	337	2346	0	287	657	3638	0
	30 min	544	611	2716	0	2947	3529	12248	0	1784	2642	13805	0	165	568	3859	0	309	564	3020	0	547	1239	5696	0
LTS ≤2 & slope<6%	10 min	40	79	718	0	86	202	1842	0	153	218	1406	0	9	35	300	0	34	67	676	0	3.0	16.9	295	0
	20 min	95	169	869	0	132	361	3051	0	424	602	3645	0	18	71	620	0	61	128	838	0	3.9	26.2	335	0
	30 min	133	217	878	0	144	432	3357	0	752	1061	6613	0	23	90	735	0	79	181	1154	0	4.0	26.6	335	0
Bicycle lane only	10 min	0.2	1.1	20	0	3.1	36.5	717	0	1.9	33.2	950	0	0.3	2.1	28	0	4.4	42.7	669	0	0.9	8.1	216	0
	20 min	0.2	1.1	20	0	6.1	71.5	1119	0	3.1	65.1	1871	0	0.4	3.4	45	0	9.0	85.1	977	0	1.7	16.4	285	0
	30 min	0.2	1.1	20	0	8.0	88.1	1254	0	5.8	103.4	2741	0	0.4	3.7	48	0	10.6	98.1	985	0	2.6	27.5	499	0

The results show that the accessibility index is positively associated with income and educational attainment, and these variables' incidence rate ratios (IRRs) are the highest in most cases (Table 30-32). Overall, all threshold travel times and network types show similar results. In the sample metropolitan regions, commercial centers and their surrounding areas with high bicycle accessibility tend to be home to middle- and high-income people. Low-income people tend to live far from these opportunities. Therefore, the accessibility index of the middle- and high-income groups is from 1.03 to 5.36 times and from 1.08 to 6.10 times higher than that of the low-income group, respectively.

However, Asuncion, Mexico City, and Santiago show some exceptions. In Asuncion, low-income individuals enjoy 45% higher accessibility than middle-income residents in the bicycle-lane-only network. The reason for this is that a high-density, low-income settlement is located in the bay area of the city center, next to bicycle lanes and a considerable number of POIs in the city center. In Mexico City, in the bicycle-lane-only network, the low-income group enjoys 48% to 56% and 18% to 54% higher accessibility than the middle- and high-income groups, respectively. In Mexico City, although the majority of bicycle lanes are clustered near downtown, where a portion of middle- and high-income people reside, the existence of some bicycle lanes on the east side with substantially high densities of low-income population induces the negative association between bicycle accessibility and income level. Santiago also shows some opposite results. In the LTS≤2 network, the accessibility index of the low-income group is 3% to 5% and 11% to 12% higher than that of the middle-and high-income groups, respectively. In the network LTS≤2 and slope < 6%, the low-income group enjoys 9% to 11% and 24% to 33% higher accessibility than the middle- and high-income groups, respectively. The reason for this is that historically, in Santiago, the upper classes have inhabited the northeastern hilly area, where more LTS 3 and 4 roads are present because it developed based on automobile-oriented planning (Errázuriz, 2016). Thus, in networks that exclude roads with higher LTS and steeper slopes, the accessibility of higher-income groups is considerably reduced.

In terms of educational attainment, the accessibility index of individuals with secondary education is 1.04 to 2.72 times higher, and that of individuals with college-level education is 1.12 to 4.15 times higher than that of individuals with primary education. Again, Santiago is an exception, where the accessibility index of individuals with college-level education is from 16% to 23% less than that of individuals with primary education. As in the previous case, in Santiago, individuals with higher education tend to live in areas with higher LTS and steeper slopes.

Regarding other variables, there are some common trends across cities. Household size, number of children, housekeepers and family workers are negatively associated with bicycle accessibility. Individuals under the age of 18 and individuals aged 65 or above tend to have higher accessibility than people aged 18 to 64. Additionally, women have slightly higher accessibility than men in some cities.

Table 30. *Sociodemographic predictors of isochrone of 10-minute cycling*

		Asuncion				Bogota				Buenos Aires				Mexico City				Santiago				Sao Paulo			
y	Isochrone within 10 min	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only
Individual var.	Women	0.955	0.956	1.013	1.073	1.007	1.003	1.017	1.077	1.014	1.019	1.014	1.081	1.059	1.046	1.049	1.046	1.025	1.009	0.986	0.964	1.051	1.046	1.082	1.236
	Age 18-64 yrs	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs	1.167	1.188	1.242	0.947	0.997	1.004	1.030	1.224	1.088	1.116	1.072	0.698	1.068	1.046	1.034	1.065	1.167	1.025	0.945	1.514	0.789	0.792	0.826	0.957
	Age ≥ 65 yrs	1.392	1.494	1.590	1.599	1.220	1.207	1.233	0.677	1.192	1.229	1.187	0.982	1.250	1.252	1.306	1.197	1.079	1.027	1.020	1.252	1.356	1.320	1.500	1.573
	Student	0.923	0.944	0.991	1.142	1.130	1.120	1.090	0.860	1.061	1.077	1.037	1.674	0.933	0.943	0.980	0.875	0.927	0.951	0.984	1.062	1.601	1.689	1.556	1.344
	Hkpr/fam wkr	0.991	1.032	0.938	0.923	0.944	0.955	0.962	0.574	0.943	0.935	0.939	0.605	0.830	0.836	0.857	0.688	0.936	0.922	0.937	0.929	0.804	0.876	0.908	0.642
	Unemployed	0.908	0.913	0.948	0.686	1.032	1.032	1.081	0.798	1.040	1.050	1.034	1.565	0.900	0.872	0.807	1.260	0.975	0.990	0.965	0.830	0.872	0.922	0.937	0.744
	Educ, ≤ prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec	1.015	1.025	1.175	1.281	1.181	1.182	1.198	2.051	1.240	1.294	1.207	2.015	1.058	1.057	1.079	1.085	1.086	1.024	1.015	1.614	1.266	1.298	1.452	1.384
	Educ, ≥ coll	1.385	1.496	1.856	1.846	1.426	1.412	1.423	2.112	1.777	1.934	1.486	3.475	1.520	1.558	1.547	1.139	1.335	1.010	0.836	2.526	2.134	2.359	2.412	2.799
HH var.	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid	0.917	0.982	1.046	0.551	1.330	1.331	1.397	1.669	1.111	1.122	1.081	2.880	2.926	3.261	2.847	0.521	1.023	0.967	0.914	1.017	1.647	1.853	1.596	1.546
	Income, high	1.012	1.088	1.341	0.968	1.325	1.300	1.178	2.299	1.395	1.483	1.279	3.746	2.931	2.988	2.029	0.510	1.079	0.887	0.757	2.088	2.988	3.855	3.554	2.520
	Single parent	1.362	1.450	1.094	1.566	1.010	0.992	1.050	1.779	1.012	1.003	0.985	2.199	1.005	0.949	0.894	0.841	1.032	1.075	1.079	1.171	1.042	1.005	0.961	1.348
	N of children	0.891	0.911	0.902	0.892	0.887	0.889	0.856	0.473	0.999	0.997	0.986	0.987	0.958	0.978	0.951	0.902	0.956	0.923	0.880	1.161	1.000	1.008	1.068	1.064
	HH size	1.002	0.993	0.928	0.848	0.948	0.949	0.980	1.007	0.960	0.953	0.973	0.848	0.965	0.961	0.969	0.929	0.919	0.949	1.000	0.589	0.857	0.823	0.844	0.860
	lnalpha	1.637	1.986	2.930	13.07	3.137	3.127	7.761	27.38	1.890	2.653	2.690	16.73	3.538	6.666	12.58	38.62	1.698	3.031	3.821	46.52	2.703	3.464	11.39	23.15
	Pseudo R2	0.002	0.003	0.006	0.020	0.002	0.002	0.001	0.014	0.004	0.004	0.002	0.027	0.013	0.011	0.008	0.005	0.002	0.001	0.001	0.012	0.015	0.020	0.020	0.017

Notes: Exponentiated coefficients. Blue/Red highlighting = a statistically significant positive/negative estimate with at least $p < 0.1$.

Table 31. *Sociodemographic predictors of isochrone of 20-minute cycling*

		Asuncion				Bogota				Buenos Aires				Mexico City				Santiago				Sao Paulo			
y	Isochrone within 20 min	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only	LTS≤3	LTS≤2	LTS≤2 & s<6%	Bike lane only
Individual var.	Women	0.983	0.991	1.053	1.073	1.006	1.003	1.020	1.097	1.010	1.015	1.009	1.109	1.052	1.055	1.045	1.018	1.026	1.016	0.985	0.992	1.047	1.045	1.106	1.256
	Age 18-64 yrs	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs	1.176	1.231	1.318	0.947	1.019	1.019	1.056	1.219	1.101	1.117	1.071	0.556	1.080	1.055	1.056	1.079	1.126	1.036	0.947	1.542	0.803	0.789	0.809	1.002
	Age ≥ 65 yrs	1.344	1.415	1.538	1.599	1.261	1.253	1.267	0.760	1.191	1.236	1.197	0.915	1.225	1.235	1.316	1.155	1.152	1.086	1.074	1.284	1.364	1.343	1.637	1.572
	Student	0.927	0.918	0.932	1.142	1.129	1.124	1.084	0.888	1.052	1.080	1.045	1.903	0.931	0.922	0.963	0.879	0.970	0.945	0.975	1.054	1.599	1.714	1.620	1.241
	Hkpr/fam wkr	0.985	1.017	0.895	0.923	0.963	0.966	0.949	0.579	0.956	0.946	0.946	0.510	0.840	0.814	0.878	0.729	0.947	0.918	0.939	0.911	0.821	0.862	0.880	0.631
	Unemployed	0.967	0.991	1.010	0.686	1.046	1.045	1.092	0.846	1.038	1.055	1.050	1.868	0.911	0.896	0.824	1.343	0.999	0.980	0.953	0.721	0.890	0.908	0.921	0.696
	Educ, ≤ prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec	1.057	1.059	1.165	1.281	1.190	1.188	1.231	2.072	1.252	1.303	1.230	2.241	1.066	1.044	1.094	1.093	1.091	1.004	0.998	1.535	1.277	1.300	1.606	1.212
	Educ, ≥ coll	1.378	1.467	1.718	1.846	1.427	1.410	1.505	2.212	1.751	1.938	1.549	4.016	1.507	1.516	1.539	1.115	1.312	1.014	0.797	2.351	2.161	2.427	2.611	2.455
HH var.	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid	0.997	1.014	1.137	0.551	1.339	1.335	1.451	1.617	1.112	1.120	1.080	3.766	3.055	3.383	2.143	0.442	1.035	0.957	0.906	1.078	1.676	1.919	1.688	1.528
	Income, high	1.100	1.077	1.352	0.968	1.338	1.311	1.256	2.254	1.392	1.506	1.304	4.545	2.821	2.661	1.586	0.459	1.097	0.888	0.711	2.472	3.197	4.240	3.760	2.796
	Single parent	1.157	1.252	0.997	1.566	0.967	0.962	0.986	1.942	0.977	1.001	0.968	2.910	1.005	0.991	0.950	0.819	1.032	1.109	1.168	1.151	1.014	1.036	0.915	1.345
	N of children	0.914	0.913	0.896	0.892	0.890	0.891	0.843	0.451	0.990	0.992	0.984	0.967	0.970	0.996	0.966	0.897	0.949	0.911	0.854	1.238	0.998	1.002	1.054	1.164
	HH size	1.007	1.014	0.946	0.848	0.952	0.954	0.973	1.025	0.961	0.952	0.967	0.830	0.970	0.958	0.979	0.929	0.925	0.940	1.007	0.549	0.859	0.823	0.852	0.840
	lnalpha	1.409	2.032	3.422	13.07	3.635	3.655	8.501	33.10	1.742	2.799	2.902	19.75	3.286	7.089	14.76	47.77	1.982	3.832	4.605	54.23	2.867	4.013	12.66	30.14
	Pseudo R2	0.002	0.001	0.003	0.020	0.002	0.002	0.002	0.012	0.004	0.004	0.002	0.029	0.011	0.009	0.004	0.005	0.001	0.001	0.001	0.011	0.013	0.017	0.019	0.013

Notes: Exponentiated coefficients. Blue/Red highlighting = a statistically significant positive/negative estimate with at least $p < 0.1$.

Table 32. *Sociodemographic predictors of isochrone of 30-minute cycling*

y	Isochrone within 30 min	Asuncion LTS≤3	Asuncion LTS≤2	Asuncion LTS≤2 & s<6%	Asuncion Bike lane only	Bogota LTS≤3	Bogota LTS≤2	Bogota LTS≤2 & s<6%	Bogota Bike lane only	Buenos Aires LTS≤3	Buenos Aires LTS≤2	Buenos Aires LTS≤2 & s<6%	Buenos Aires Bike lane only	Mexico City LTS≤3	Mexico City LTS≤2	Mexico City LTS≤2 & s<6%	Mexico City Bike lane only	Santiago LTS≤3	Santiago LTS≤2	Santiago LTS≤2 & s<6%	Santiago Bike lane only	Sao Paulo LTS≤3	Sao Paulo LTS≤2	Sao Paulo LTS≤2 & s<6%	Sao Paulo Bike lane only
Individual var.	Women	0.981	0.991	1.053	1.073	1.007	1.006	1.024	1.101	1.010	1.013	1.008	1.140	1.059	1.074	1.042	1.012	1.030	1.025	0.992	0.996	1.049	1.049	1.109	1.214
	Age 18-64 yrs	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs	1.143	1.180	1.285	0.947	1.031	1.031	1.059	1.202	1.107	1.110	1.076	0.571	1.087	1.066	1.081	1.086	1.106	1.035	0.931	1.520	0.819	0.791	0.802	0.957
	Age ≥ 65 yrs	1.284	1.332	1.415	1.599	1.256	1.250	1.295	0.866	1.179	1.221	1.185	1.333	1.211	1.260	1.323	1.150	1.204	1.143	1.109	1.345	1.376	1.367	1.638	1.554
	Student	0.941	0.944	0.925	1.142	1.120	1.115	1.104	0.928	1.034	1.072	1.043	2.092	0.923	0.915	0.956	0.881	0.983	0.948	0.986	1.070	1.564	1.737	1.644	1.228
	Hkpr/fam wkr	1.000	1.020	0.940	0.923	0.977	0.979	0.937	0.582	0.958	0.955	0.956	0.533	0.833	0.773	0.902	0.745	0.947	0.919	0.940	0.937	0.831	0.841	0.878	0.650
	Unemployed	0.980	1.017	1.055	0.686	1.046	1.046	1.093	0.888	1.024	1.058	1.045	2.180	0.921	0.917	0.832	1.347	1.007	0.995	0.978	0.702	0.897	0.907	0.927	0.679
	Educ, ≤ prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec	1.040	1.042	1.168	1.281	1.176	1.174	1.256	2.067	1.238	1.290	1.227	2.719	1.061	1.050	1.099	1.101	1.092	0.998	0.980	1.484	1.288	1.334	1.625	1.091
	Educ, ≥ coll	1.304	1.399	1.687	1.846	1.406	1.391	1.593	2.330	1.660	1.861	1.553	4.148	1.463	1.556	1.553	1.121	1.291	1.030	0.770	2.273	2.122	2.529	2.634	2.122
HH var.	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid	1.021	1.030	1.098	0.551	1.327	1.323	1.475	1.682	1.113	1.123	1.092	5.369	3.023	3.744	1.890	0.450	1.033	0.949	0.891	1.113	1.663	1.987	1.669	1.397
	Income, high	1.168	1.163	1.304	0.968	1.350	1.329	1.338	2.363	1.364	1.493	1.327	6.105	2.719	2.971	1.786	0.483	1.097	0.882	0.667	2.690	3.122	4.565	3.674	2.743
	Single parent	1.141	1.155	1.063	1.566	0.959	0.957	0.980	1.900	0.992	0.997	0.973	2.352	0.991	0.973	0.994	0.820	1.007	1.101	1.165	1.138	0.988	1.004	0.901	1.535
	N of children	0.945	0.936	0.938	0.892	0.898	0.899	0.831	0.461	0.984	0.986	0.976	0.948	0.972	0.991	0.961	0.896	0.938	0.899	0.839	1.276	1.006	1.018	1.059	1.137
	HH size	1.001	1.008	0.952	0.848	0.955	0.956	0.968	1.024	0.968	0.957	0.971	0.825	0.970	0.958	0.977	0.929	0.939	0.946	1.010	0.537	0.869	0.819	0.851	0.830
	lnalpha	1.317	2.078	3.668	13.07	3.928	3.956	8.659	35.23	1.653	2.927	3.085	24.06	3.305	7.627	15.64	50.13	2.197	4.338	4.989	56.04	2.908	4.512	12.75	34.81
	Pseudo R2	0.001	0.001	0.002	0.020	0.001	0.001	0.002	0.011	0.003	0.003	0.002	0.025	0.009	0.009	0.003	0.005	0.001	0.001	0.002	0.011	0.011	0.015	0.019	0.011

Notes: Exponentiated coefficients. Blue/Red highlighting = a statistically significant positive/negative estimate with at least $p < 0.1$.

3.5 DISCUSSION

The consistency in the results across cities is striking: social inequities in bicycle accessibility are common in this region. These findings can offer some indications about people's behavior and the urban spatial structure in the sample metropolitan areas. The city center, which provides greater opportunities, tends to be occupied by the wealthy with higher educational attainment, and the poor are confined to the periphery. Bicycle lanes seem to be deployed close to activity centers, following a utilitarian logic. This concentration of infrastructure investments reinforces peripherality and exclusion. Overall, our findings align with previous literature on Latin America, in which scholars have found inequities in bicycle accessibility among different income groups.

Considering geography and place when expanding bicycle networks is vital to reducing social inequity in bicycle accessibility. As the opposite results in bicycle-lane-only models show, even a modest bicycle infrastructure investment can have a significant impact when deployed in key places. In Asuncion, the existence of a bay area waterfront road with bicycle lanes significantly improved low-income residents' accessibility. In Mexico City, infrastructure investments in lower-income areas on the east side, such as the City of Chimalhuacán (IPOMEX, 2013) and the City of Nezahualcóyotl (Fernández, 2016), shaped the outcomes. In Mexico, the Institute of Policies for Transportation and Development promotes bicycle infrastructure investments to reduce social inequity because the use of automobiles imposes a heavy financial burden on low-income people (ITDP, 2015). Also, Cyclists' movements supported the investments, which were primarily prompted by student-led campaigns (Fernández, 2016).

Analyzing different networks and travel times helps us to understand better accessibility equity in these cities. In bicycle-lane-only models, network coverage is the smallest, and the number of reachable POIs is limited; thus, there is the smallest portion of people enjoying higher accessibility. The highest pseudo R-squared statistics of bicycle-lane-only models indicate that the inequality (but not necessarily inequity) of the distribution of accessibility benefits is the greatest, and therefore, it tends to be more predictable than other models. As the bicycle network becomes larger (e.g., LTS≤3 with a 30 min threshold), more people have access to opportunities, though it also becomes clearer that individuals with higher income enjoy greater accessibility across cities. Therefore, not only providing bicycle lanes, but also providing housing alternatives in highly accessible places for lower-income people is crucial to improving equity. Here, I confirm that applying different accessibility measures and comparing their results, instead of relying on just one accessibility measure, are important for drawing conclusions.

Other sociodemographic variables showed some interesting findings. Individuals aged 65 and over tend to have better accessibility than individuals aged 18 to 64. Perhaps this reflects older people's early locational choices, inability to move, or preference to be in accessible places. Similarly, individuals under the age of 18 tend to have better accessibility. This contrasts with the outcomes for the number of dependent children, which shows negative associations with accessibility. I can interpret from this that parents with dependent children might prefer to live in accessible places. However, when the number of dependent children is greater, living expenses and housing costs tend to be higher, and thus, living in accessible places might no longer be an option due to its high prices. The same logic can be applied to the negative effect of household size on accessibility. In some cities, women tend to have a slightly higher level of accessibility than men. Perhaps certain types of women (e.g., single women) prefer to live in accessible places, because women tend to use transit and walk more than men (Delclòs-Alió et al., 2022; Goel et al., 2022). However, I cannot exclude the possibility of survey bias in the gender variable because the differences between women and men are just slight in most cases. These findings can be further studied in the future to understand whether some social groups spend a greater portion of their disposable income in order to live in highly accessible places and its equity implications.

Data limitations combined with the simplicity of the LTS method might compromise the performance strength of our accessibility measures. In this study, the number of vehicle lanes was excluded from the decision tree of Conveyal's LTS, which could have affected the outcomes. In addition, missing data on speed limits of unclassified roads and detailed bicycle infrastructure characteristics might affect the measurement of accessibility. Regarding the speed limit data of unclassified roads, the upper quartile imputation for missing data might bias the results. The lack of detailed bicycle network data is another concern. Bicycle maps provided by municipalities indicate only "separated" bicycle lanes, which simply means that they are not part of vehicle lanes. Specifications regarding the types of bicycle infrastructure (buffered, off-street, etc.) and intersection treatments are not available, which might bias our outcomes. Regarding the OSM data, I verified the existence of bicycle lanes and road characteristics visually via comparisons with bicycle network maps provided by municipalities, Google maps, satellite photos, and street views. The OSM data highly matched these data, although some inconsistencies with reality might exist. Additionally, the representativeness of our POI data could be a concern if missing data were not randomly distributed. Several studies confirm that although OSM POI data might be incomplete, they still deliver significant insights (Klemmer et al., 2018; Zhang & Pfoser, 2019), and even perform better than local business permit data (Lu et al., 2019). Finally, I believe that there is no better data source at this time for our study, mainly because of open data's transparency (the survey data and OSM data) and its fairly high reliability.

3.6 CONCLUSIONS

This study has identified important sociodemographic disparities in bicycle accessibility in six Latin American metropolitan areas. Overall, our models consistently demonstrated that income and educational attainment are positively associated with bicycle accessibility. This finding confirms the existence of inequities in the accessibility benefits provided by bicycles in the sample metropolitan areas. Higher-income residents are more likely to be located close to CBDs, which provide more bicycle infrastructure and opportunities than non-CBD areas. In contrast, lower-income residents are more likely to locate in the urban periphery where bicycle infrastructure and opportunities are scarce.

Infrastructure to support cycling, whether exclusive to bicycles or in a low-stress environment, is a product of the uneven spatial distribution of opportunities in these cities. At the same time, it can also be a perpetrator and agent that strengthens existing disparities in overall accessibility, even if bicycle use is a relatively inexpensive mode of travel. Despite the uneven spatial structure, some cities demonstrate that even modest bicycle infrastructure investments can improve accessibility inequity through infrastructure decisions. Our results confirm the importance of incorporating equity studies in transportation planning and infrastructure decisions, especially in Latin American cities.

4 IS ISOCHRONE ACCESSIBILITY ASSOCIATED WITH CYCLING? EVIDENCE FROM FIVE LARGE LATIN AMERICAN CITIES

4.1 INTRODUCTION

Although cycling is a sustainable transportation alternative for cities, little is known about how accessibility measures are associated with cycling. Especially in Latin America, despite its relevance, related studies are still scarce. This chapter examines how isochrone accessibility is associated with cycling in the sample cities. The isochrone measures from the home location to POIs computed in the previous chapter were used. Zero-inflated negative binomial regressions were conducted to analyze how the frequency of cycling trips is associated with the isochrone measures, physical environment, and socioeconomic variables. The emphasis of this study is to find common trends across cities and identify generalizable patterns of associations between accessibility and cycling in this region.

Accessibility-oriented planning provides environmental and social benefits, preventing the increase in the distance between origins and destinations, reducing land consumption, strengthening societal gains by facilitating access to valued destinations, and encouraging the use of active modes (Cervero, 1997; Levine et al., 2019). In particular, cycling is promoted as an environmentally friendly, cost-effective, and health-improving travel mode. Thus, understanding how accessibility relates to cycling is essential to support accessibility-oriented planning based on evidence.

4.2 LITERATURE REVIEW

4.2.1 Accessibility Measures

Several lines of evidence show that increased cycling is associated with higher accessibility to retail, jobs, and points of interest (POIs) (Cervero, 1996; Cervero & Duncan, 2003; Faghih Imani et al., 2019; Nielsen & Skov-Petersen, 2018; Saghapour et al., 2017, 2019) (Table 33). Regarding the performance of accessibility, Saghapour et al. (2019) showed that it performed better than land-use measures to predict walking and cycling trips in Melbourne. In terms of the opportunity types, retail density better explains bicycle mode choice than housing density and employment accessibility (Cervero, 1996; Nielsen & Skov-Petersen, 2018). On the other hand, Mitra and Nash (2019) reported that in Toronto, the effect of accessibility on cycling was not statistically significant, despite its gender-specific effects. Wang et al. (2016) found that in Oregon, total bicycle trips are positively associated with low-stress accessibility to homes and jobs, although such an association was not found for commuting trips.

Regarding the catchment areas for accessibility calculations, there are inconsistent findings. Cervero (1996) indicated that greater access to grocery stores within 300 feet of home encourages commuting by cycling. Faghih Imani et al. (2019) found that 30-minute low-stress isochrones to jobs are positively associated with cycling. Cervero and Duncan (2003) stated that the presence of a considerable number of retails/services within a 1-mile radius of home encouraged cycling. However, they also pointed out that a greater number of overall jobs within a 5-mile radius of home discouraged cycling, apparently due to higher vehicle traffic.

Table 33. *Accessibility and other factors associated with cycling in previous literature*

	Variable		D.A.	Trip Purpose	Place	Year	Authors
Physical Environment Variables	Accessibility	to retail/ offices	+	Work	US	1996	Cervero
			+	Nonwork	San Francisco Bay Area	2003	Cervero & Duncan
			+	Total	Denmark	2018	Nielsen & Skov-
			0 0	Work Nonwork	Toronto	2019	Mitra & Nash
		to jobs	–	Nonwork	San Francisco Bay Area	2003	Cervero & Duncan
			– 0	Total Work	Oregon	2016	H. Wang et al.
			+	Total	Denmark	2018	Nielsen & Skov-
			+	Total	Toronto	2019	Faghih Imani et al.
		to POI	+	Total	Melbourne	2017 2019	Saghapour et al.
	LTS		0	To School	Davis, CA	2016	Fitch et al.
			–	Work	Franklin County, Ohio	2020	K. Wang et al.
			–	Work	Bogota	2021	Higuera-Mendieta
	Bicycle Lanes		+	Work	18 US cities	1997	Nelson & Allen
			+	Work	43 large US cities	2003	Dill & Carr
			0	Work	Portland, OR	2007	Dill & Voros
			+	Work	UK	2007	Parkin et al.
			+	Work	UK	2007	Wardman et al.
			+	Total	Denmark	2018	Nielsen & Skov-
			+ 0	Work Nonwork	Toronto	2019	Mitra & Nash
			+	Total	Bogota	2009	Cervero et al.
			0	Total	Bogota	2018	Leon et al.
			+	Total	Bogota	2019	Rodriguez-Valencia
			0	Work	Mexico City	2021	Bautista-Hernández
			+	Work	Santiago	2020	Gutiérrez et al.
			+	Work	Santiago	2021	Echiburú et al.
			+	Total	Sao Paulo	2010	Florindo et al.
	Vehicle Speed		0	Total	Baltimore-Washington,	2014	Cui et al.
			– 0	Work Nonwork	Toronto	2019	Mitra & Nash
	Roadway Density		–	Total	Melbourne	2019	Saghapour et al.
			+	Utilitarian	Bogota	2009	Cervero et al.
			–	Work	Mexico City	2021	Bautista-Hernández
	Slope		–	Nonwork	San Francisco Bay Area	2003	Cervero & Duncan
			–	Work	Chapel Hill, NC	2004	Rodriguez & Joo
			–	Work	UK	2007	Parkin et al.
			–	Total	Denmark	2018	Nielsen & Skov-
			–	Utilitarian	Bogota	2009	Cervero et al.
			–	Work	Bogota	2021	Higuera-Mendieta
Individual Variables	Gender (0-men, 1-women)		–	Nonwork	San Francisco Bay Area	2003	Cervero & Duncan
			–	Work	Chapel Hill, NC	2004	Rodriguez & Joo
			–	Work	6 Small U.S. Cities	2011	Handy & Xing
			–	Work	US	2005	Plaut
			–	Work	US	2020	Guerra et al.
			–	Work	UK	2007	Parkin et al.
			–	Work	UK	2007	Wardman et al.
			–	Total	Toronto	2019	Faghih Imani et al.
			–	Utilitarian	Bogota	2009	Cervero et al., 2009
			–	Work	Bogota	2021	Higuera-Mendieta
			–	Total	Bogota	2019	Rodriguez-Valencia
			–	Work	Mexico City	2021	Bautista-Hernández
			–	Work	Mexico	2020	Guerra et al.
			–	Work	Santiago	2020	Gutiérrez et al.
			–	Work	Santiago	2021	Echiburú et al.
			–	Total	Sao Paulo	2018	Florindo et al.
			–	Total	Sao Paulo	2016	Sá et al.

Notes: D.A. = direction of association. 0 = no statistically significant association was found.

(Continued) Table 33*. Accessibility and other factors associated with cycling in previous literature*

	Variable		D.A.	Trip Purpose	Place	Year	Authors
Individual Variables	Age		–	Work	Chapel Hill, NC	2004	Rodriguez & Joo
			–	Work	Portland, OR	2007	Dill & Voros
			–	Work	US	2020	Guerra et al.
			–	Work	6 US cities, Toronto	1999	Pucher et al.
			0	Work	US	2011	Handy & Xing
			0	Work	UK	2007	Wardman et al.
			+ –	Total	Toronto	2019	Faghih Imani et al.
			–	Utilitarian purposes	Bogota	2009	Cervero et al.
			+ –	Work	Bogota	2021	Higuera-Mendieta et al.
			+ –	Total	Bogota	2019	Rodriguez-Valencia et
			–	Work	Mexico City	2021	Bautista-Hernández
			+ –	Work	Mexico	2020	Guerra et al.
			+ –	Total	Sao Paulo	2018	Florindo et al.
			+ –	Total	Sao Paulo	2016	Sá et al.
			–	Work	Santiago	2020	Gutiérrez et al.
	Activity	students	+	Work	18 US cities	1997	Nelson & Allen
			–	Work	Bogota	2021	Higuera-Mendieta et al.
			0	Work	Santiago	2020	Gutiérrez et al.
		employed	+	Work	Bogota	2021	Higuera-Mendieta et al.
			0	Work	Santiago	2020	Gutiérrez et al.
			+	Total	Sao Paulo	2018	Florindo et al.
	Number of Children		0	Work, Nonwork	Toronto	2019	Mitra & Nash
			-	Work	Santiago	2021	Echiburú et al.
	Educational attainment		0	Work	6 Small U.S. Cities	2011	Handy & Xing
			+	Work	US	2005	Plaut
			+ –	Work	US	2020	Guerra et al.
			–	Utilitarian purposes	Bogota	2009	Cervero et al.
			–	Total	Bogota	2019	Rodriguez-Valencia et
			–	Work	Mexico City	2021	Bautista-Hernández
			–	Work	Mexico	2020	Guerra et al.
			–	Total	Sao Paulo	2016	Sá et al.
Household Variables	Income		+	Nonwork	San Francisco Bay Area	2003	Cervero & Duncan
			–	Total	Baltimore-Washington, MD	2014	Cui et al.
			0	Work	43 large US cities	2003	Dill & Carr
			0	Work	6 Small U.S. Cities	2011	Handy & Xing
			–	Work	US	2005	Plaut
			–	Work	US	2020	Guerra et al.
			+	Work	UK	2007	Parkin et al.
			+	Work	UK	2007	Wardman et al.
			+	Total	Toronto	2019	Faghih Imani et al.
			+ –	Total	Bogota	2019	Rodriguez-Valencia et
			+ –	Work	Bogota	2021	Higuera-Mendieta et al.
			–	Work	Mexico City	2021	Bautista-Hernández
			–	Work	Mexico	2020	Guerra et al.
			–	Work	Santiago	2020	Gutiérrez et al.
			–	Total	Sao Paulo	2016	Sá et al.
	HH size		0	All, Work	Oregon	2016	H. Wang et al.
			0	Work	6 Small U.S. Cities	2011	Handy & Xing
			+	Total, Work, Nonwork	US	2003	Saelens et al.
			+	Work	US	2005	Plaut
			–	Work	US	2020	Guerra et al.
			+	Total	Melbourne	2019	Saghapour et al.
			0	Work	Mexico City	2021	Bautista-Hernández
			+	Work	Mexico	2020	Guerra et al.
			–	Work	Santiago	2020	Gutiérrez et al.

Notes: D.A. = direction of association. 0 = no statistically significant association was found.
+ – = relationship is nonlinear.

Nielsen and Skov-Petersen (2018) argued that high retail accessibility within 1 km of the origin becomes a negative factor since it favors walking and transit use.

4.2.2 Other Physical Environmental Variables

Regarding the level of traffic stress (LTS), several studies have shown that the percentage of low LTS roads is positively related to cycling (Higuera-Mendieta et al., 2021; K. Wang et al., 2020). Fitch et al. (2016) indicated that access to school through roads with moderate LTS was almost as important as that through roads with low LTS, which suggests that individuals tend to accept moderate levels of traffic stress. With regard to bicycle lanes, several scholars have shown that they are positively associated with bicycle use (Cervero et al., 2009; Dill & Carr, 2003; Echiburú et al., 2021; Florindo et al., 2018; Gutiérrez et al., 2020; Nelson & Allen, 1997; Nielsen & Skov-Petersen, 2018; Parkin et al., 2007; Rodriguez-Valencia et al., 2019; Wardman et al., 2007). However, others have indicated that such an association was not statistically significant (Bautista-Hernández, 2021; Dill & Voros, 2007; Leon et al., 2018; Mitra & Nash, 2019). Mitra and Nash (2019) argued that high-speed vehicle traffic seems to be an important impediment to cycling, particularly for women. However, Cui et al. (2014) reported that vehicle speed does not significantly affect cycling. Recent studies have shown that road density is negatively associated with active trips (Bautista-Hernández, 2021; Saghapour et al., 2019). While Cervero et al. (2009) suggested the opposite. In regard to topography, previous research has consistently found that steep slopes reduce the probability of cycling (Cervero et al., 2009; Parkin et al., 2007; Rodriguez & Joo, 2004).

4.2.3 Sociodemographic variables

Previous studies have steadily illustrated that women are less likely to bike than men in different places in the world (Bautista-Hernández, 2021; Cervero et al., 2009; Cervero & Duncan, 2003; Echiburú et al., 2021; Faghih Imani et al., 2019; Florindo et al., 2018; Guerra et al., 2020; Gutiérrez et al., 2020; Handy & Xing, 2011; Higuera-Mendieta et al., 2021; Parkin et al., 2007; Plaut, 2005; Rodriguez & Joo, 2004; Rodriguez-Valencia et al., 2019; Sá et al., 2016; Wardman et al., 2007). Some scholars have reported that the cycling rate peaks at 20-45 years old (Faghih Imani et al., 2019; Florindo et al., 2018; Guerra et al., 2020; Higuera-Mendieta et al., 2021; Rodriguez-Valencia et al., 2019; Sá et al., 2016). Furthermore, older people tend to cycle significantly less (Bautista-Hernández, 2021; Cervero et al., 2009; Dill & Voros, 2007; Guerra et al., 2020; Gutiérrez et al., 2020; Pucher et al., 1999; Rodriguez & Joo, 2004). Others have found that age is not significantly associated with cycling (Handy & Xing, 2011; Wardman et al., 2007). Activity status and the number of children show mixed results (Echiburú et al., 2021; Florindo et al., 2018; Gutiérrez et al., 2020; Higuera-Mendieta et al., 2021; Mitra & Nash, 2019; Nelson & Allen, 1997). Regarding education, in the US, college or postgraduate level education (Guerra et al., 2020; Plaut, 2005) and less than a high school degree (Guerra et al., 2020) are positively associated with cycling, while education is statistically non-significant in college towns (Handy & Xing, 2011). In Bogota, Mexico City, and Sao Paulo, education attainment is negatively associated with the likelihood of cycling (Bautista-Hernández, 2021; Cervero et al., 2009; Rodriguez-Valencia et al., 2019; Sá et al., 2016). Some scholars have found that lower-income people are more prone to cycle (Bautista-Hernández, 2021; Cui et al., 2014; Guerra et al., 2020; Gutiérrez et al., 2020; Plaut, 2005; Sá et al., 2016). Others have argued the opposite (Cervero & Duncan, 2003; Faghih Imani et al., 2019; Parkin et al., 2007; Wardman et al., 2007) or that income is statistically non-significant (Dill & Carr, 2003; Handy & Xing, 2011). While in

Bogota, the middle socioeconomic status was least likely to bike (Rodriguez-Valencia et al., 2019). Several studies have found that household size is positively associated with cycling (Guerra et al., 2020; Plaut, 2005; Saelens et al., 2003; Saghapour et al., 2019). While others have argued the opposite (Guerra et al., 2020; Gutiérrez et al., 2020) or that it is statistically non-significant (Bautista-Hernández, 2021; Handy & Xing, 2011; H. Wang et al., 2016).

As Table 33 shows, studies on bicycle accessibility and LTS are mostly led by researchers in the Global North. Moreover, most studies have focused on a single city or country. Thus, some findings might be specific to only certain contexts and not generalizable. Several scholars claim that the effect of accessibility measures on travel behavior tends to be considerably weaker than that of sociodemographic attributes and topography (Cervero & Duncan, 2003; Crane, 2000). However, there are some contradictory findings, as stated above. There is room for improvement in the research on how these variables relate to cycling.

4.3 METHODOLOGY

4.3.1 Dataset Preparation

Same as in the previous chapter, travel data, and sociodemographic information from household travel survey data were used (INEGI, 2017; METRO, 2017; PTUBA, 2010; Steer - CNC, 2019; UAH, 2012). The road network and POI for each metropolitan area were extracted from Open Street Map (OSM) using OSMnx (Boeing, 2017) and Overpass API (Overpass, 2021), respectively. To estimate the slope for each road segment, elevation data at a 30-meter resolution from the USGS Earth Resources Observation and Science (EROS) collection were used (USGS-EROS, 2017) (for more details, see Methodology of Chapter 2).

For Buenos Aires and Santiago, since there are gaps of twelve and ten years between the respective survey years and the present, the bicycle networks for the corresponding year were prepared based on historical data (Dictuc, 2011; Germán, 2010; OMSV, 2020). In this study, Asuncion was excluded from the sample cities due to the small sample size of cyclists.

4.3.2 Bicycle Accessibility

For bicycle accessibility, isochrone measures were used. The number of reachable POIs within 10, 20, and 30 minutes of network travel time from survey respondents' home locations for four types of bicycle networks were computed: 1) street segments with LTS ≤ 3; 2) street segments with LTS ≤ 2; 3) street segments with LTS ≤ 2 and slope < 6%; and 4) bicycle-lane-only network. LTS for each street segment was defined by applying the LTS classification rules in Table 26 (for more details, see Methodology of Chapter 2).

All bicycle accessibility measures were standardized to make them comparable.

4.3.3 Physical Environmental Variables

The following physical environmental variables within a 500-meter radius of the survey respondents' home locations were computed: the percentage of low-stress roads (LTS 1 & 2), total kilometers of bicycle lanes, average speed limits (km/h), total kilometers of road length, and the average slope (%) of the road segments. The 500-meter radius was selected to ensure comparability with previous studies.(Higuera-Mendieta et al., 2021; Rodriguez-Valencia et al., 2019). All these procedures were conducted using Python 3.8.3.

4.3.4 Statistical Models of Bicycle Use

For each city, zero-inflated negative binomial (ZINB) regressions were conducted with the number of total, work, and nonwork bicycle trips per person as the dependent variables. These dependent variables are nonnegative integers with excess zeros and overdispersion, hence the need to use negative binomial models with excess zeros. Regressions for each of the twelve types of standardized POI accessibility were conducted, considering four types of bicycle networks with three travel time thresholds. Also, physical environment factors within a 500-meter radius of the survey respondents' home locations (the proportion of LTS 1 & 2, total km of bicycle lanes, average speed limit, total km of roads, average slope) and sociodemographic variables (gender, age, activity status, head of household, single parent, number of dependent children, educational attainment, income groups, and household size) were included as independent variables. First, how the associations between accessibility and cycling vary among different types of isochrone measures was examined. Second, the effect of accessibility was compared to the effect of other physical environment factors and sociodemographic variables on cycling. Unweighted regression models were chosen for simplicity because little difference in estimates between weighted and unweighted regression models was found.

The extent of multicollinearity was tested for all models using the variance inflation factor (VIF). The VIF corresponds to the ratio of the variance of a model with multiple variables to the variance of a model with a single variable. In all models, the variables showed a VIF less than 5; thus, significant multicollinearity was not found. For the calculation of standard errors, standard errors clustered at the household level were applied to address correlation within households.

Variables with extremely large standard errors were dropped to address complete or quasi-complete separation. In the case of cities with smaller sample sizes, more variables were dropped due to a greater probability of complete or quasi-complete separation and convergence issues. Tables 34-35 show summary statistics of the total, work, nonwork bicycle trips, and physical environment variables (for summary statistics of sociodemographic variables and isochrone measures, see Table 28-29). Regarding bicycle trips, the average number of weekday cycling trips ranges from 0.008 to 0.04 in total, from 0.007 to 0.03 for work trips, and from 0.001 to 0.01 for nonwork trips. The percentage of individuals that make more than one cycling trip ranges from 0.7% to 2.1% in total, from 0.6% to 1.6% for work trips, and from 0.1% to 0.6% for nonwork trips.

The ZINB regression is composed of two processes that separate the two types of zeros. First, a binary (logit) regression estimates excess zeros or zero inflation. In this study, excess zeros are individuals who never ride a bicycle and show only zero outcomes. Second, a negative binomial regression estimates counts of bicycle trips, including zeros. Here, those with zeros are individuals who could have taken bicycle trips but incidentally presented zeros. Through these two processes, the following can be identified: 1) factors that influence the avoidance of bicycles as a transport mode and 2) factors that are associated with the frequency of bicycle trips among those who have a chance to ride a bicycle. For this reason, it is often the case that coefficients in the first equation are of opposite signs from coefficients in the second equation. All ZINB regressions were performed using R (version 4.1.1).

Table 34. *Total, work, nonwork bicycle trips - Statistics overview*

	Bogota				Buenos Aires				Mexico City				Santiago				Sao Paulo			
Average trips per person	Mean	SD	Max	Min	Mean	SD	Max	Min	Mean	SD	Max	Min	Mean	SD	Max	Min	Mean	SD	Max	Min
Total bicycle trips	0.04	0.21	4	0	0.03	0.19	5	0	0.02	0.16	6	0	0.02	0.18	6	0	0.008	0.11	5	0
Work bicycle trips	0.03	0.17	3	0	0.02	0.15	4	0	0.01	0.12	6	0	0.02	0.13	3	0	0.007	0.10	5	0
Non-work bicycle trips	0.01	0.11	4	0	0.01	0.12	5	0	0.01	0.10	4	0	0.01	0.10	4	0	0.001	0.04	3	0

		Bogota n = 62,396		Buenos Aires n = 64,157		Mexico City n = 185,312		Santiago n = 55,264		Sao Paulo n = 81,393	
Variable	Category	n	%	n	%	n	%	n	%	n	%
Total bicycle trips	no trips	58,949	94.5%	62,559	97.5%	181,823	98.1%	54,225	98.1%	80,844	99.3%
	1 or more trips	1,299	2.1%	1,165	1.8%	3,489	1.9%	1,039	1.9%	549	0.7%
Work bicycle trips	no trips	60,063	96.3%	63,065	98.3%	182,785	98.6%	54,475	98.6%	80,922	99.4%
	1 or more trips	970	1.6%	918	1.4%	2,527	1.4%	789	1.4%	471	0.6%
Nonwork bicycle trips	no trips	61,002	97.8%	63,600	99.1%	184,246	99.4%	54,934	99.4%	81,286	99.9%
	1 or more trips	338	0.5%	274	0.4%	1,066	0.6%	330	0.6%	107	0.1%

Note: total trips do not correspond to the sum of work and nonwork trips, because some individuals make both work and nonwork trips.

Table 35. *Physical environment variables - Statistics overview*

	Bogota				Buenos Aires				Mexico City				Santiago				Sao Paulo			
Variable	Mean	SD	Max	Min	Mean	SD	Max	Min	Mean	SD	Max	Min	Mean	SD	Max	Min	Mean	SD	Max	Min
LTS 1 & 2 (%)	0.86	0.11	1.00	0.16	0.78	0.19	1.00	0.00	0.70	0.25	1.00	0.00	0.69	0.15	1.00	0.00	0.77	0.16	1.00	0.00
Bicycle lane (total km)	0.92	1.06	5.60	0.00	0.04	0.23	1.88	0.00	0.17	0.54	3.41	0.00	0.39	0.67	4.66	0.00	0.53	0.83	6.47	0.00
Speed limit (avg km/h)	31.12	2.37	52.51	13.89	42.00	3.35	62.50	30.00	45.45	7.12	80.82	21.35	46.81	3.87	74.76	20.00	40.83	2.58	120.00	26.71
Road (total km)	16.01	5.16	32.41	1.05	11.16	3.46	20.76	0.45	12.83	6.37	22.72	0.53	16.61	4.77	32.00	0.34	13.13	3.49	26.32	0.55
Slope (avg %)	5.83	3.77	24.46	1.43	3.13	1.72	11.16	0.26	6.14	4.70	28.05	1.57	3.00	1.72	23.02	0.68	8.26	2.90	22.57	1.44

Additionally, regressions with interaction terms were conducted to understand accessibility effects on cycling according to socioeconomic characteristics. I separately interacted gender, age, education, and income categories with the accessibility index, and added the interaction terms to the models as independent variables. Nevertheless, the interaction terms showed mixed results, and no consistent trends across cities were found. Therefore, only the models without interaction terms are presented in the results section.

4.4 RESULTS

4.4.1 Outcomes of the Twelve Accessibility Measures

In this study, the expected outcomes for the accessibility measures are negative estimates in zero-inflation models and positive estimates in count models. In other words, greater numbers of reachable POIs, especially via a low-stress network, are expected to be associated with higher cycling.

In zero-inflation models, I obtained mixed results (Table 36). For instance, in Buenos Aires, the estimates of accessibility measures are mostly positive. The reason for this is that in Buenos Aires, bicycle trips are mainly generated in outer areas of the city, as demonstrated by the density of bicycle trip origins (see Fig. 1). In these areas, the number of reachable POIs is scarce, as I can see in the maps of the accessibility measures (see Supplemental Fig. A1-A12). Therefore, the opposite results are obtained due to the mismatch between where cyclists live and where POIs are in this city. Some outcomes in Bogota, Mexico City, Santiago, and Sao Paulo show negative estimates as expected, while there are also some opposite results. In Bogota, Santiago, and Sao Paulo, the accessibility measures defined by the lowest stress networks, LTS ≤2 & slope<6% and bicycle-lane-only networks, show some positive estimates. In the smallest networks, catchment areas are the most limited, and thus, fewer POIs are reachable. These cases are similar to, though less extreme than, that shown in Buenos Aires, where bicycle trips are generated in areas where fewer POIs are available. In Buenos Aires, accessibility measures in the model with the bicycle-lane-only network exhibit complete or quasi-complete separation: there may be subgroups of cyclists, all of whom have no access to the bicycle network. Because in Buenos Aires, bicycle lanes were concentrated at the city center in the survey year (2010), cyclists, who are mostly residents of outer areas, did not have direct access to it from their homes.

Furthermore, many estimates of accessibility measures are statistically not significant, particularly count models. Also, in count models, most of the statistically significant estimates are negative, opposite to what I expected, particularly in Bogota, Buenos Aires, and Mexico City. This could be linked to the fact that most frequent bicycle users in these cities live far from the downtown area, as stated above, and thus, it is difficult to reach a significant number of POIs. On the other hand, Sao Paulo shows mixed results in count models. In Sao Paulo, the spatial mismatch is not observed, as the density of bicycle trip origins and the maps of the accessibility measures show. Thus, the outcomes might simply imply that the relationship between accessibility and bicycle trips in this city is not straightforward and cannot be easily predicted.

Additionally, the drawback of the isochrone measure is that it tends to be sensitive to arbitrarily defined travel time thresholds. Within each network and travel purpose type, sometimes, the estimates of accessibility measures seem sensitive to the travel time threshold.

Table 36. *Exponentiated coefficients of accessibility measures to predict bicycle trips*

Model	Accessibility type		BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
			Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.
Count models	*LTS ≤ 3*	*10′*	0.841	0.946	1.043	1.109	1.154	1.023	1.030	0.964	0.959	0.839	1.126	0.856	1.318	1.108	1.058
		20′	0.814	0.939	1.077	1.132	1.113	0.980	1.033	1.003	0.909	0.860	1.145	0.921	1.416	1.175	0.982
		30′	0.810	0.901	1.168	1.223	1.219	1.033	1.079	0.999	0.901	0.983	1.132	1.064	1.293	1.208	0.934
	LTS ≤ 2	*10′*	0.844	0.945	1.046	0.976	1.059	0.938	1.076	1.030	0.992	0.972	1.084	0.906	1.054	0.808	1.258
		20′	0.819	0.943	1.084	0.974	0.734	0.880	1.056	1.018	0.909	0.914	1.189	0.897	1.061	0.756	0.494
		30′	0.815	0.908	1.178	0.967	0.730	0.901	1.082	1.043	0.865	0.917	1.188	1.017	1.126	0.791	0.563
	LTS ≤ 2 & slope<6%	*10′*	0.935	0.995	1.121	0.919	0.886	0.966	1.041	0.999	0.967	0.946	1.067	0.969	0.917	0.928	1.703
		20′	0.945	1.059	1.134	1.011	1.061	1.050	1.009	1.036	0.936	1.019	1.096	1.005	0.974	0.963	1.082
		30′	0.946	1.067	1.126	0.978	1.037	1.055	1.020	1.046	0.973	0.964	1.134	1.031	0.975	0.970	1.080
	Bicycle lane only	*10′*	0.962	1.124	0.947		0.014		0.981	0.995	0.866	0.976	0.966	1.085	0.875	0.855	0.936
		20′	0.993	1.154	0.975		0.0002		0.979	0.997	0.862	0.988	1.008	1.132	0.830	0.815	0.680
		30′	1.013	1.119	0.993				0.977	0.996	0.859	0.962	0.992	1.164	0.854	0.815	0.767
Zero-inflation models	*LTS ≤ 3*	*10′*	0.754	0.810	1.041	1.539	1.951	1.569	0.900	0.725	0.906	0.689	1.227	0.963	0.926	0.778	0.831
		20′	0.744	0.802	1.109	1.695	2.038	1.623	0.893	0.761	0.865	0.677	1.380	0.948	0.930	0.775	0.721
		30′	0.767	0.779	1.211	1.853	2.295	1.579	0.980	0.790	0.884	0.694	1.086	1.055	0.822	0.774	0.665
	LTS ≤ 2	*10′*	0.761	0.823	1.030	1.313	1.617	1.560	0.969	0.866	0.923	0.570	1.094	0.930	0.766	0.538	1.034
		20′	0.751	0.818	1.105	1.429	0.994	1.717	0.967	0.874	0.852	0.799	1.272	0.915	0.747	0.476	0.325
		30′	0.773	0.796	1.210	1.443	1.008	1.738	0.984	0.893	0.807	0.827	1.261	1.039	0.736	0.482	0.372
	LTS ≤ 2 & slope<6%	*10′*	0.881	0.911	1.097	1.132	1.042	1.420	1.028	0.946	0.981	0.864	1.068	0.994	0.813	0.806	1.311
		20′	0.888	1.011	1.122	1.312	1.549	1.680	0.997	1.038	0.940	0.995	1.179	0.967	0.879	0.848	1.028
		30′	0.884	1.018	1.108	1.311	1.564	1.917	1.011	1.077	0.952	0.668	1.257	0.952	0.878	0.855	1.027
	Bicycle lane only	*10′*	0.936	1.165	0.871				1.000	1.035	0.888	1.270	1.063	1.228	0.768	0.798	0.905
		20′	0.976	1.193	0.909				1.004	1.051	0.889	1.314	1.119	1.285	0.662	0.744	0.322
		30′	0.997	1.152	0.928				1.006	1.056	0.890	1.302	1.093	1.322	0.728	0.736	0.561

Notes: Exponentiated coefficients. Blue/Red highlighting = a statistically significant positive/negative estimate with at least $p < 0.1$. Nw. = nonwork.

4.4.2 Outcomes of Physical Environmental Factors

In Table 37, the estimates of the physical environment, individual, and household factors are shown. In this table, the accessibility index corresponds to an isochrone with a 10-minute threshold via a bicycle network defined by LTS≤2 and slope <6%. This is one of the twelve accessibility measures with the lowest stress for cyclists.

Zero-inflation models show that greater amounts of bicycle lanes reduce the probability of never cycling, as expected, in Bogota, Mexico City, and Santiago. The positive associations between road length and zero inflation suggest that greater road length often becomes a barrier to cycling, perhaps due to fear of traffic (Chataway et al., 2014). Overall, steeper slopes are associated with higher odds of never riding a bicycle. Nonetheless, Santiago shows the opposite, which might reflect that most bicycle users in Santiago are from northeastern hilly areas (Fig. 1). Regarding count models, there is no consistent trend across cities among physical environmental variables.

4.4.3 Outcomes of Sociodemographic Factors

In zero-inflation models, women and age ≥65 years are associated with the odds of never riding a bicycle, and these are the most consistent variables across cities. Household/family workers and unemployed individuals are more likely to never ride a bicycle to work. This is reasonable since they make fewer work-related trips. Educational attainment tends to be positively associated with the odds of never riding a bicycle. Similarly, high-income people are more likely to avoid cycling in most cities.

In count models, the number of dependent children (<15 years) is observed to be associated with higher cycling among those who have a chance of riding a bicycle. This suggests that in the child-raising period, individuals' overall number of activities increases, which is reflected in the higher frequency of cycling. Middle-income people tend to ride a bicycle less frequently than low-income people in Bogota, Mexico City, and Sao Paulo.

The fit of zero-inflation models is better than the fit of count models. It reveals that in these cities, modeling those who never cycle is easier than modeling cycling frequencies. This might be because of the overall low cycling mode shares in this region. With regard to magnitudes, individual and household factors show greater magnitudes than accessibility and physical environmental variables. The variables that show consistently greater magnitudes are women, age ≥65 years, housekeepers/family workers, and unemployed in zero-inflation models.

4.5 DISCUSSION

The effect of accessibility on cycling is difficult to estimate in this region, because of the mismatch between where cyclists reside and where opportunities are located. Most cyclists are individuals with low educational attainment and low income who live far from the city center, where the density of POIs is lower, as corroborated by earlier findings (Pritchard et al., 2019; Rosas-Satizábal et al., 2020). Santiago is an exception, because most cyclists live in wealthier neighborhoods located in the northeastern area. In this area, low-stress roads are limited, because of steeper slopes and high-speed roads that extend across the area. Thus, cyclists' access to opportunities is limited. Again, the spatial mismatch between where the opportunities are and where cyclists live is influencing the results. For this reason, accessibility measures show mostly

Table 37. *Predictors of the total, work, and nonwork bicycle trips – Zero-inflation models*

			BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
		Explanatory variables	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.
Zero-Inflation Models	Physical Env. Var.	Accessibility index	0.88	0.91	1.10	1.13	1.04	1.42	1.03	0.95	0.98	0.86	1.07	0.99	0.81	0.81	1.31
		LTS 1 & 2 (%)				1.66	2.29	1.94	0.55	0.80	0.47			3.62	0.77	0.74	1.63
		Bicycle lane (total km)	0.84	1.21	0.68				0.66	0.56	1.03	0.52	0.35	0.95	0.76	0.76	0.39
		Speed limit (avg km/h)	0.94	1.00	1.03	1.03	1.08	1.04	1.00	1.00	1.00	0.95	0.98	1.02	0.98	0.95	1.17
		Road (total km)	1.04	1.03	1.04	1.05	1.06	1.05	1.03	1.02	1.03	1.05	1.04	1.04	1.06	1.08	1.25
		Slope (avg %)	1.16	0.98	1.19	1.17	0.97	1.29	1.18	1.02	1.19	0.83	1.04	0.84	1.06	1.09	1.09
	Individual Var.	Women	3.46	7.78	1.20	3.51	0.62	0.87	4.83	5.07	1.65	6.02		6.76	5.37	10.55	7.26
		Age 18-64 yrs	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
		Age <18 yrs	0.35		1.02	0.10	0.43	1.06	0.94	0.51	3.07	0.99		3.18	1.24	1.51	1.23
		Age ≥65 yrs	10.38		3.15	4.95	12.82	0.29	1.85	1.94	0.67	2.25		2.94	9.09	8.31	7.08
		Student	1.39	0.13	0.24	2.26	5.33	1.21	0.34	0.09	0.48	1.03		0.63	1.02	0.66	2.97
		Hkpr/family worker	2.68		0.65	1.58	24.37	0.33	1.53	0.03	0.45	4.97		1.26	9.71	25.42	0.86
		Unemployed	4.67	9.28	0.96	4.57	5.00	0.74	2.46	8.83	0.68	6.91		1.87	2.44	10.02	0.15
		Head of HH	1.44	1.08	1.59	0.66	0.59	0.76	0.80	1.01	0.86	1.37	1.08	0.84	1.06	1.22	1.48
		Single parent	1.41		0.69	1.62	1.66	1.55	1.65	2.25	1.10	1.03		0.53	2.13	5.56	0.39
		Num. of children <15yrs	0.84	0.75	0.78	0.94	1.09	0.61	1.03	1.07	1.02	1.14	1.27	1.45	0.84	0.86	1.19
		Education, ≤ primary	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
		Education, secondary	1.90	2.10	1.46	1.27	0.68	1.57	1.20	1.38	0.97	0.74	0.19	0.69	1.35	1.08	3.88
		Education, ≥ college	2.28	0.35	1.79	0.68	3.65	0.81	3.15	17.83	1.06	2.99		1.34	0.90	0.54	1.33
	HH Factors	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
		Income, middle	1.07	0.91	0.72	0.76	0.52	0.90	1.45	0.76	1.23	1.37	1.47	1.45	1.21	1.20	0.23
		Income, high	1.89	1.65	2.44	0.83	0.85	0.85	2.07	0.56	2.17	1.74	2.45	1.31	1.97	1.89	0.39
		HH size	1.06	0.87	1.36	0.98	1.12	1.29	0.99	0.96	1.05	0.97	0.99	1.03	1.23	1.26	0.82
		Intercept	2.51	1.11	0.83	0.79	0.02	3.91	1.60	0.85	18.46	9.92	7.47	1.42	4.84	9.46	0.01

Notes: Exponentiated coefficients. Blue/Red highlighting = a statistically significant positive/negative estimate with at least $p < 0.1$. Nw. = nonwork.

(Continued) Table 37. *Predictors of the total, work, and nonwork bicycle trips – Count models*

			BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
		Explanatory variables	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.
Count Models	Physical Env. Var.	Accessibility index	0.93	0.99	1.12	0.92	0.89	0.97	1.04	1.00	0.97	0.95	1.07	0.97	0.92	0.93	1.70
		LTS 1 & 2 (%)	1.08	0.86	2.23	1.33	1.44	1.47	0.70	1.10	0.43	0.44	0.59		0.21	0.17	
		Bicycle lane (total km)	0.98	1.20	0.84		0.54		0.89	0.94	1.11	0.92	0.70	1.23	1.04	1.06	0.47
		Speed limit (avg km/h)	0.95	0.99	1.00	1.01	1.05	0.99	0.98	0.99	0.97	0.96	0.98	1.02	0.95	0.92	1.20
		Road (total km)	1.00	0.98	0.99	1.00	0.99	0.99	0.99	0.97	1.01	1.00	1.00	1.01	1.03	1.06	1.18
		Slope (avg %)	0.96	0.84	1.00	0.99	0.87	1.04	0.97	0.86	0.99	0.93	1.04	0.88	0.97	1.00	0.99
	Individual Var.	Women	1.18	0.95	0.74	1.85	0.35	0.85	1.52	0.87	0.91	1.16	0.23	2.71	0.88	1.92	
		Age 18-64 yrs	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
		Age <18 yrs	0.62	1.65	1.48	0.15		0.28	0.93	1.19	2.02	0.21	0.28	0.96	1.25	1.18	3.33
		Age ≥65 yrs	2.01		1.29	1.66		0.31	1.11	0.66	0.85	0.62		2.28	2.04	2.35	
		Student	1.61	0.68	0.13	0.91		1.40	0.30	0.19	0.40	1.22		1.55	0.37	0.23	1.58
		Hkpr/family worker	1.55		1.08	1.36		1.06	1.38	0.02	1.30	1.44		2.36	1.60	1.55	
		Unemployed	1.68		1.23	2.07		1.44	1.42	1.27	1.37	1.89		5.81	0.93	1.04	0.44
		Head of HH	1.16	0.85	1.46	0.64	0.74	0.69	0.86	0.98	0.94	1.32	1.15	0.96	0.93	1.04	1.44
		Single parent	1.99	0.80	1.34	1.11		0.83	1.71	1.61	1.71	1.27		1.10			
		Num. of children <15yrs	1.24	1.03	1.89	1.28	1.22	1.18	1.24	1.19	1.40	1.19	1.29	1.81	1.23	1.29	1.63
		Education, ≤ primary	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
		Education, secondary	1.70	1.72	1.58	0.84	0.54	1.18	0.80	0.67	1.09	0.49	0.27	0.36	1.00	0.70	5.30
		Education, ≥ college	1.86	0.81	1.27	0.37	1.39	0.42	1.14	2.44	0.94	1.15		0.84	0.81	0.43	2.04
	HH Factors	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
		Income, middle	0.80	0.72	0.60	0.84	0.72	0.87	0.70	0.46	0.66	0.99	1.28	0.95	0.97	0.94	0.20
		Income, high	0.97	0.70	1.69	0.82	0.87	0.81	0.87	0.37	0.90	1.21	1.62	1.61	1.56	1.32	0.45
		HH size	0.99	0.92	1.21	0.90	1.02	1.05	0.94	0.93	1.00	0.93	1.02	0.84	1.07	1.11	0.64
		Intercept	0.74	0.31	0.03	0.30	0.02	1.03	1.51	0.91	2.08	2.30	0.63	0.10	4.96	13.43	0.00
		Pseudo R2	0.08	0.08	0.08	0.06	0.07	0.09	0.11	0.11	0.06	0.07	0.06	0.06	0.10	0.13	0.08

Notes: Exponentiated coefficients. Blue/Red highlighting = a statistically significant positive/negative estimate with at least $p < 0.1$. Nw. = nonwork.

non-significant results. Furthermore, among the statistically significant results, an important amount of the opposite result was obtained, especially in the cities where the spatial mismatch was greater. In the case of Sao Paulo, spatial mismatch is visually not identified. However, count models show mixed results and many statistically non-significant outcomes. This seems to reflect the complexity of travel behavior, and bicycle trips appear not to be straightforwardly related to the levels of accessibility in this city.

In terms of other physical environmental variables, LTS 1 & 2 was mostly not statistically significant, contrary to some previous findings (Higuera-Mendieta et al., 2021; H. Wang et al., 2016; K. Wang et al., 2020). However, this is consistent with other studies, which showed that individuals tend to endure some traffic stress (Arellana et al., 2020; Fitch et al., 2016). Regarding bicycle lanes, the negative associations between the length of bicycle lanes and the odds of never riding a bicycle match those observed in previous studies (Cervero et al., 2009; Dill & Carr, 2003; Echiburú et al., 2021; Florindo et al., 2018; Gutiérrez et al., 2020; Mitra & Nash, 2019; Nelson & Allen, 1997; Nielsen & Skov-Petersen, 2018; Parkin et al., 2007; Rodriguez-Valencia et al., 2019; Wardman et al., 2007). Road length was positively associated with the odds of never riding a bicycle, which confirms some previous findings (Bautista-Hernández, 2021; Saghapour et al., 2019). A possible explanation for this could be the increasing fear of traffic due to greater road density (Chataway et al., 2014). Another reason could be that most cyclists reside in low road density areas far from city centers. The slope was positively associated with the odds of never riding a bicycle, which is consistent with the findings of previous studies (Cervero et al., 2009; Cervero & Duncan, 2003; Higuera-Mendieta et al., 2021; Nielsen & Skov-Petersen, 2018; Parkin et al., 2007; Rodriguez & Joo, 2004).

Regarding sociodemographic variables, the results showed that women, older adults, and people with higher educational attainment and high income tend to avoid cycling. A possible explanation for this can be the lack of a safe cycling environment, which is related not only to fear of traffic but also to fear of being publicly exposed, aggression, and harassment from strangers (Garrard et al., 2012). Also, gender stereotypes and women’s tendency toward risk aversion might influence this situation (Bautista-Hernández, 2021; Montoya-Robledo et al., 2020). One interesting finding was that individuals with a greater number of dependent children are more likely to cycle. Emond et al. (2009) indicated that individuals with dependent children make more bicycle trips, and our results confirm this.

This study has multiple limitations, starting from the time gap between the POI data and survey data, which may affect the accuracy of the results. For the POI data, current data were used for all cities due to the limitation of historical data. Third, the accuracy of OSM data could be another limitation. For this study, the OSM dataset was verified that highly match the official bicycle network maps, and other street characteristics were randomly checked against satellite data and street views. However, some disparities from reality might exist. To date, the OSM dataset is our best option for large-scale analysis since it offers open data and can be used completely offline. Finally, simultaneous endogeneity can be present among the dependent variable and most physical environmental factors, including accessibility. The self-selection effect could be a potential cause of bias (Chatman, 2009; Handy & Xing, 2011) even though sociodemographic and physical environmental variables were included in the models.

4.6 CONCLUSIONS

The present study was designed to determine the effect of isochrone accessibility on cycling. Overall, this study has shown that estimating the effect of accessibility measures is difficult in this region, due to the spatial mismatch between where potential opportunities are and where cyclists reside in most cities. Thus, most estimates of accessibility measures were statistically non-significant. Among the statistically significant outcomes, an important amount of the opposite result was obtained, particularly in the cities where the spatial mismatch was greater. In case the spatial mismatch is small or visually not identified, mixed results were found. This might demonstrate that the relationship between accessibility and cycling is not straightforward and difficult to predict. This study has confirmed that sociodemographic variables have far greater effects than physical environmental variables. The findings of this study indicate that although accessibility is useful for equity evaluations, the strength of the association between accessibility and cycling seems weak in this region.

5 Gender Differences in Factors Associated with Cycling in Latin American Cities

5.1 Introduction

In Latin America, women's cycling rates are much lower than those of men. Despite this difference, few studies have been published on the gender-specific effects of factors associated with cycling in Latin America. Women tend to engage more in household maintenance tasks and childcare. This is relevant because the provision of bicycle infrastructure is often centered around employment centers and activity nodes, where women are less likely to be represented. I address the gap in the literature by investigating gender differences in the environmental and sociodemographic characteristics associated with cycling in the sample cities. Specifically, I examined the factors associated with bicycle mode choice and cycling distances for each gender and identified significant differences between the outcomes for men and women.

Inclusive cycling environments will help diverse groups of people, engendering congestion relief, environmental and health benefits, and flexibility and affordability in travel. Understanding the factors that are related to women's cycling is a critical prerequisite to boosting women's representation in cycling. The purpose of this study is to identify commonalities across cities, recognize the challenges and priorities in increasing women's bicycle use, and ultimately suggest strategies to encourage cycling by women in these cities.

5.2 Literature Review

The latest research suggests that the proportion of women in cycling is an indicator of the bicycle-friendliness of a city, indicating its positive association with the overall cycling rate (Baker, 2009; Garrard, 2021; Garrard et al., 2012; Goel et al., 2021). This research shows that in high-cycling countries, bicycles are an everyday transport mode used by almost equal numbers of women and men. In low-cycling cities, women's representation in cycling is low, possibly because of the risk aversion of women (Aldred et al., 2016; Garrard et al., 2008). Women are more sensitive to vehicular traffic, the lack of dedicated bicycle lanes, aggression from motorists, and fear of assault and sexual harassment (Abasahl et al., 2018; Akar et al., 2013; Chataway et al., 2014; Garrard et al., 2012; Handy, 2011). In addition, compared to men, women make shorter cycle trips, and these trips tend to involve errands or familiar activities rather than serving as transportation to work, which is known as 'mobility of care' (Madariaga, 2013; Montoya-Robledo et al., 2020).

In Latin America, women's cycling rates are significantly low (Bautista-Hernández, 2021; Florindo et al., 2018; Gutiérrez et al., 2020; Rodriguez-Valencia et al., 2019). However, there have been a limited number of studies on gender differences in factors associated with cycling. Some scholars have identified the positive effects of well-protected bicycle lanes on cycling in North American and Australian cities, especially for women (Akar et al., 2013; Garrard et al., 2008; Heesch et al., 2012; Mitra & Nash, 2019). Similarly, the fact that a higher proportion of roads have speed limits above 60km/h decreases women's cycling rates in Toronto, but not those of men (Mitra & Nash, 2019). Accessibility measures, an indicator of the ease of access to destinations, have marginal positive effects on cycling, regardless of gender in the US (Emond et al., 2009), and positive effects on bicycle commuting for women and non-commuting for men in Toronto (Mitra & Nash, 2019).

In contrast, the evidence emerging from studies in Latin America is more nuanced. Echiburú et al. (2021) found that women were less satisfied with bicycle lanes than men in Santiago, perhaps due to crowded conditions. In Bogota, topography was a key variable negatively affecting both men and women (Higuera-Mendieta et al., 2021). The proportion of low-stress cycling roads seems to be positively associated with cycling for both genders in Bogota (Higuera-Mendieta et al., 2021).

Research results regarding the associations between personal sociodemographic characteristics and cycling are mixed. In Oregon, lower-income men and higher-income women tend to cycle more (Singleton & Goddard, 2016). In the US, the perception that 'cyclists are poor' is negatively related to cycling (Emond et al., 2009). In Bogota, 'very low' socioeconomic status is positively associated with cycling, although only for men (Higuera-Mendieta et al., 2021). Rosas-Satizábal et al. (2020), on the other hand, identified an over-representation of low-income women cyclists. Having children also has ambiguous associations. In the US, having children who need assistance traveling has positive effects on cycling for both genders (Emond et al., 2009). In Oregon, women making escort trips seldom cycle (Singleton & Goddard, 2016). In Australia, men with two or more children aged under 18 years were more likely to cycle, while the opposite was true for their women counterparts. Nonetheless, having children aged 6-12 years is associated with higher recreational cycling for both genders (Sersli et al., 2021). In contrast, assessments of cycling among older ages show fairly consistent results. Goel et al. (2022) suggested that the gender gap in cycling grows at older ages. In the US, older women cycle significantly less (Emond et al., 2009). Similarly, in Bogota, a negative association between age and bicycle commuting was found, and its effect is greater for women (Higuera-Mendieta et al., 2021). In Oregon, age is negatively associated with cycling for both genders (Singleton & Goddard, 2016).

Taken together, these studies indicate consistent gender differences in cycling, but those differences seem more context-specific and less consistent from the perspective of cycling and income, or the impact of having children for women, relative to that for men. Furthermore, in Latin America, extant studies are limited to single cities. The current study addresses these gaps by examining the gender-specific effects of the physical environment and the sociodemographic characteristics commonly associated with cycling in the sample cities.

5.3 METHODOLOGY

5.3.1 Dataset Preparation

Same as in the previous chapters, from the household travel survey data of the sample cities, I include relevant sociodemographic variables which may be associated with both gender and cycling behavior (INEGI, 2017; INE/MADES/PNUD/FMAM, 2022; METRO, 2017; PTUBA, 2010; Steer - CNC, 2019; UAH, 2012). The road network and POI for each metropolitan area were extracted from Open Street Map (OSM) using OSMnx (Boeing, 2017) and Overpass API (Overpass, 2021), respectively. To estimate the slope for each road segment, elevation data at a

30-meter resolution from the USGS Earth Resources Observation and Science (EROS) collection were used (USGS-EROS, 2017) (for more details, see Methodology of Chapter 2).

For Buenos Aires and Santiago, since there are gaps of twelve and ten years between the respective survey years and the present, the bicycle networks for the corresponding year were prepared based on historical data (Dictuc, 2011; Germán, 2010; OMSV, 2020).

5.3.2 Bicycle Accessibility

Accessibility measures were estimated using isochrones, which measure cumulative opportunities within a time threshold. I counted the number of points of interest (POIs) within 10 minutes of travel by bicycle from home, with an average speed of 15 km/h, using only roads with an LTS ≤ 2 and a slope $<6\%$. The POIs were downloaded from OSM using Overpass API (Overpass, 2021) (for more details, see Methodology of Chapter 2).

All bicycle accessibility measures were standardized to make them comparable.

5.3.3 Physical Environmental Variables

The following physical environmental variables within a 500-meter radius of the survey respondents' home locations were computed: the percentage of low-stress roads (LTS 1 & 2), total kilometers of bicycle lanes, average speed limits (km/h), total kilometers of road length, and the average slope (%) of the road segments (for more details see Methodology of Chapter 3).

5.3.4 Bicycle Mode Choice and Cycling Distance Models

I estimated two sets of regression models at the individual person level: 1) a set of logit models to examine whether a person used a bicycle (1 for bicycle and 0 for other modes) and 2) a set of ordinary least squares (OLS) models to estimate the cycling distance (km) per person. Independent variables consisted of physical environment factors, and individual, and household sociodemographic variables, as listed above. Because a household can have more than one person represented in our data, I used clustered standard errors around the household. To elucidate gender differences, I estimated regression models for men and women separately and for three trip types (total, work, and nonwork) for each city, resulting in six regression questions for each outcome in each city. Then, for each outcome, I tested the coefficients of the model for women relative to the model for men using a Chow test (Bruin, 2011). Finally, for simplicity, I did not weigh the data because I found little or no difference in coefficients among weighted and unweighted regressions. All models were estimated using R (version 4.2.1).

5.4 RESULTS

In this section, I summarize the data and interpret the results of the regression models, emphasizing coefficients with low p-values that are consistent across cities. I also highlight statistically significant differences in the estimates between men and women. Summary statistics (Table 38-41) show important differences across cities, which justifies our decision to examine each city separately. Regarding bicycle mode choice, men and women who use bicycles represent 0.4% to 8.7% and 0.1% to 2.7% of the population, respectively. The average cycling distance ranges from 0.005 to 0.061 km for men and 0.002 to 0.022 km for women.

Table 38. *Bicycle trips by gender – Statistics overview*

		Asuncion				Bogota				Buenos Aires				Mexico City				Santiago				Sao Paulo			
		Women		Men		Women		Men		Women		Men		Women		Men		Women		Men		Women		Men	
	Trip	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
T	0	3,323	99.9%	3,267	99.6%	32,248	97.3%	26,701	91.3%	32,426	98.4%	30,133	96.6%	95,099	98.9%	86,724	97.2%	29,111	99.2%	25,114	96.9%	43,235	99.8%	37,609	98.8%
	≥ 1	3	0.1%	14	0.4%	911	2.7%	2,536	8.7%	536	1.6%	1,062	3.4%	1,011	1.1%	2,478	2.8%	243	0.8%	796	3.1%	81	0.2%	468	1.2%
W	0	3,323	99.9%	3,269	99.6%	32,616	98.4%	27,447	93.9%	32,671	99.1%	30,394	97.4%	95,587	99.5%	87,198	97.8%	29,195	99.5%	25,280	97.6%	43,250	99.8%	37,672	98.9%
	≥ 1	3	0.1%	12	0.4%	543	1.6%	1,790	6.1%	291	0.9%	801	2.6%	523	0.5%	2,004	2.2%	159	0.5%	630	2.4%	66	0.2%	405	1.1%
N	0	3,325	100.0%	3,277	99.9%	32,731	98.7%	28,271	96.7%	32,696	99.2%	30,904	99.1%	95,595	99.5%	88,651	99.4%	29,245	99.6%	25,689	99.1%	43,299	100.0%	37,987	99.8%
	≥ 1	1	0.03%	4	0.1%	428	1.3%	966	3.3%	266	0.8%	291	0.9%	515	0.5%	551	0.6%	109	0.4%	221	0.9%	17	0.04%	90	0.2%

Table 39. *Cycling distance (km) by gender – Statistics overview*

	Asuncion				Bogota				Buenos Aires				Mexico City				Santiago				Sao Paulo			
	Women		Men		Women		Men		Women		Men		Women		Men		Women		Men		Women		Men	
	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD
T	0.002	0.052	0.005	0.087	0.022	0.161	0.061	0.247	0.019	0.179	0.033	0.208	0.013	0.134	0.031	0.191	0.011	0.129	0.035	0.215	0.002	0.055	0.015	0.150
W	0.001	0.042	0.004	0.068	0.014	0.114	0.048	0.209	0.009	0.101	0.027	0.182	0.006	0.081	0.024	0.159	0.006	0.084	0.026	0.169	0.002	0.051	0.012	0.129
N	0.0003	0.017	0.001	0.035	0.008	0.104	0.013	0.114	0.010	0.142	0.006	0.092	0.007	0.104	0.007	0.097	0.005	0.082	0.010	0.108	0.0004	0.020	0.003	0.060

Note: T = Total. W = Work. N = Nonwork. 0 = Zero bicycle trips. ≥1 = More than one bicycle trips.

Table 40*. Physical environment variables - Statistics overview*

	Asuncion				Bogota				Buenos Aires				Mexico City				Santiago				Sao Paulo			
	Women		Men		Women		Men		Women		Men		Women		Men		Women		Men		Women		Men	
Variable	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD
Accessibility index	40.6	78.6	39.9	79.3	83.2	195.5	83.3	196.1	153.7	218.9	151.7	216.5	9.5	35.1	9.4	35.2	34.1	67	34.3	66.2	3.1	17.3	2.9	16.4
LTS 1 & 2 (%)	0.8	0.1	0.9	0.1	0.9	0.1	0.9	0.1	0.8	0.2	0.8	0.2	0.7	0.2	0.7	0.2	0.7	0.2	0.7	0.2	0.8	0.2	0.8	0.2
Bicycle lane (total km)	0.1	0.3	0.1	0.3	0.9	1.1	0.9	1.1	0.2	0.5	0.2	0.5	0.2	0.6	0.2	0.6	0.4	0.7	0.4	0.7	0.5	0.8	0.5	0.8
Speed limit (Avg km/h)	40	3.1	39.9	3.1	31.1	2.4	31.1	2.4	42	3.2	42	3.3	45.2	6.8	45.2	6.9	46.9	3.9	46.8	3.9	40.8	2.5	40.8	2.7
Road (total km)	11	2.8	10.8	2.8	16	5.1	16	5.2	11.2	3.5	11.2	3.5	13.4	6	13.4	6	16.6	4.7	16.6	4.8	13.2	3.5	13.1	3.5
Slope (Avg %)	3.2	0.9	3.2	0.9	5.8	3.7	5.9	3.8	3.1	1.7	3.1	1.7	5.9	4.5	5.9	4.5	3	1.7	3	1.8	8.2	2.9	8.3	2.9

***Table 41**. Individual and household variables – Statistics overview*

		Asuncion				Bogota				Buenos Aires				Mexico City				Santiago				Sao Paulo			
		Women		Men		Women		Men		Women		Men		Women		Men		Women		Men		Women		Men	
	Variable	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Individual var.	Age(yrs) <18	572	17	723	22	5,207	16	5,468	19	6,475	20	6,990	22	17,210	18	18,422	21	4,569	16	4,729	18	5,734	13	6,062	16
	18-64	2,382	72	2,256	69	23,421	71	20,367	70	21,421	65	20,242	65	68,594	71	62,652	70	20,185	69	17,846	69	30,585	71	26,997	71
	≥65	372	11	302	9	4,531	14	3,402	12	5,066	15	3,963	13	10,306	11	8,128	9	4,600	16	3,335	13	6,997	16	5,018	13
	Student	999	30	1,049	32	6,909	21	6,970	24	4,671	14	4,178	13	21,667	23	22,730	25	6,822	23	6,926	27	6,540	15	6,639	17
	Employed	1,575	47	2,049	62	13,080	39	16,228	56	12,240	37	18,821	60	35,777	37	54,834	61	28,575	97	24,824	96	18,897	44	22,347	59
	Unemployed	342	10	392	12	2,541	8	2,895	10	5,841	18	6,790	22	8,693	9	6,824	8	779	3	1,086	4	12,095	28	9,073	24
	Hkpr/Fam wkr	714	21	54	2	9,279	28	1,470	5	7,472	23	267	1	26,977	28	261	0	8,435	29	83	0	5,902	14	92	0
	Head of HH	833	25	1,193	36	8,166	25	13,633	47	8,316	25	13,826	44	15,497	16	41,081	46	6,255	21	11,789	45	12,953	30	19,073	50
	Single parent	79	2.4	9	0.3	916	2.8	114	0.4	826	2.5	156	0.5	1,704	1.8	198	0.2	565	1.9	53	0.2	1,129	2.6	83	0.2
	Num. child. 0	2,490	75	2,547	78	25,088	76	23,103	79	24,060	73	23,369	75	71,992	75	69,410	78	24,151	82	21,413	83	34,347	79	30,885	81
	<15yrs 1	498	15	429	13	5,179	16	3,877	13	4,305	13	3,732	12	12,836	13	10,355	12	3,003	10	2,538	10	5,828	13	4,608	12
	2	238	7	215	7	2,381	7	1,848	6	2,977	9	2,667	9	8,130	8	6,850	8	1,739	6	1,558	6	2,477	6	2,060	5
	3 or more	100	3	90	3	511	2	409	1	1,620	5	1,427	5	3,152	3	2,587	3	461	2	401	2	664	2	524	1
	Educ. Primary	977	29	981	30	10,926	33	9,698	33	20,366	62	20,130	65	28,671	30	23,764	27	8,891	30	7,293	28	17,281	40	15,522	41
	Secondary	1,407	42	1,521	46	11,540	35	10,552	36	7,199	22	6,669	21	43,710	45	44,233	50	13,631	46	11,889	46	15,045	35	13,000	34
	Superior	942	28	779	24	10,693	32	8,987	31	5,397	16	4,396	14	23,729	25	21,205	24	6,832	23	6,728	26	10,990	25	9,555	25
HH var.	Income Low	1,897	57	1,808	55	14,823	45	12,851	44	9,474	29	8,897	29	56,285	59	52,910	59	10,370	35	7,966	31	14,906	34	12,441	33
	Middle	894	27	913	28	11,463	35	10,207	35	13,695	42	13,231	42	28,755	30	26,284	29	9,693	33	8,695	34	14,305	33	12,728	33
	High	535	16	560	17	6,873	21	6,179	21	9,793	30	9,067	29	11,070	12	10,008	11	9,291	32	9,249	36	14,105	33	12,908	34
	HH size 1	106	3	140	4	1,765	5	1,812	6	1,817	6	1,450	5	2,965	3	3,079	3	1,212	4	936	4	3,372	8	2,710	7
	2	394	12	352	11	5,424	16	4,286	15	5,905	18	5,229	17	11,746	12	10,110	11	4,514	15	3,561	14	10,899	25	8,855	23
	3	621	19	596	18	8,121	24	6,963	24	6,303	19	5,980	19	17,818	19	16,138	18	6,399	22	5,521	21	11,748	27	10,315	27
	4	847	25	806	25	8,759	26	7,933	27	7,653	23	7,541	24	25,029	26	23,950	27	7,580	26	7,044	27	10,027	23	9,333	25
	5 or more	1,358	41	1,387	42	9,090	27	8,243	28	11,284	34	10,995	35	38,552	40	35,925	40	9,649	33	8,848	34	7,270	17	6,864	18

The average accessibility index ranges from 2.9 to 151.7 for men and from 3.1 to 153.7 for women. For the regression analysis, I standardized the accessibility index. The average of the total km of bicycle lanes within 500 m of home ranges from 0.1 to 0.9 for both genders. In the case of Asuncion, I estimate regression models only for work trips because of the small sample size of nonwork bicycle trips. Variables with extremely high standard errors were dropped to avoid complete or quasi-complete separation.

5.4.1 Factors Associated with Bicycle Mode Choice

In regression models representing bicycle choice, an increase in bicycle lane distances, fewer roads, and flatter slopes are associated with a greater likelihood of cycling for both genders (Tables 42 & 43). These represent more comfortable environments for cyclists with fewer obstacles. Regarding slope, Santiago is an exception. In Santiago, slopes are positively associated with women's nonwork cycling trips, meaning that women who cycle tend to live in hillier neighborhoods. In some cases, the average speed limit is negatively associated with cycling. This trend is more apparent for women, which shows the greater effectiveness of lower speed limits for women than for men. For both genders, accessibility measures and LTS 1 & 2 do not show consistent results across cities.

In terms of sociodemographic factors, age ≥65 years, housekeeper/family worker, and unemployment are negatively associated with the choice to cycle, particularly on work trips. On nonwork trips, these variables tend to show positive effects. This is reasonable since individuals with these characteristics tend to make fewer work-related trips and tend to dedicate more of their time to nonwork activities. For men, student status is negatively associated with cycling, while for women, this variable shows mixed results. The number of dependent children exerts positive effects on bicycle mode choice for both genders.

For women, age ≥65 years and the number of dependent children show significantly stronger magnitudes and more consistent trends than they do for men. Men with lower educational attainment are more likely to choose cycling. However, for women, the effect of education shows mixed results. Income is mostly negatively associated with cycling for both genders, except in Santiago, where high-income men and women cycle more to nonwork and work destinations, respectively, than their low-income counterparts. Smaller household sizes tend to be associated with greater odds of cycling for both genders.

For men, the variables that show the greatest magnitudes are age ≥65 years, number of dependent children, bicycle lanes, and unemployment. For women, age ≥65 years, number of dependent children, bicycle lanes, and housekeepers/family workers show the greatest magnitudes. The variables that show the greatest gender differences are education, age ≥65 years, and the number of dependent children.

Table 42. *Men - Predictors of bicycle mode choice for weekday trips*

		ASUNCION			BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
	Explanatory variables	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.
Physical env. var.	Accessibility index		0.98		1.05	1.04	1.05	***0.92***	***0.94***	0.76	1.01	1.02	0.97	1.01	1.01	0.99	1.10	1.11	1.04
	LTS 1 & 2 (%)				0.89	0.64	2.52	0.88	1.10	0.36	1.30	1.37	0.95	***0.61***	***0.73***	0.26	0.34	0.28	0.60
	Bicycle lane (total km)		1.47		1.12	1.13	1.23	0.66	0.73		1.28	1.32	1.13	1.29	1.29	1.28	***1.27***	***1.28***	1.17
	Speed limit (avg km/h)		1.04		1.00	1.00	0.99	1.00	***1.02***	0.92	0.98	0.99	0.98	1.00	1.00	1.01	0.98	0.97	***1.02***
	Road (total km)		***1.05***		0.97	0.96	0.96	0.96	0.95	0.95	***0.96***	***0.96***	0.98	0.97	***0.97***	0.98	0.97	0.98	0.94
	Slope (avg %)		0.94		0.85	0.85	0.85	***0.91***	0.92	***0.88***	***0.86***	***0.86***	***0.86***	1.00	0.99	***0.98***	0.93	0.92	0.93
Individual var.	Age 18-64 yrs		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs		0.50		1.36	1.45	1.68	1.63	1.89	***0.93***	***0.73***	***0.77***	0.54	***0.20***	***0.14***	0.29	***1.54***	1.23	***3.60***
	Age ≥ 65 yrs		1.80		***0.30***	0.16	***0.74***	***0.46***	***0.22***	***3.24***	***0.72***	***0.44***	***1.81***	***0.49***	***0.31***	***1.06***	0.22	0.25	0.16
	Student		0.72		1.05	1.17	0.40	0.31	0.28	0.62	***0.59***	***0.54***	0.90	1.01	***0.85***	2.21	***0.23***	***0.22***	***0.32***
	Hkpr/fam wkr				0.41	0.07	1.59	0.67	***0.36***	3.95	0.63		3.06	0.81		***4.41***			
	Unemployed				0.40	0.16	1.39	***0.29***	***0.23***	1.24	0.57	0.28	1.68	0.50	0.05	***3.31***	***0.35***	***0.08***	2.63
	Head of HH		0.65		0.85	0.79	0.97	1.04	1.00	1.31	1.05	***0.98***	1.23	1.00	1.03	1.03	0.89	0.86	0.85
	Single parent				1.37	0.38	***4.34***	0.94	0.89	***2.08***	1.23	0.95	2.06	1.22	0.88	1.27	0.53		3.09
	Num. of children		1.59		***1.16***	***1.05***	***1.50***	***1.20***	1.16	1.65	***1.09***	1.11	***1.03***	1.03	1.02	1.06	1.42	1.41	1.41
	Educ, ≤ primary		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, secondary		1.00		1.05	***1.11***	0.91	***0.62***	0.66	***0.24***	***0.61***	0.56	***0.85***	***0.57***	***0.58***	***0.42***	0.72	0.67	1.14
	Educ, ≥ college		0.78		0.98	1.16	0.68	***0.35***	***0.33***	0.51	***0.31***	***0.25***	***0.70***	***0.46***	***0.43***	***0.50***	***0.75***	***0.75***	***0.98***
HH var.	Income, low		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, middle		0.64		0.77	0.74	0.88	1.11	1.10	1.19	0.54	0.51	***0.66***	0.85	0.88	0.76	0.80	0.77	0.99
	Income, high		1.78		0.58	0.57	0.61	1.08	1.05	1.24	0.48	0.53	0.36	0.86	***0.75***	***1.48***	0.75	0.66	1.53
	HH size		0.83		***0.99***	0.98	***0.97***	***0.96***	0.96	0.85	0.96	0.95	0.95	0.95	0.98	0.79	0.86	0.88	***0.75***
	Intercept		0.00		0.16	0.21	0.02	0.09	***0.04***	0.48	0.46	0.42	0.06	0.17	0.17	0.06	0.38	0.69	0.01
	Pseudo R2		0.036		0.051	0.070	0.045	0.043	0.051	0.076	0.062	0.071	0.050	0.032	0.050	0.054	0.058	0.083	0.042

Notes: Exponentiated coefficients. Blue/Red highlighting = a statistically significant positive/negative estimate with at least a p < 0.1. Nw. = Nonwork. Bold italic = a statistically significantly different estimate between men and women.

Table 43. *Women - Predictors of bicycle mode choice for weekday trips*

		ASUNCION			BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
	Explanatory variables	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.
Physical env. var.	Accessibility index				1.00	1.01	0.97	***0.66***	***0.65***	0.65	1.01	1.01	1.01	1.02	1.03	0.94	1.05	1.07	0.79
	LTS 1 & 2 (%)				3.52	1.57	11.67	0.77	0.61	1.02	1.12	0.92	1.24	***0.15***	***0.08***	0.28	0.31	0.27	0.90
	Bicycle lane (total km)				1.17	1.06	1.28				1.13	1.28	0.95	1.36	1.44	1.27	***1.68***	***1.66***	1.69
	Speed limit (avg km/h)		1.21		0.99	0.97	1.00	0.96	***0.94***	0.98	0.97	0.97	0.97	0.97	0.98	0.98	0.96	0.99	***0.86***
	Road (total km)		***0.83***		0.97	0.97	0.96	0.95	0.96	0.95	***0.98***	***0.97***	0.98	0.98	***1.01***	0.95	0.92	0.92	0.92
	Slope (avg %)		1.05		0.83	0.84	0.83	***0.80***	0.82	***0.74***	***0.80***	***0.78***	***0.81***	1.06	1.02	***1.10***	0.89	0.90	0.81
Individual var.	Age 18-64 yrs		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs				1.93	1.93	0.90	1.25	2.01	***0.14***	***1.47***	***1.79***	0.72	***0.38***	***0.46***	0.47	***0.35***	0.38	***0.30***
	Age ≥ 65 yrs				***0.03***		***0.05***	***0.09***	***0.02***	***0.22***	***0.40***	***0.28***	***0.55***	***0.13***	***0.08***	***0.19***	0.16	0.33	0.19
	Student		2.37		1.24	1.53	0.73	0.49	0.30	1.13	***0.99***	***0.89***	0.92	1.43	***1.78***	2.18	***3.28***	***2.70***	***7.65***
	Hkpr/fam wkr				0.64	0.05	1.48	0.81	***0.08***	2.42	1.02	0.14	2.70	0.42		***1.35***	0.32	0.11	2.16
	Unemployed				0.38	0.13	0.86	***1.03***	***0.62***	1.98	0.76	0.17	1.99	0.11		***0.38***	***0.73***	***0.29***	3.84
	Head of HH		2.24		1.08	0.93	1.15	0.96	1.00	0.93	1.07	***1.01***	1.06	1.10	1.05	1.58	0.86	0.80	1.75
	Single parent				0.75	0.69	***0.93***	0.54	0.84	***0.36***	0.86	0.66	1.15	0.87	0.71	1.20	0.87	0.50	1.68
	Num. of children		1.98		***1.88***	***1.39***	***2.63***	***1.44***	1.09	1.85	***1.33***	1.26	***1.38***	1.22	0.95	1.35	1.15	1.23	1.10
	Educ, ≤ primary		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, secondary		2.58		0.94	***0.80***	1.30	***0.84***	0.65	***0.95***	***0.86***	0.60	***1.36***	***1.03***	***1.05***	***1.08***	1.17	1.16	1.50
	Educ, ≥ college				0.85	1.03	0.81	***1.11***	***1.34***	0.66	***0.69***	***0.48***	***1.09***	***1.35***	***1.85***	***1.32***	***3.43***	***2.74***	***8.17***
HH var.	Income, low		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, middle				0.75	0.72	0.92	1.10	1.13	0.93	0.50	0.52	***0.49***	0.73	1.32	0.53	1.10	1.30	0.77
	Income, high		2.79		0.53	0.43	0.78	0.83	0.77	0.91	0.48	0.45	0.52	0.81	***1.51***	***0.85***	0.99	1.19	0.66
	HH size		1.03		***0.88***	0.95	***0.77***	***0.87***	0.92	0.77	0.95	0.93	0.97	1.00	1.01	0.92	0.88	0.83	***1.12***
	Intercept		0.00		0.04	0.09	0.00	0.46	***0.79***	0.08	0.21	0.36	0.04	0.15	0.04	0.04	0.15	0.04	0.24
	Pseudo R2		0.106		0.084	0.105	0.124	0.062	0.091	0.130	0.066	0.108	0.089	0.075	0.082	0.068	0.089	0.101	0.103

Notes: Exponentiated coefficients. Blue/Red highlighting = a statistically significant positive/negative estimate with at least a p < 0.1. Nw. = Nonwork.
Bold italic = a statistically significantly different estimate between men and women.

5.4.2 Factors Associated with Cycling Distances

In OLS models predicting cycling distances (Tables 44 & 45), most of the variables show trends similar to those in the bicycle choice models, with several differences. Unlike logit models, the proportion of LTS 1 & 2 shows negative effects for women overall, which is unexpected (see Discussion). Income shows mixed results for women. It is apparent that the negative effect of income is less consistent for women in terms of cycling distances. For men, age <18 years is negatively associated with cycling distances, while for women, this variable shows mixed results. Housekeeper/family worker's negative effect on cycling distances is consistent for men, while for women, it is positively associated with nonwork bicycle distances. Overall, women's coefficients in the OLS models show weaker magnitudes than those of men.

Sociodemographic factors tend to show greater magnitudes than physical environment factors. For men, the variables with the greatest magnitudes are housekeeper/family worker, age <18 years, age ≥65 years, and bicycle lanes. For women, the variables with the greatest magnitudes are age ≥65 years, number of dependent children, unemployment, and slope. Finally, the variables that show significant and robust gender differences are housekeeper/family worker, age <18 years, age ≥65 years, and unemployment.

5.5 DISCUSSION

In this study, I analyzed common trends across cities regarding the gender-specific effects of the factors associated with cycling. Contrary to prior research, I found little difference in the effect of bicycle facilities on the choice of bicycling by gender. This differs from previous studies that identified its effects only for women (Akar et al., 2013; Mitra & Nash, 2019) or its null effects for both genders (Higuera-Mendieta et al., 2021). Negative associations of speed limits with cycling are more frequently found among women, which supports Mitra and Nash's (2019) study that found its effects only for women cyclists. Road density is negatively associated with cycling distances regardless of gender. According to Wang et al. (2020), this is due to Watts and Strogatz's (1998) 'small world' phenomenon. Other explanations could be cyclists' fear of motorized traffic (Chataway et al., 2014) caused by higher road density, and because most cyclists live in low-income outer neighborhoods with low density of roads, far from the city center. Since mode choice models also show the negative effects of road density, the latter explanations appear to have stronger validity.

Older people are less likely to choose cycling, and this trend is stronger among women in mode choice models. This finding is consistent with previous research (Goel et al., 2022; Higuera-Mendieta et al., 2021). In contrast, cycling distance models show that the coefficients of age ≥65 years for women show weaker magnitudes than those for men. The effect of age can be interpreted in conjunction with the overall weaker coefficients for women in the cycling distance models. Women cyclists tend to travel shorter distances than men (Table 39). Moreover, most women in this region never cycle (Table 38), indicated by the intercept differences between men and women. These might be the reasons why women's cycling distances are less affected by physical and sociodemographic factors than those of men.

Table 44. *Men - Predictors of cycling distances (km) for weekday trips*

		ASUNCION			BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
	Explanatory variables	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.
Physical env. var.	Accessibility index		0.0000		-0.0051	-0.0032	-0.0019	-0.0081	***-0.0092***	0.0012	0.0016	0.0007	0.0009	0.0022	-0.0002	0.0024	***0.0104***	***0.0096***	0.0008
	LTS 1 & 2 (%)		-0.0148		0.2586	0.2512	0.0074	-0.0896	-0.0121	-0.0775	***0.0461***	***0.0462***	-0.0002	-0.1018	-0.0232	-0.0785	***-0.0580***	***-0.0432***	-0.0148
	Bicycle lane (total km)		0.0042		0.0214	0.0200	0.0015	0.0151	0.0091	0.0061	***0.0242***	***0.0164***	0.0078	0.0321	0.0256	0.0064	0.0075	0.0069	0.0006
	Speed limit (avg km/h)		0.0006		-0.0019	-0.0017	-0.0003	-0.0020	0.0005	-0.0026	***-0.0021***	***-0.0016***	-0.0005	-0.0015	-0.0013	-0.0002	-0.0012	-0.0012	0.0000
	Road (total km)		-0.0005		-0.0093	-0.0066	-0.0027	-0.0032	-0.0019	-0.0014	***-0.0033***	***-0.0032***	-0.0002	-0.0036	-0.0033	-0.0003	-0.0015	-0.0009	-0.0006
	Slope (avg %)		-0.0046		***-0.0310***	***-0.0252***	-0.0058	***-0.0149***	***-0.0105***	-0.0044	***-0.0078***	***-0.0067***	-0.0011	-0.0026	-0.0021	-0.0005	***-0.0033***	***-0.0027***	-0.0006
Individual var.	Age 18-64 yrs		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs		-0.0189		***-0.2161***	***-0.2278***	0.0117	***-0.0646***	***-0.0300***	***-0.0347***	***-0.0522***	***-0.0451***	***-0.0071***	***-0.1722***	***-0.1315***	-0.0407	0.0024	-0.0142	0.0166
	Age ≥ 65 yrs		0.0011		***-0.2447***	***-0.2200***	-0.0248	***-0.0855***	***-0.1008***	0.0153	***-0.0494***	***-0.0518***	0.0024	***-0.1130***	***-0.1089***	-0.0041	***-0.0266***	***-0.0152***	***-0.0114***
	Student		0.0200		-0.0377	-0.0342	-0.0035	-0.0342	***-0.0588***	***0.0247***	***-0.0258***	***-0.0258***	0.0001	0.0175	-0.0177	0.0352	***-0.0447***	***-0.0293***	-0.0153
	Hkpr/fam wkr		-0.0059		***-0.2362***	***-0.2541***	0.0179	***-0.1063***	***-0.0920***	***-0.0144***	***-0.0696***	***-0.0657***	-0.0038	***-0.1035***	***-0.1220***	0.0186	***-0.0597***	***-0.0536***	***-0.0061***
	Unemployed		***-0.0165***		***-0.2187***	***-0.2461***	0.0274	-0.0370	***-0.0816***	***0.0446***	***-0.0304***	***-0.0464***	***0.0160***	-0.0686	***-0.1222***	***0.0536***	***-0.0393***	***-0.0473***	***0.0080***
	Head of HH		0.0223		-0.0128	-0.0338	0.0210	0.0238	0.0114	0.0124	0.0016	-0.0044	***0.0060***	0.0189	0.0113	0.0076	-0.0085	-0.0066	-0.0019
	Single parent		-0.0402		-0.1898	-0.1843	-0.0056	0.0347	0.0445	-0.0098	0.0265	-0.0126	0.0391	-0.0509	-0.0327	-0.0182	***-0.0761***	***-0.0661***	***-0.0100***
	Num. of children		0.0153		0.0573	0.0540	***0.0034***	0.0246	***0.0197***	0.0048	0.0096	***0.0104***	***-0.0008***	-0.0018	-0.0026	0.0008	***0.0223***	***0.0204***	0.0019
	Educ, ≤ primary		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, secondary		0.0055		0.0068	-0.0108	0.0176	***-0.0470***	***-0.0391***	***-0.0078***	***-0.0222***	***-0.0202***	***-0.0021***	***-0.0761***	***-0.0622***	-0.0139	***-0.0184***	***-0.0184***	0.0001
	Educ, ≥ college		-0.0046		-0.0746	-0.0886	0.0141	***-0.0791***	***-0.0637***	***-0.0154***	***-0.0514***	***-0.0462***	-0.0052	***-0.0918***	***-0.0846***	-0.0073	-0.0096	-0.0069	-0.0027
HH var.	Income, low		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, middle		0.0137		***-0.0952***	***-0.0821***	-0.0131	0.0042	-0.0025	0.0067	***-0.0326***	***-0.0317***	-0.0009	-0.0071	-0.0077	0.0006	***-0.0112***	-0.0082	-0.0030
	Income, high		0.0254		***-0.1702***	***-0.1556***	-0.0146	-0.0236	-0.0183	-0.0053	***-0.0223***	***-0.0180***	-0.0043	-0.0211	***-0.0319***	0.0107	***-0.0156***	***-0.0155***	-0.0001
	HH size		0.0006		-0.0031	0.0001	-0.0032	-0.0065	-0.0046	-0.0019	***-0.0033***	***-0.0031***	-0.0001	-0.0057	-0.0027	-0.0030	***-0.0081***	***-0.0054***	***-0.0027***
	Intercept		-0.0037		***0.6382***	***0.5180***	0.1202	0.4062	0.1928	0.2134	***0.2838***	***0.2402***	0.0436	0.4284	***0.3304***	0.0980	***0.2420***	***0.2008***	0.0413
	R2		0.0031		0.0118	0.0128	0.0013	0.0045	0.0056	0.0012	0.0045	0.0046	0.0008	0.0066	0.0068	0.0048	0.0048	0.0054	0.0012

Notes: Blue/Red highlighting = a statistically significant positive/negative estimate with at least a $p < 0.1$. Nw. = Nonwork.
Bold italic = a statistically significantly different estimate between men and women.

Table 45. *Women - Predictors of cycling distances (km) for weekday trips*

		ASUNCION			BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
	Explanatory variables	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.
Physical env. var.	Accessibility index		-0.0007		-0.0070	-0.0031	-0.0039	-0.0050	***-0.0030***	-0.0021	0.0001	0.0004	-0.0003	0.0003	0.0013	-0.0010	***-0.0004***	***-0.0002***	-0.0002
	LTS 1 & 2 (%)		-0.0250		0.0733	0.0836	-0.0103	-0.0325	-0.0103	-0.0223	***0.0073***	***0.0091***	-0.0018	-0.0681	-0.0345	-0.0336	***-0.0051***	***-0.0051***	0.0000
	Bicycle lane (total km)		-0.0011		0.0029	0.0042	-0.0013	0.0064	-0.0008	0.0073	***0.0048***	***0.0054***	-0.0006	0.0161	0.0127	0.0035	0.0050	0.0042	0.0008
	Speed limit (avg km/h)		-0.0001		0.0005	-0.0001	0.0006	-0.0022	-0.0011	-0.0011	***-0.0003***	***0.0001***	-0.0003	-0.0008	0.0001	-0.0009	-0.0003	-0.0001	-0.0002
	Road (total km)		-0.0003		-0.0061	-0.0036	-0.0026	-0.0028	-0.0024	-0.0004	***-0.0005***	***-0.0004***	-0.0001	-0.0023	-0.0005	-0.0018	-0.0008	-0.0007	-0.0001
	Slope (avg %)		-0.0008		***-0.0135***	***-0.0088***	-0.0047	***-0.0052***	***-0.0022***	-0.0030	***-0.0014***	***-0.0008***	-0.0006	0.0013	0.0005	0.0008	***-0.0003***	***-0.0001***	-0.0003
Individual var.	Age 18-64 yrs		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs		-0.0047		***-0.0067***	***-0.0085***	0.0018	***0.0101***	***0.0058***	***0.0043***	***0.0015***	***0.0016***	***0.0000***	***-0.0705***	***-0.0151***	-0.0554	-0.0121	-0.0120	-0.0002
	Age ≥ 65 yrs		0.0004		***-0.0447***	***-0.0323***	-0.0123	***-0.0317***	***-0.0306***	-0.0011	***-0.0055***	***-0.0054***	0.0000	***-0.0280***	***-0.0196***	-0.0084	***-0.0055***	***-0.0044***	***-0.0011***
	Student		0.0012		-0.0087	-0.0072	-0.0015	-0.0328	***-0.0332***	***0.0004***	***-0.0044***	***-0.0052***	0.0008	0.0533	0.0030	0.0503	***0.0061***	***0.0054***	0.0007
	Hkpr/fam wkr		-0.0052		***-0.0920***	***-0.0957***	0.0037	***-0.0242***	***-0.0345***	***0.0103***	***-0.0049***	***-0.0123***	0.0074	***-0.0279***	***-0.0202***	-0.0077	***-0.0074***	***-0.0082***	***0.0008***
	Unemployed		***-0.0028***		***-0.0973***	***-0.0891***	-0.0081	-0.0221	***-0.0206***	***-0.0015***	***-0.0085***	***-0.0115***	***0.0031***	-0.0260	***-0.0281***	***0.0021***	***-0.0054***	***-0.0068***	***0.0014***
	Head of HH		0.0002		0.0094	-0.0133	0.0227	-0.0015	-0.0087	0.0071	0.0003	0.0008	***-0.0005***	0.0029	-0.0043	0.0072	0.0020	0.0016	0.0004
	Single parent		-0.0079		-0.0718	-0.0384	-0.0334	-0.0320	-0.0107	-0.0213	-0.0107	-0.0035	-0.0072	-0.0199	-0.0001	-0.0198	***-0.0079***	***-0.0073***	***-0.0006***
	Num. of children		0.0046		0.0524	0.0293	***0.0232***	0.0134	***0.0015***	0.0119	0.0052	***0.0006***	***0.0046***	0.0255	-0.0028	0.0283	***0.0002***	***-0.0001***	0.0003
	Educ, ≤ primary		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, secondary		-0.0004		-0.0261	-0.0222	-0.0039	***0.0049***	***-0.0045***	***0.0094***	***0.0033***	***0.0000***	***0.0033***	***-0.0249***	***-0.0041***	-0.0208	***-0.0003***	***-0.0005***	0.0002
	Educ, ≥ college		-0.0048		-0.0495	-0.0439	-0.0057	***0.0121***	***0.0047***	***0.0074***	***0.0012***	***-0.0006***	0.0018	***-0.0111***	***0.0179***	-0.0290	0.0029	0.0009	0.0020
HH var.	Income, low		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, middle		-0.0033		***-0.0214***	***-0.0072***	-0.0142	0.0011	0.0054	-0.0043	***-0.0028***	***-0.0008***	-0.0020	0.0019	-0.0051	0.0070	***0.0006***	0.0003	0.0003
	Income, high		-0.0017		***-0.0322***	***-0.0272***	-0.0050	-0.0082	-0.0004	-0.0079	***-0.0028***	***-0.0031***	0.0003	-0.0005	***-0.0051***	0.0046	***0.0031***	***0.0038***	-0.0007
	HH size		0.0003		-0.0010	-0.0036	0.0026	-0.0039	-0.0021	-0.0018	***-0.0001***	***0.0000***	-0.0001	-0.0005	0.0011	-0.0016	***-0.0004***	***-0.0003***	***-0.0001***
	Intercept		0.0353		***0.2466***	***0.1733***	0.0733	0.2191	0.1316	0.0875	***0.0349***	***0.0146***	0.0202	0.1608	***0.0464***	0.1144	***0.0359***	***0.0263***	0.0095
	R2		0.0058		0.0045	0.0046	0.0014	0.0025	0.0028	0.0027	0.0008	0.0009	0.0011	0.0034	0.0036	0.0023	0.0012	0.0012	0.0007

Notes: Blue/Red highlighting = a statistically significant positive/negative estimate with at least a p < 0.1. Nw. = Nonwork.
Bold italic = a statistically significantly different estimate between men and women.

Differences between work and nonwork trips, as well as differences in the effect of children in the household by gender, underscore the importance of the mobility of care. Socially constructed and adopted roles of care are manifested in our results. Although the number of dependent children is positively associated with cycling for both genders, this trend is more consistent among women. This is surprising because it has been argued that child care responsibilities are one of the critical reasons why women avoid cycling in Bogota (Montoya-Robledo et al., 2020). Verification of whether this trend is observed across all modes is important. The descriptive statistics of travel data show that most trip rates of women with dependent children are considerably greater than those of women without dependent children, for all modes, particularly to nonwork destinations (Table 46-48). This trend not only reflects women's overall increase in trip rates during the child-raising period but also women's considerably lower rates of holding a driver's license and of driving a car (Table 22-23). Unlike men, for women, the difference in mode choice between women with and without dependent children is the largest in most cities.

For women, education shows mixed effects on cycling, while for men, education is negatively associated with cycling, which is partially in accord with Singleton and Goddard's (2016) study that found positive effects of education for women and differs from the findings of Emond et al. (2009) which claim positive effects for both genders. Income is negatively associated with cycling for men, while for women, income shows mixed results in cycling distance models. Earlier studies observed this gender-specific effect of income on cycling (Higuera-Mendieta et al., 2021; Singleton & Goddard, 2016). Santiago is an exception in this study, since in this city, a higher income tends to be associated with higher cycling for both genders. This trend agrees with Santiago's exception in slope. That is to say, cyclists tend to live in hilly neighborhoods, which differs from other cities. In Santiago, the wealthy typically live in hilly areas located in the northeastern zone, and they are also more likely to use bicycles.

Our results for accessibility and LTS were unexpected and, in some cases, contrary to existing evidence. Accessibility does not show consistent effects across cities for either gender. This does not support the previous research that showed accessibility's positive associations with cycling (Emond et al., 2009; Mitra & Nash, 2019). The reason could be a simple spatial mismatch between where cyclists live and where opportunities are (see Fig. 1 & Supplemental Fig. A1-12). Cyclists tend to live far from the city center in places where housing costs are lower, because they are mostly low-income. I found negative effects of LTS 1 & 2 on cycling distances for women, contrary to Higuera-Mendieta et al. (2021), who suggest a positive effect of low LTS on cycling. This could be because of our data limitations in calculating LTS. According to Harvey et al. (2019), the most useful variables for calculating LTS are bicycle lanes, boulevards, and street size. However, quality data concerning boulevards and street size are not available in the sample cities. Another possible explanation is that LTS methods have been developed and tested in the Global North and perhaps do not fit well in Latin America (Salvo et al., 2014).

There are important limitations to this study, beginning with the absence of detailed cycling infrastructure data. Thus, I was not able to include information on the quality of cycling networks, such as off-street bicycle lanes and intersection treatments. Second, cycling skills and preferences were not considered in this study due to data limitations, although these tend to considerably affect cycling behavior (Abasahl et al., 2018; Mitra & Nash, 2019). Third, a higher

Table 46. *Total - % difference of trip rates between persons with and without children aged <15*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Mode	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Transit	79%	11%	33%	19%	25%	40%	8%	19%	6%	5%	5%	2%
Auto	71%	72%	50%	77%	100%	102%	33%	52%	97%	98%	78%	100%
Motorcycle	124%	141%	48%	109%	83%	99%	105%	83%	9%	49%	82%	129%
Taxi	4%	-44%	2%	10%	38%	-47%	8%	-14%	33%	11%	22%	-40%
Bicycle	819%	-8%	156%	46%	257%	79%	112%	39%	35%	10%	30%	90%
Walking	27%	-21%	50%	-37%	88%	-35%	84%	-40%	50%	-37%	79%	1%

Table 47. *Work - % difference of trip rates between persons with and without children aged <15*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Mode	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Transit	83%	14%	23%	21%	-11%	40%	-9%	27%	-22%	18%	14%	14%
Auto	42%	76%	15%	52%	1%	66%	-11%	46%	14%	95%	111%	127%
Motorcycle	93%	152%	9%	95%	-31%	86%	-15%	64%	58%	62%	38%	129%
Taxi	88%	-18%	-13%	-4%	-2%	-56%	-27%	-8%	-16%	26%	50%	-22%
Bicycle	620%	37%	28%	30%	28%	84%	-11%	49%	-12%	33%	64%	121%
Walking	9%	-2%	-47%	-60%	-48%	-44%	-45%	-49%	-49%	-43%	100%	3%

Table 48. *Nonwork - % difference of trip rates between persons with and without children aged <15*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Mode	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Transit	73%	-5%	91%	5%	252%	40%	50%	-27%	47%	-37%	-20%	-44%
Auto	105%	65%	142%	156%	541%	302%	101%	69%	163%	103%	22%	24%
Motorcycle	211%	103%	528%	253%	741%	200%	306%	165%	-31%	0%	438%	131%
Taxi	-37%	-90%	40%	75%	116%	-3%	43%	-26%	56%	-3%	5%	-56%
Bicycle	-	-100%	530%	114%	833%	60%	296%	11%	121%	-37%	-56%	-17%
Walking	40%	-41%	153%	20%	434%	8%	193%	-13%	103%	-30%	6%	-7%

Note: Percentage difference = (avg. trip rate of persons with children – avg. trip rate of persons without children) / avg. trip rate of persons without children. Survey weight is applied to each individual.

cycling rate could be partially linked to individual preferences for living in a bicycle-friendly community (Chatman, 2009; Emond et al., 2009), so the associations presented may reflect this self-selection effect. Fourth, the small sample size of Asuncion is a limitation, and it prevented our ability to obtain clearer gender differences in this city. Finally, some of the coefficients may be significant by chance – I estimated 64 regression models – and this is why I focused on results that were fairly consistent across cities.

5.6 Conclusions

This study complements prior studies that focused on individual cities by providing a comparative perspective of commonalities across cities. Although many of the findings can be interpreted in light of local conditions, from historical settlement patterns to contemporary built environments and policies, our focus was to identify common findings across the cities that can arise from social and behavioral circumstances. Bicycling continues to be an uncommon mode of transportation in Latin America, but change is happening. Other research (Pardo et al., 2021) shows how trends in bicycle infrastructure investments and mode share are increasing. Understanding these gender differences is important as I consider a gendered framework to prioritize investments and evaluate policies.

Taken together, the findings of this study demonstrate that both genders are more likely to cycle when there are more bicycle lanes. To decrease the growing gender gap among older individuals, more comfortable and protected cycling networks, especially for older women, can be vital. The roles related to the presence of children must be given special consideration in cycling policies and planning, based on their higher likelihood of cycling, particularly for women traveling to nonwork destinations. The fact that most cyclists in this area are typically lower income, do not have a driver's license and do not own a motor vehicle, suggests that they are captive users. Therefore, to increase overall cycling, it is essential to improve cycling infrastructure by making it more attractive and inclusive for a diverse range of individuals.

6 OVERALL CONCLUSIONS

Cycling is a travel mode with one of the lowest mode shares in the six Latin American cities examined in this dissertation. Summary statistics show that bicycle share decreases as income level increases in most cities. Furthermore, cycling is one of the modes with the greatest gender difference in mode share and distance traveled; women cycle substantially less and shorter distances than men. For men, cycling to work is most frequent in all cities, while for women, cycling for personal and household chores is considerably higher than that for men. Regarding cycling origins, the highest densities of bicycle trip origins are clustered outside of the city center, except in Sao Paulo. Cycling origins are concentrated in lower-income areas in Buenos Aires, Bogota, and Mexico City, in high-income areas in Santiago, and across high- to low-income areas in Asuncion and Sao Paulo.

My results show that accessibility is positively associated with income and educational attainment, confirming that social inequities in bicycle accessibility are pervasive in Latin American cities. This is different from North America, where the distribution of bicycle accessibility across different income groups shows mixed results. In the sample Latin American cities, commercial centers and their surrounding areas with high bicycle accessibility tend to be home to middle- and high-income people. Low-income people tend to live far from these opportunities. The accessibility index of the middle- and high-income groups is from 1.03 to 5.36 times and from 1.08 to 6.10 times higher than that of the low-income group, respectively. In terms of educational attainment, the accessibility index of individuals with secondary education is 1.04 to 2.72 times higher, and that of individuals with college-level education is 1.12 to 4.15 times higher than that of individuals with primary education. However, bicycle-lane-only models in Asuncion and Mexico City show some exceptions. The deployment of bicycle lanes in high-density, low-income neighborhoods induced a negative association between bicycle accessibility and income level in the bicycle-lane-only models in these cities.

The spatial mismatch between where potential opportunities are and where cyclists reside makes it challenging to intervene equitably. As soon as any motorized mode becomes affordable or their incomes rise, they might quit cycling. Regarding the relationship between accessibility and the number of cycling trips, mixed results were found. Some results showed positive associations, as expected, though others showed negative associations. Particularly in the cities where the spatial mismatch was greater, such as Buenos Aires, an important amount of negative associations were found. In cases where there is a more limited spatial mismatch, for instance, in Sao Paulo, I found mixed results. Furthermore, many results showed statistically non-significant associations between accessibility and the number of cycling trips. This might demonstrate that the relationship between accessibility and cycling is not straightforward and difficult to predict. My finding differs from theory and previous studies, which have suggested that bicycle accessibility is positively associated with cycling. It underscores the importance of interpreting accessibility measures in the context of the prevailing urban spatial structure and the process that determined it. On the other hand, this study has confirmed that sociodemographic variables have far greater effects on cycling behavior than physical environmental variables, as previous literature demonstrated.

I also found that the presence of bicycle lanes is positively associated with cycling for both genders. Older people are less likely to choose cycling, and this trend is stronger among women. One unanticipated outcome was that the number of dependent children exerts positive effects on bicycle mode choice for both genders, and this trend is stronger for women. This finding differs from previous literature, which suggests that child caring might be the main reason why women avoid cycling. The possible explanations for this outcome could be higher overall trip rates of women with dependent children and women's lower rates of driver's licenses and access to motorized modes. Based on their higher likelihood of cycling, the roles related to the presence of children must be given special consideration in cycling regulations and planning. Since the majority of cyclists in this region tend to be low-income, lack a driver's license, and have limited access to a car, it is likely that they are captive users.

Several follow-up questions arise from this research. First, is whether providing safe and pleasant cycling networks can directly increase cycling or not, especially among women. Detailed data on bicycle facilities are unavailable in this region; thus, to answer this question, generating data related to the quality of bicycle lanes is needed. Second, if more street data become available, the LTS classification rules and measurement can be improved, considering more variables related to cyclists' levels of stress. Then, more precise LTS can be used to test its relationship with cycling rates. Third, is that not only the physical environment but emerging technologies might make a significant impact on modal change. The case of Santiago shows that in hilly areas, more women choose cycling. In Santiago, the use of e-bikes is popular in northeastern hilly neighborhoods, which helps to overcome topographic obstacles. Therefore, promoting the use of e-bikes might be an effective way to increase cycling in this region. Lastly, although isochrone accessibility has many benefits because of its simplicity, its effect on cycling is difficult to identify when cycling is not popular among the diversity of population and in cities with high spatial segregation. Conducting a large-scale study, selecting high-cycling cities where diverse populations use bicycles, might show a different result, which can be a measurement of a more real impact of isochrone accessibility on cycling.

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Table A1. Household travel survey data – Information and data harmonization

		Asuncion	Bogota	Buenos Aires	Mexico City	Santiago	Sao Paulo
Survey name (url)		Encuesta de Movilidad del AMA	Encuesta de Movilidad de Bogotá	Encuesta de Movilidad Domiciliaria (ENMODO)	Encuesta Origen-Destino en Hogares	Encuesta Origen Destino de Viajes	Pesquisa Origem Destino
Year		2021/2022	2019	2010	2017	2012	2017
Survey entity		Instituto Nacional de Estadística (INE)	Steer - Centro Nacional de Consultoría (CNC)	Secretaría de Transporte	Instituto Nacional de Estadística y Geografía (INEGI)	Universidad Alberto Hurtado	Companhia do Metropolitano de Sao Paulo (METRO)
Sample size*	**Pers.**	6,607 (7,316)	62,396 (66,820)	64,157 (70,321)	185,312 (200,117)	55,264 (60,054)	81,393 (86,318)
	HH	2,050 (2,061)	21,828 (21,828)	22,158 (22,170)	56,667 (56,685)	18,081 (18,264)	32,025 (32,025)
Geographic area		The City of Asuncion and 10 municipalities	Bogota DC and 18 municipalities	The City of Buenos Aires and 27 partidos	CDMX and 60 municipalities	45 comunas in the Province of Santiago and surroundings	39 municipalities in the Sao Paulo State
Trip data		1 day (both weekdays and weekends)	1 weekday and 1 weekend day	1 weekday	1 weekday and 1 weekend day	1 day (both weekdays and weekends)	1 weekday
Activity status	**Student**	'A310': Es estudiante. 'ED307': Asiste actualmente a una institución educativa	Estudia en colegio/escuela + Univ./Pregrado + Univ./Posgrado + Inst. Técnico + Inst. educ. no formal + Va a jardín	'OCUPPRI': Estudiante	Es estudiante	'Actividad': Estudia	'cd_ativi': Estudante
	Hkpr/ family worker	'A310': Se dedica a los quehaceres del hogar. 'A309': Ayudo en algún negocio familiar sin recibir pago	Dedicado al hogar + Trabajador sin remuneración	OCUPPRI': Ama de casa. 'TIPOREDE': Trabajador en el ámbito familiar sin renumeración	Se dedica a los quehaceres del hogar o a cuidar a sus hijos	'Actividad': Dueña de casa. 'Ocupacion': Familiar no remunerado	'cd_ativi': Dona de casa. 'vinc': Trabalhador familiar
	Employed	'A309': Hizo o vendió algún producto + Crió animales o cultivó algo + Ofreció algún servicio por un pago + Atendió su propio negocio + Tenía trabajo pero no trabajó por permiso, vacaciones o incapacidad temporal + Trabajo nuevo que empezó en esta semana. 'A308': Trabajó la semana pasada. 'A310': Vive de renta o alquileres	Patrón/empleador + Obrero + Jornalero/agricultor + Conductor/mensajero + Empleado de empresa particular + Empleado doméstico + Rentista + Empleado público Profesional independiente + Trabajador independiente + Vendedor informal	TIPOREND': Empleador + Changas + Otros trabajos no especializados + Comerciante sin personal + Técnico + Artesano + Trabajador especializado + Profesional independiente + Otros autónomos. 'OCUPPRI': Rentista. 'TIPOREDE': Gerencia + Alta dirección + Plan social + Obrero + Obrero calificado + Técnico + Capataz + Empleado + Empleado profesional + Jefe intermedio + Fuerzas armadas/seguridad pública + Seguridad privada + Empleada doméstica + Otros	Trabaja	'Ocupacion': Patrón o empleador + Empleado u obrero del sector público + Empleado u obrero de empresas públicas + Empleado u obrero del sector privado + FF.AA. Y del orden + Trabajador por cuenta propia + Servicio doméstico puertas adentro + Servicio doméstico puertas afuera	'vinc': Empregador + Assalariado com carteira + Assalariado sem carteira + Funcionário público + Autónomo + Profissional liberal + Dono de negócio familiar
	Un-employed	'A309': Busco trabajo. 'A310': No trabajo.	Jubilado/pensionado + Buscar trabajo + Incapacitado permanente + No ocupado	'OCUPPRI': Desocupado + No trabaja + Inactivo por discapacidad + Beneficiario de algún plan + No trabajo, pero mantiene trabajo + No tiene	Es jubilado o pensionado + Buscó trabajo + Está incapacitado permanentemente para trabajar + No trabajó	'Actividad': Jubilado + Busca trabajo por primera vez + Desempleado	'cd_ativi': Aposentado/pensionista + Sem trabalho + Nunca trabalhou

*Sample sizes after data cleaning are listed. Original sample sizes are in parentheses.

(Continued) Table A1. *Household travel survey data – Information and data harmonization*

		Asuncion	Bogota	Buenos Aires	Mexico City	Santiago	Sao Paulo
Educ.	**≤ Primary**	Sin instrucción + Nivel inicial/grado esp. y programa esp. + Educ. esp. + EEB (1o y 2o ciclo) + Educ. básica bilingüe + Educ. básica alternativa + Programa de alfabetización	Ninguno + Preescolar + Primaria incompleta + Primaria completa + Secundaria incompleta	Sin estudios + Prim. Incompleto/ EGB incompleto + Educ. no formal + Primario completo/EGB completo + Sec. Incompleto/ polimodal incompleto	Ninguno + Preescolar o kinder + Primaria + Normal básica	Ninguno o nunca estudió + Preescolar/ parvularia + Básica/ primaria + Normalista + Especial/diferencial	Não alfabetizado/fundam. I incompleto + Fundam. I completo/fundam. II incompleto + Fundam. II completo/médio incompleto
	Secondary	EEB(3o ciclo) + Educ. media + Educ. media a distancia/media alternativa/media para jóvenes y adultos + Bachillerato a distancia + Formación profesional no bachillerato de la media	Sec. completa + Media incompleta (10º y 11º) + Media completa (10º y 11º) + Técnico/ tecnológico incompleta + Univ. incompleta	Secundario completo/polimodal completo + Terciario incompleto + Universitario incompleto	Secundaria + Preparatoria o bachillerato	Media científica/humanista + Humanidades + Media técnico-profesional	Médio completo/superior Incompleto
	≥ College	Técnica superior + Formac. docente + Profes. docente + Formac. militar/policial + Universitario	Técnico/tecnológica completa + Universitario completa + Postgrado incompleto + Postgrado completo	Terciario completo + Universitario completo + Estudios de postgrado	Carrera técnica con sec. + Carrera técnica con prep. + Licenc. o profesional + Maestría o doctorado	Centro de Formación Técnica + Instituto Profesional + Universitaria	Superior completo
Income	**Low**	Continuous (2021 min. salary =2.28M Gs) ≤ 4,500,000 Gs	Categories (2019 min. salary = 828,116 COL$) 1 + 2 (≤ 1,500,000 COL$)	Quintiles (2010 min. salary = 1,500 AR$) 1 (avg: 1,320 AR$)	Socio-economic Status Bajo + Medio bajo	Continuous (2012 min. salary = 187,500 CL$) ≤ 421,948 CL$	Continuous (2017 min. salary = 937 R$) ≤ 2,600 R$
	Middle	> 4,500,000 Gs ≤ 9,000,000 Gs	3 + 4 + 5 + 6 (> 1,500,000 COL$, ≤ 4,900,000 COL$)	2 + 3 (avg: 2,590 AR$)	Medio alto	> 421,948 CL$ ≤ 781,719 CL$	> 2,600 R$ ≤ 4,800 R$
	High	> 9,000,000 Gs	7 + 8 + 9 + 10 (> 4,900,000 COL$)	4 + 5 (avg: 5,770 AR$)	Alto	> 781,719 CL$	> 4,800 R$
Work trips	**Work**	Trabajo + Tramites de trabajo	Trabajar + Asuntos de trabajo	Lugar de trabajo + Asunto laboral	Ir al trabajo	Al trabajo + Por trabajo	Trabalho indústria + Trabalho comércio + Trabalho serviços
	Study	Estudios	Estudiar	Cursar estudios + Otros estudios	Ir a estudiar	Al estudio + Por estudio	Escola/educação
Non-work trips	**Personal chores**	Tramites personales + Dejar/recoger a alguien en un centro educ. + Dejar/recoger a alguien	Buscar/dejar a alguien + Buscar/dejar algo + Trámites + Buscar trabajo + Cuidado de personas	Personal + Tramites personales + Dejar, recoger o acompañar a miembro del hogar/NO miembro del hogar a otro educ./a otro lugar	Hacer un trámite + Llevar o recoger a alguien	Buscar o dejar algo + Tramites + Buscar o dejar a alguien	Procurar emprego + Assuntos pessoais
	Shopping	Compras	Compras	Compras	Ir de compras	De compras	Compras
	Health care	Asistencia médica/dental	Recibir atención en salud	Salud	Ir al médico	De salud	Médico/dentista/saúde
	Recrea-tion /social	Actividad religiosa + Ir a comer + Visitar a alguien + Acompañar a alguien + Entretenim. y ocio + Actividad política/ sindical/comunitaria	Ver a alguien + Comer/tomar algo + Recreación y cultura + Actividades con fines religiosos + Actividad física y deporte	Gastronomía + Amigos + Familia + Social + Culto + Deportes + Recreación	Convivir (amigos o familiares), deportes o recreación + Ir a acto religioso	Visitar a alguien + Comer o Tomar algo + Recreación	Recreação/visitas/lazer + Refeição
	Other	Otros	Otros	Otro	Otro	Otros	

Fig. A1. *10-min POI accessibility via a bicycle network defined by LTS ≤ 3*

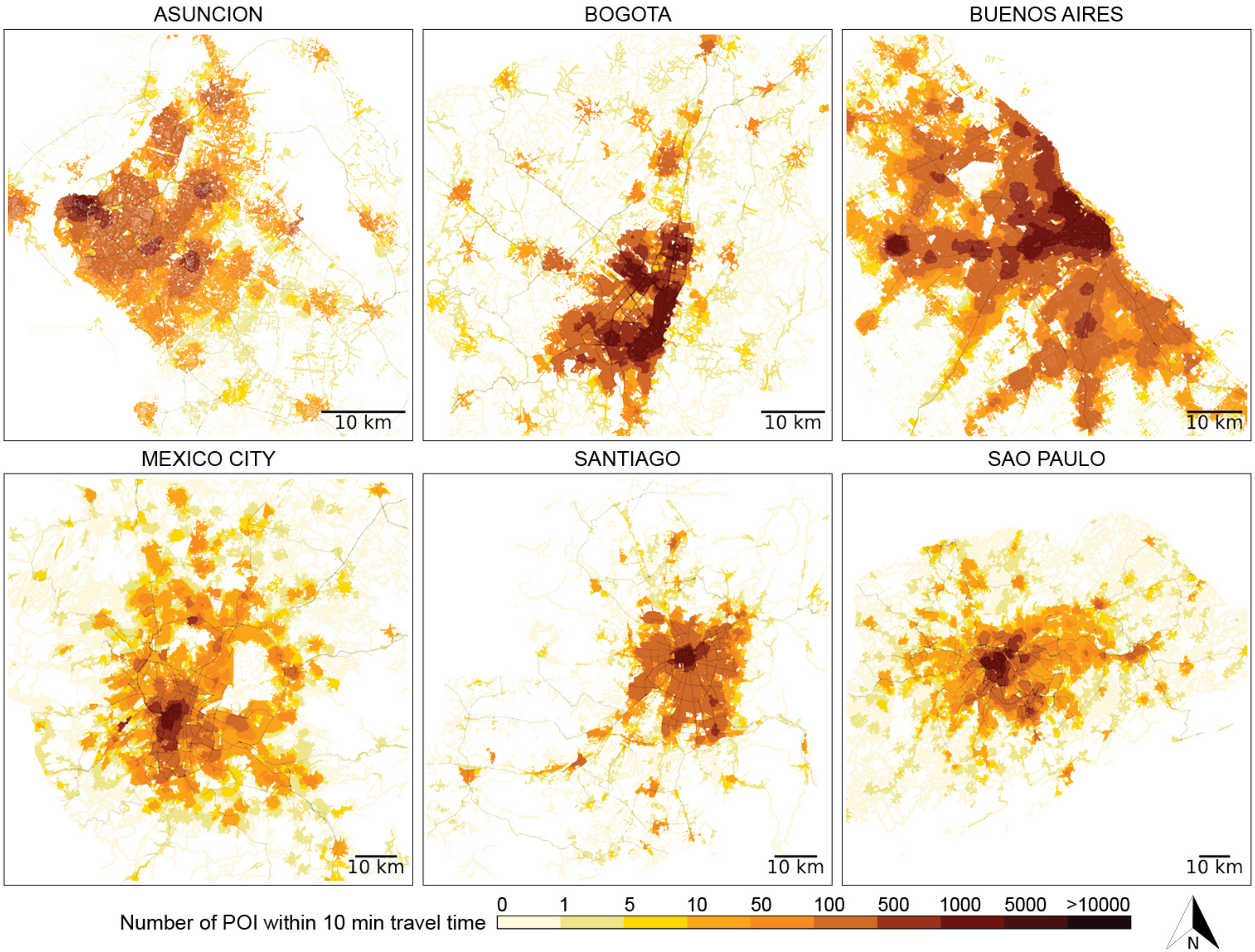

Fig. A2. *20-min POI accessibility via a bicycle network defined by LTS ≤ 3*

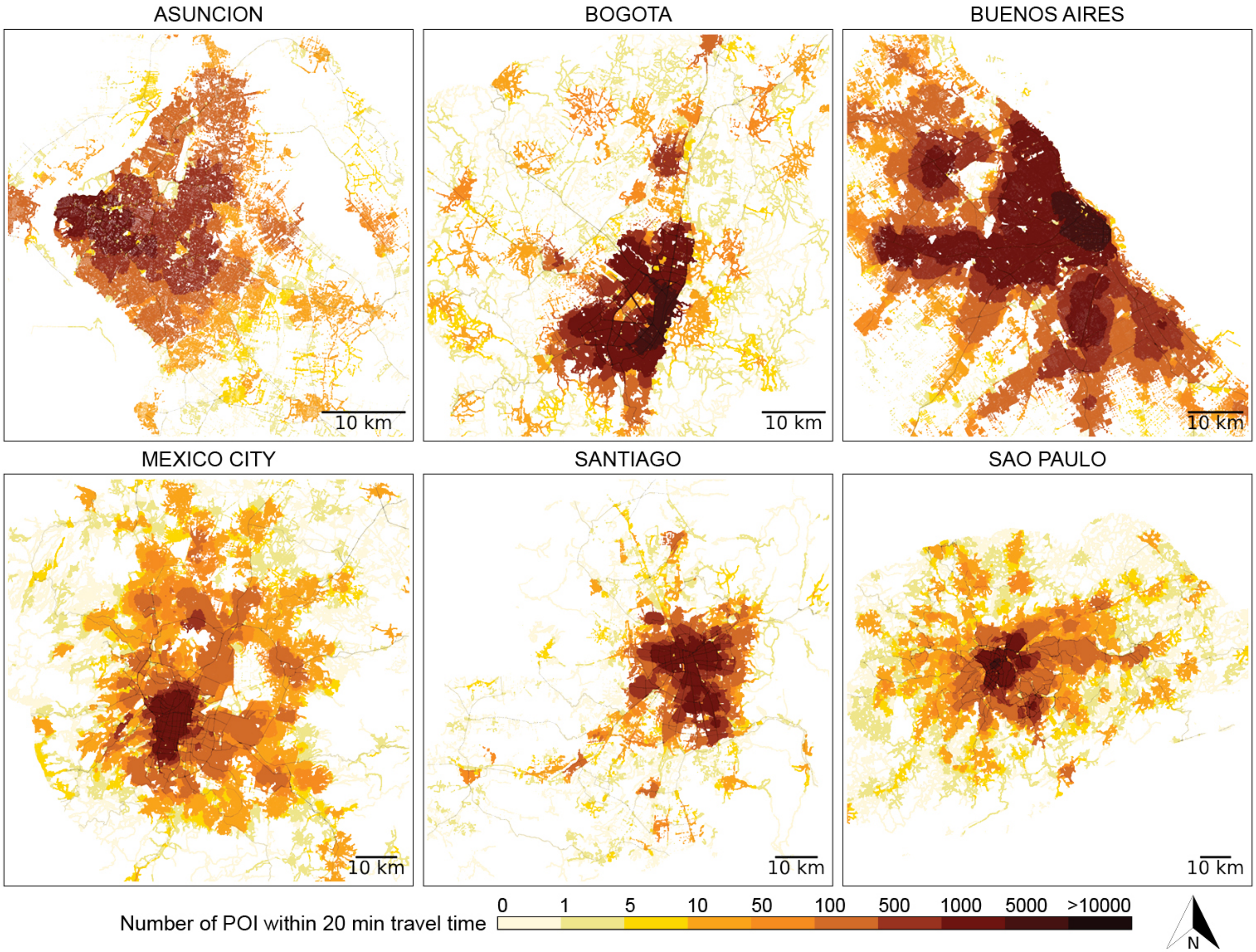

Fig. A3. *30-min POI accessibility via a bicycle network defined by LTS ≤ 3*

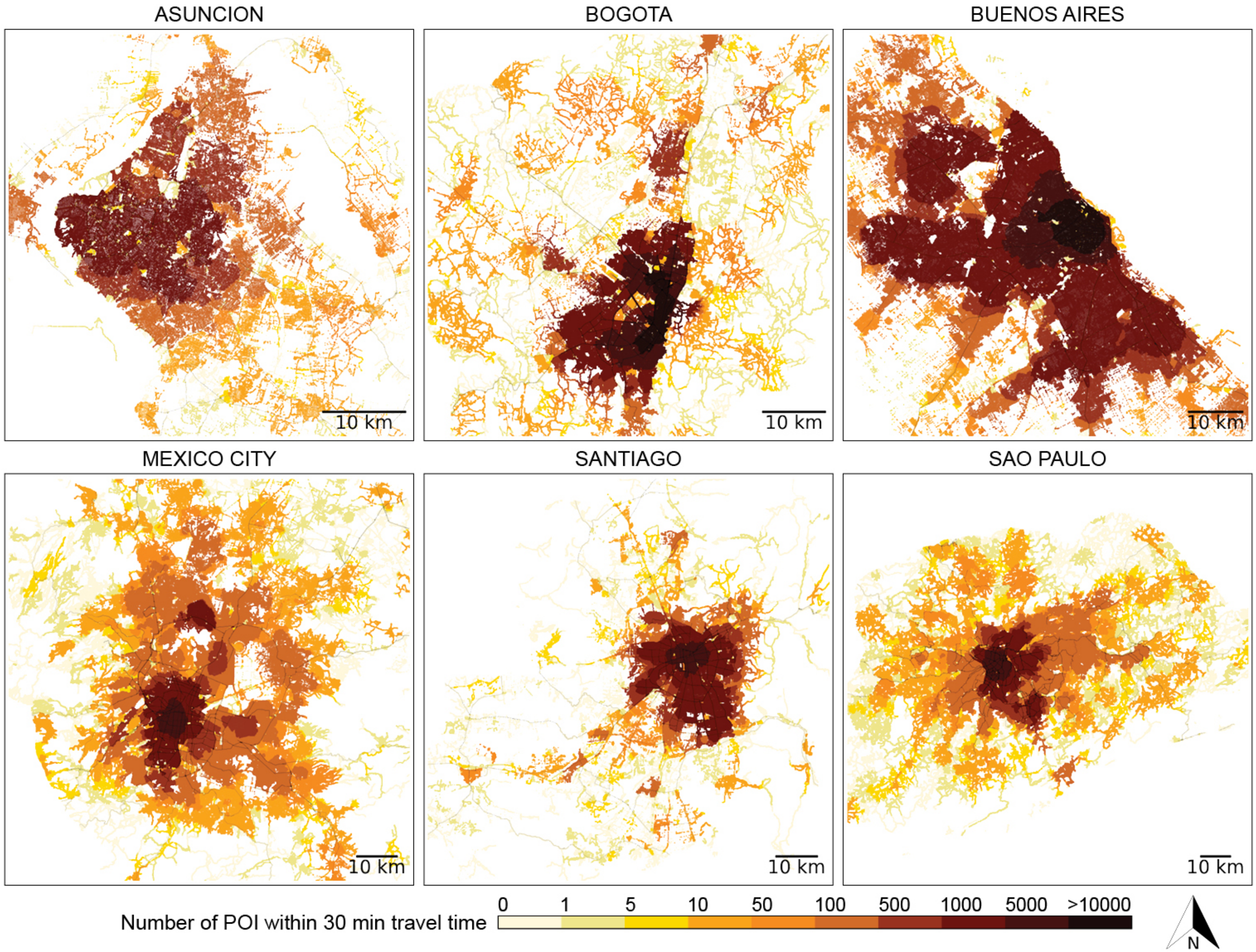

Fig. A4. *10-min POI accessibility via a bicycle network defined by LTS ≤ 2*

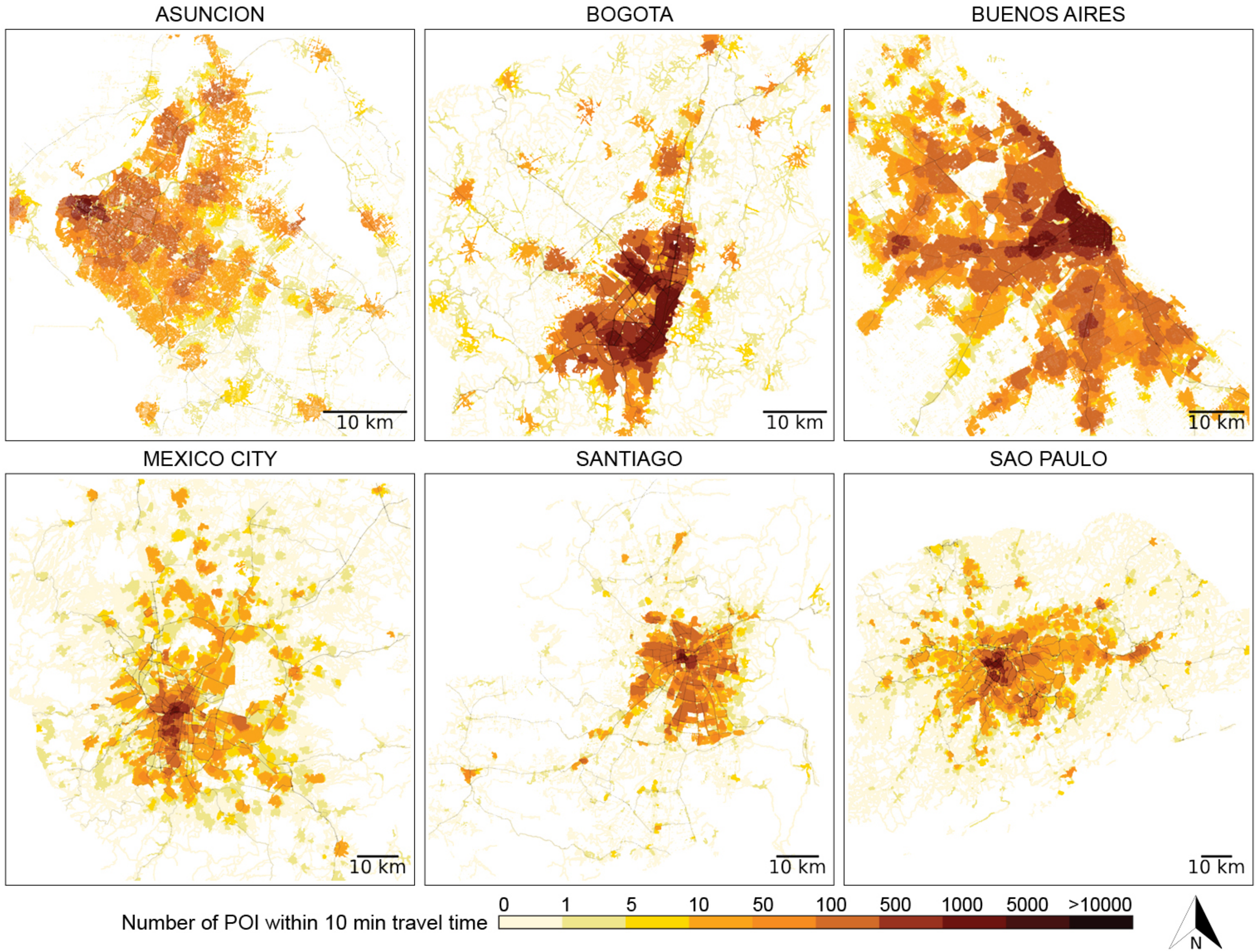

Fig. A5. *20-min POI accessibility via a bicycle network defined by LTS ≤ 2*

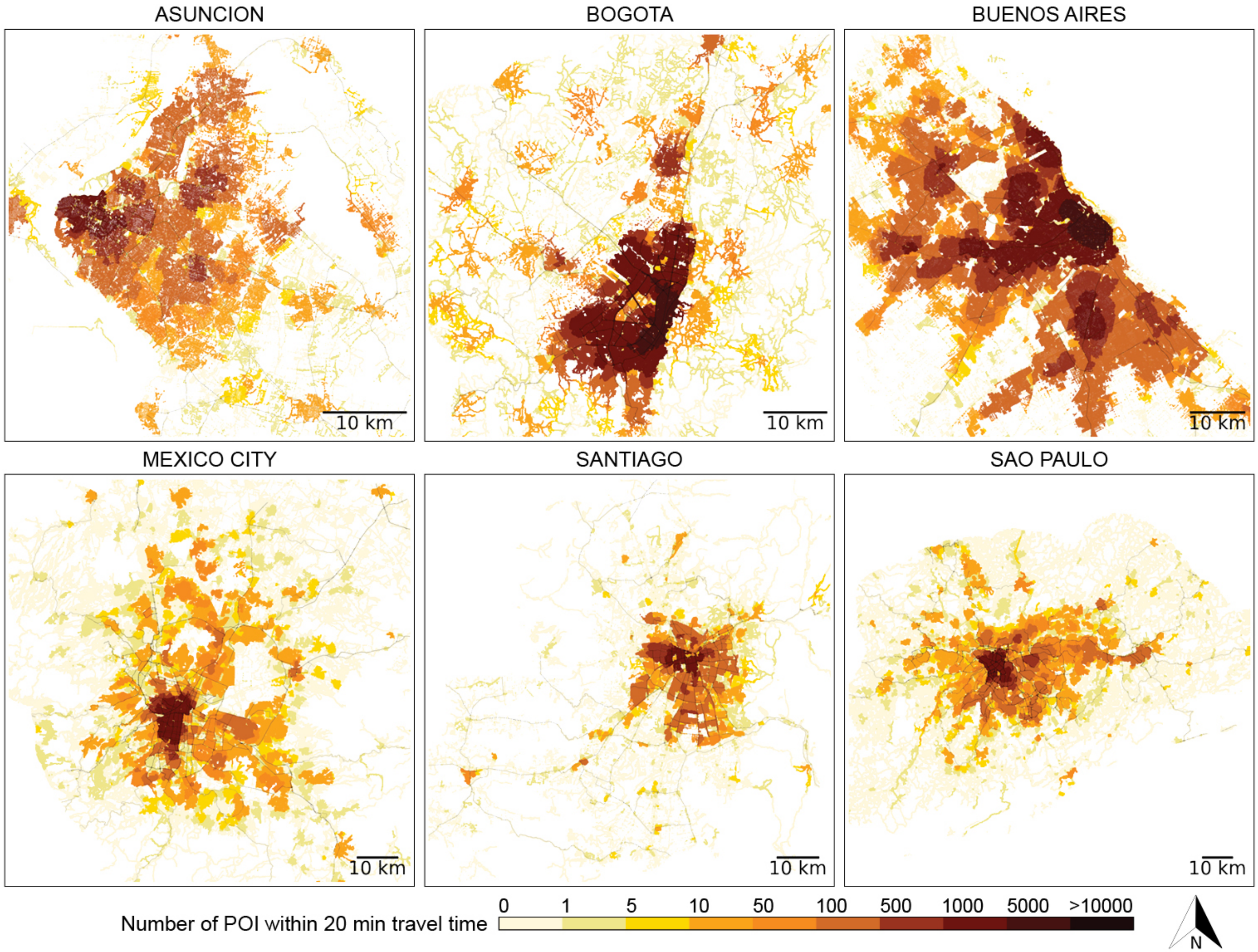

Fig. A6. *30-min POI accessibility via a bicycle network defined by LTS ≤ 2*

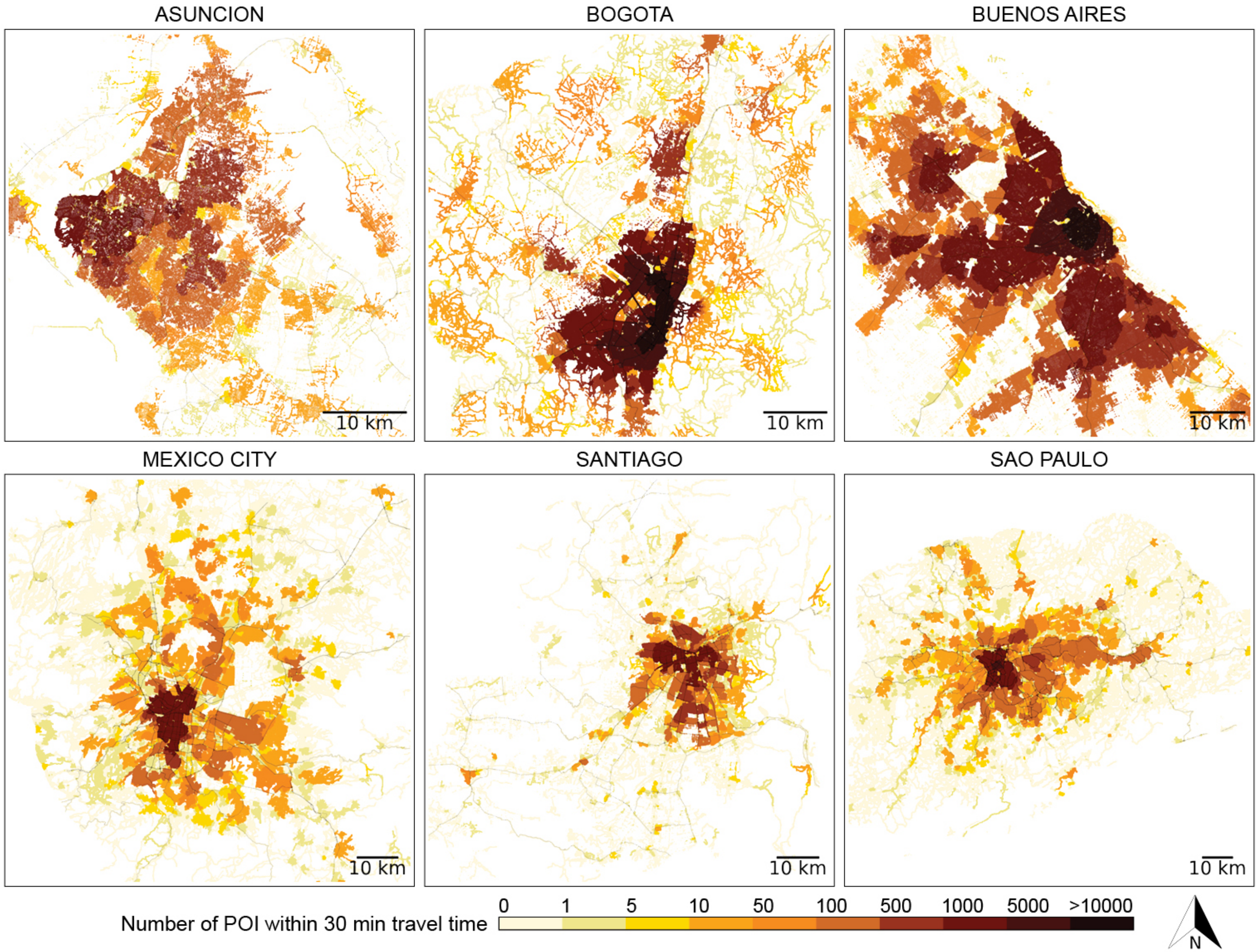

Fig. A7. *10-min POI accessibility via a bicycle network defined by LTS ≤ 2 & slope < 6%*

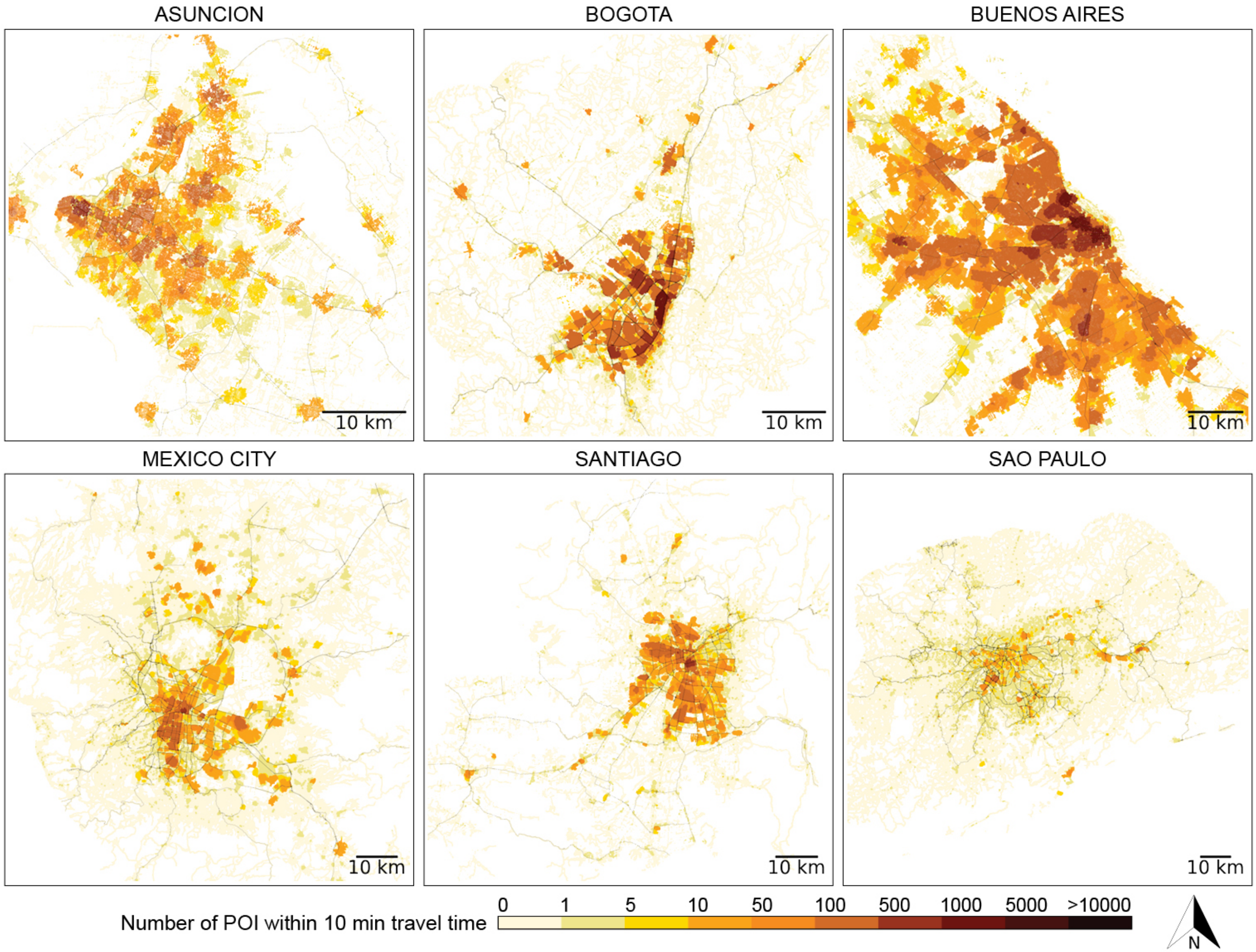

Fig. A8. *20-min POI accessibility via a bicycle network defined by LTS ≤ 2 & slope < 6%*

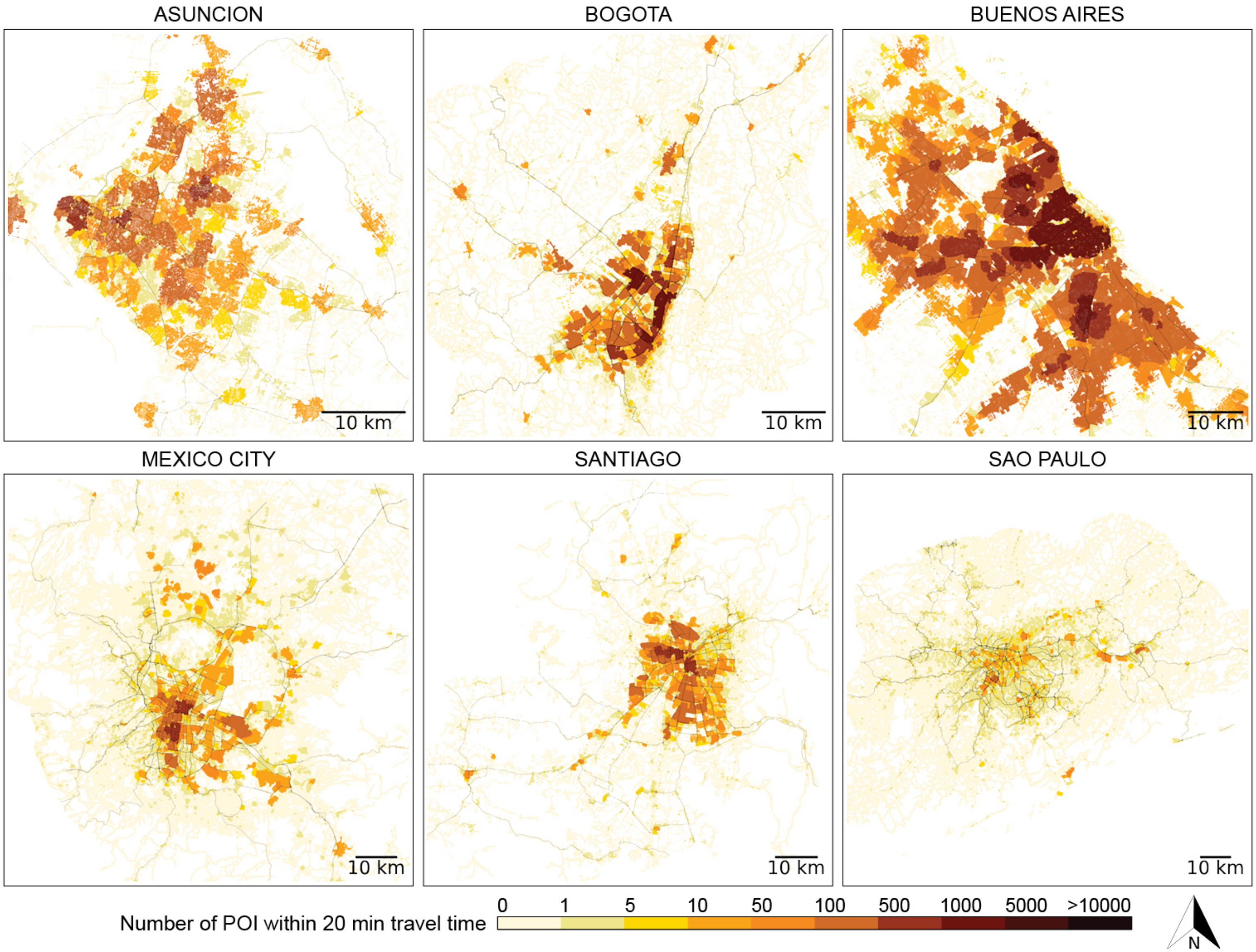

Fig. A9. *30-min POI accessibility via a bicycle network defined by LTS ≤ 2 & slope < 6%*

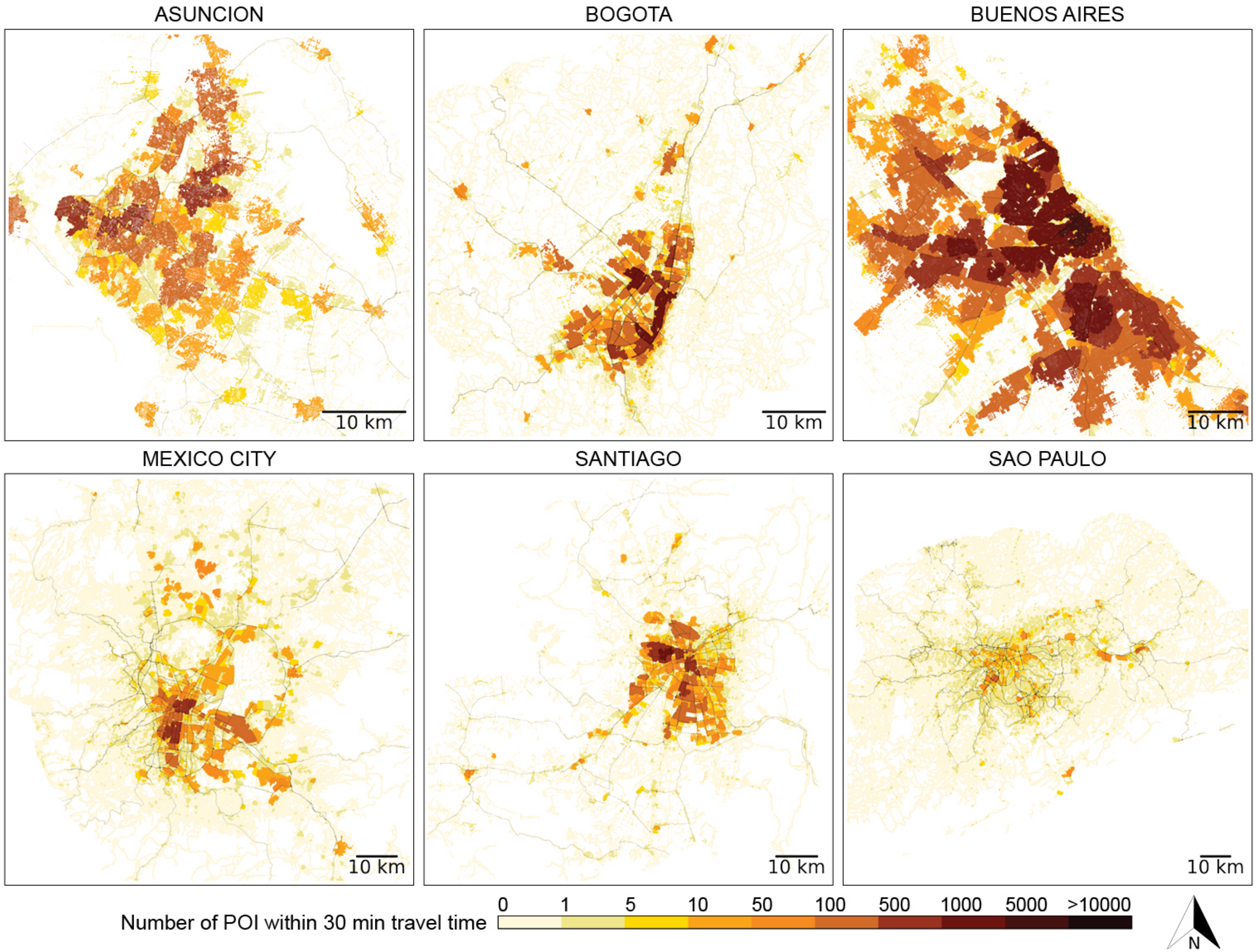

Fig. A10. *10-min POI accessibility via a bicycle-lane-only network*

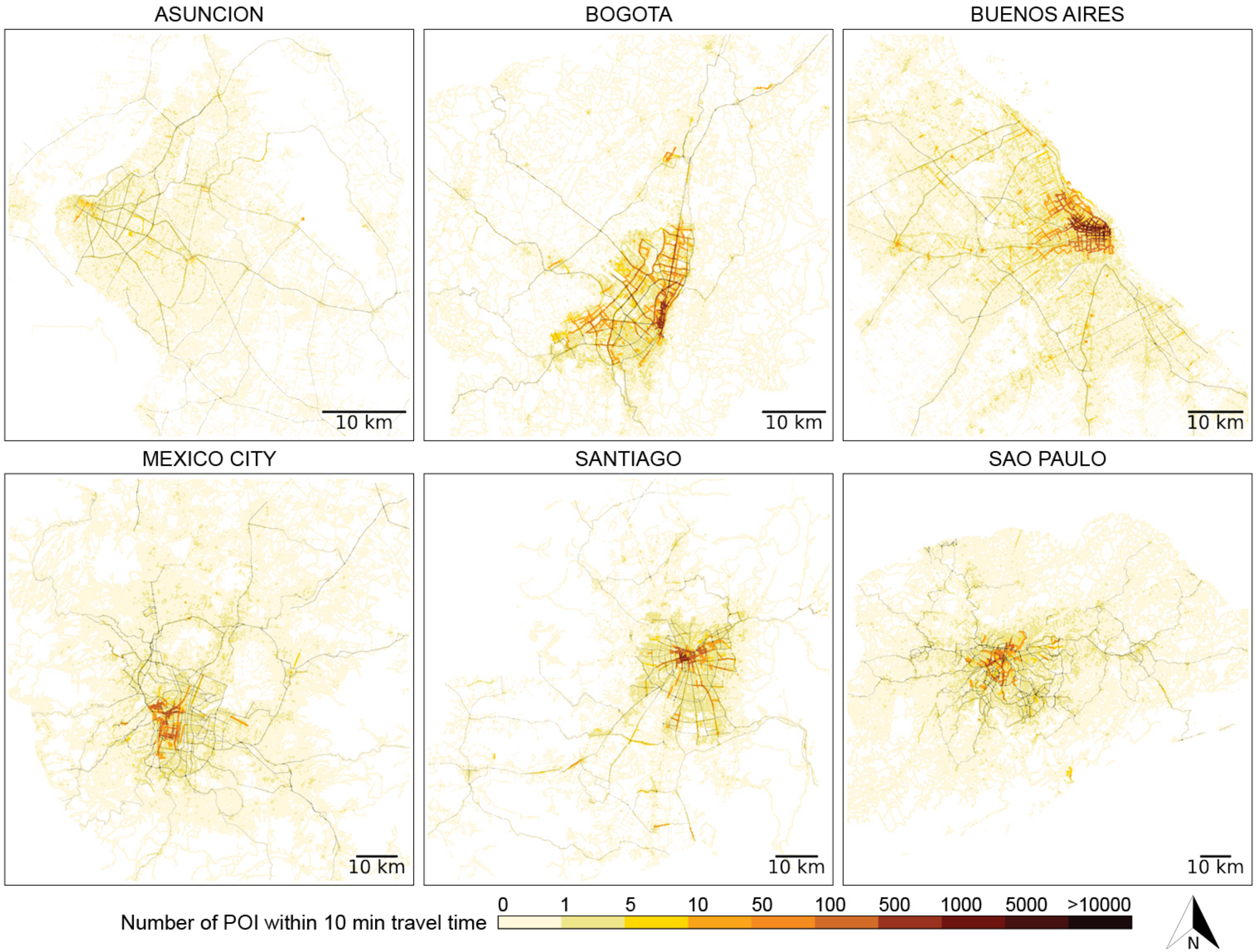

Fig. A11. *20-min POI accessibility via a bicycle-lane-only network*

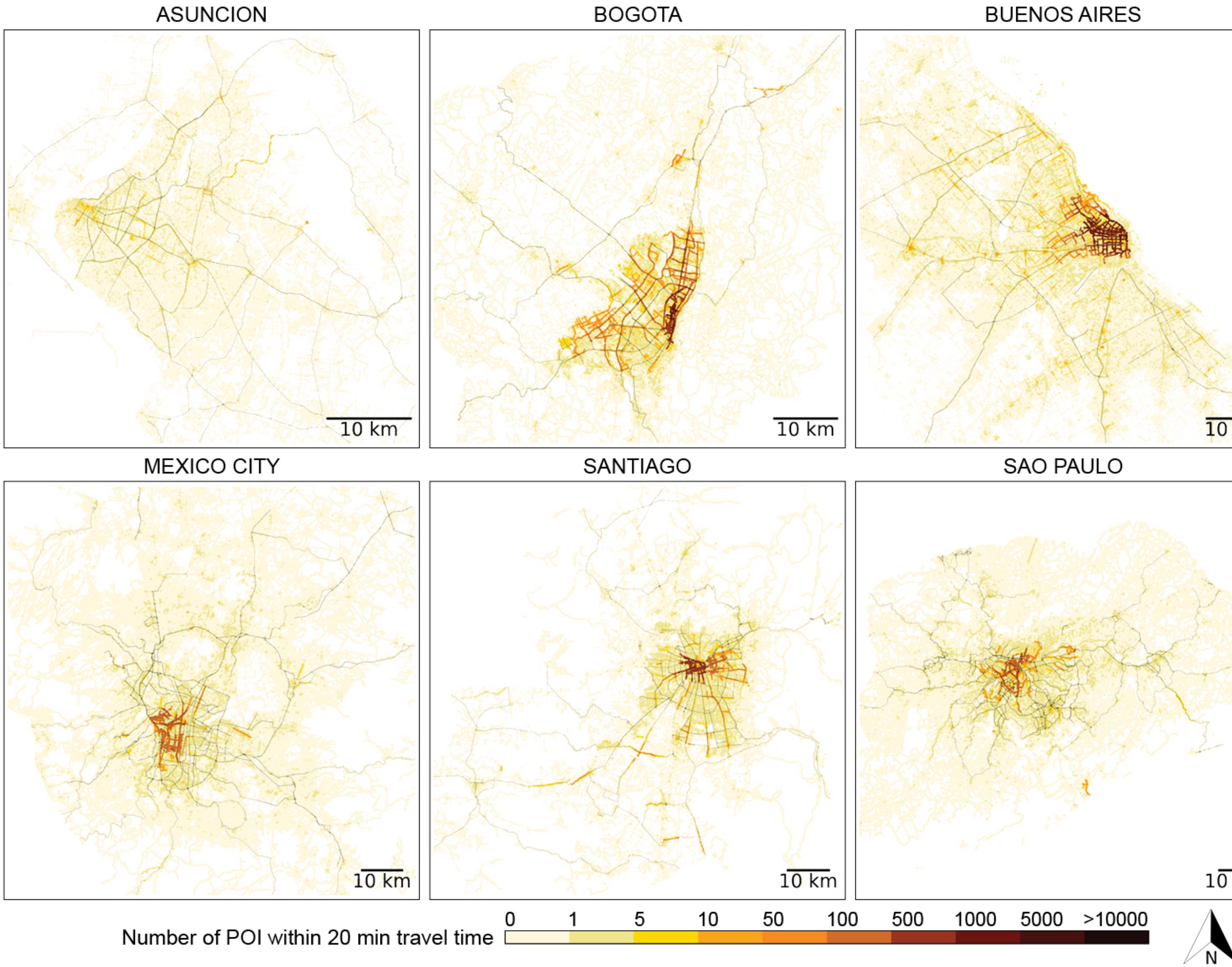

Fig. A12. *30-min POI accessibility via a bicycle-lane-only network*

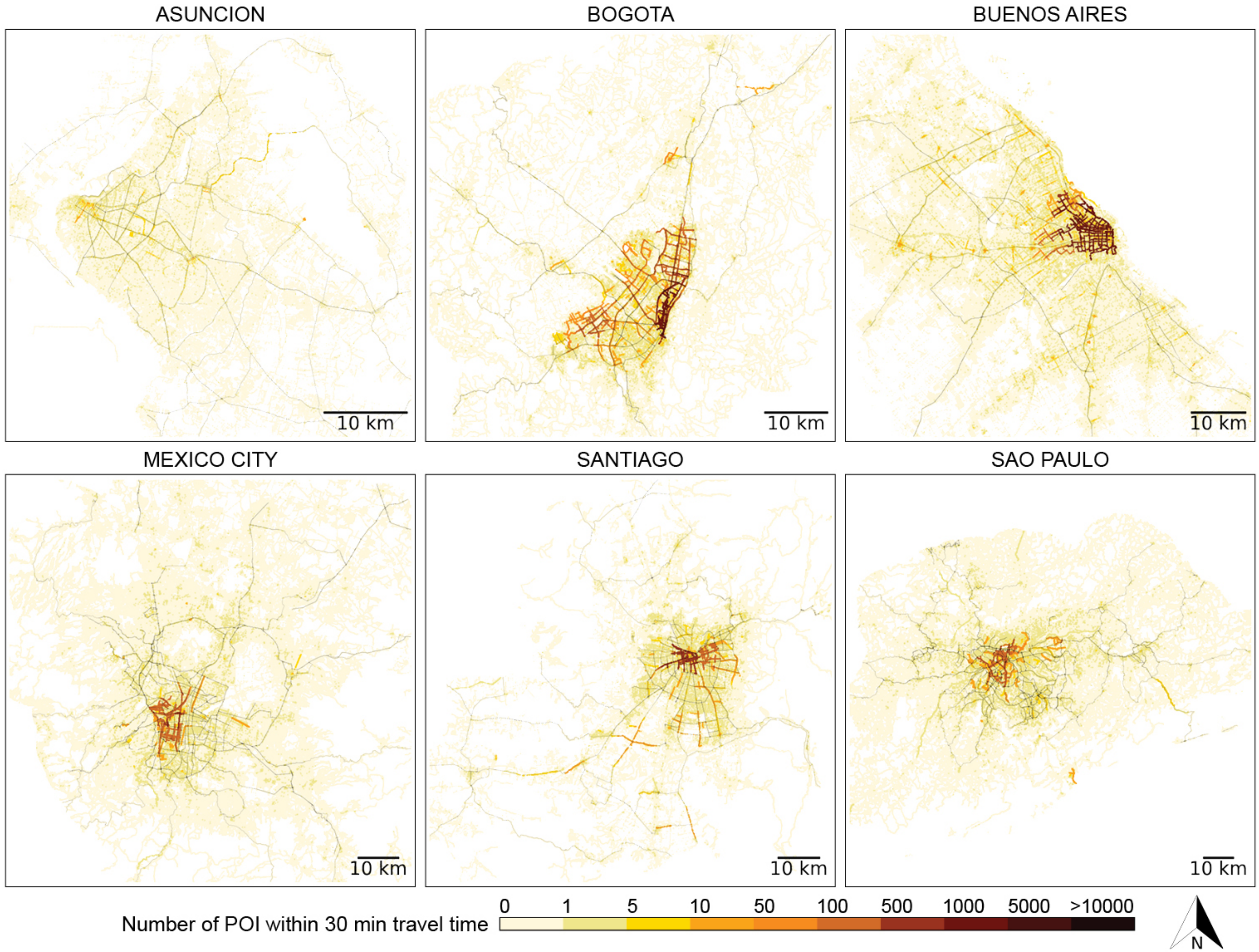

Table A2. *Asuncion - Sociodemographic predictors of POI isochrones*

y	Isochrone	LTS≤3			LTS≤2			LTS≤2 & s<6%			Bicycle-lane-only		
		10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min
Individual var.	Women	0.955	0.983	0.981	0.956	0.991	0.991	1.013	1.053	1.053	1.073	1.073	1.073
		[0.894,1.019]	[0.926,1.045]	[0.925,1.041]	[0.890,1.028]	[0.921,1.065]	[0.921,1.067]	[0.927,1.106]	[0.958,1.156]	[0.955,1.161]	[0.855,1.347]	[0.855,1.347]	[0.855,1.347]
	Age 18-64 yrs	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age <18 yrs	1.167**	1.176***	1.143**	1.188**	1.231***	1.180**	1.242**	1.318***	1.285**	0.947	0.947	0.947
		[1.022,1.331]	[1.041,1.329]	[1.017,1.285]	[1.027,1.374]	[1.063,1.426]	[1.019,1.368]	[1.038,1.486]	[1.084,1.602]	[1.051,1.571]	[0.608,1.475]	[0.608,1.475]	[0.608,1.475]
	Age ≥65 yrs	1.392***	1.344***	1.284***	1.494***	1.415***	1.332***	1.590***	1.538***	1.415***	1.599**	1.599**	1.599**
		[1.234,1.569]	[1.203,1.501]	[1.153,1.429]	[1.309,1.706]	[1.240,1.616]	[1.165,1.523]	[1.352,1.871]	[1.293,1.829]	[1.184,1.692]	[1.068,2.395]	[1.068,2.395]	[1.068,2.395]
	Student	0.923	0.927	0.941	0.944	0.918	0.944	0.991	0.932	0.925	1.142	1.142	1.142
		[0.833,1.023]	[0.843,1.020]	[0.859,1.031]	[0.843,1.058]	[0.819,1.030]	[0.842,1.059]	[0.863,1.138]	[0.801,1.085]	[0.791,1.081]	[0.819,1.593]	[0.819,1.593]	[0.819,1.593]
	Hkpr/fam	0.991	0.985	1.000	1.032	1.017	1.020	0.938	0.895	0.940	0.923	0.923	0.923
	wkr	[0.889,1.104]	[0.891,1.089]	[0.907,1.102]	[0.916,1.163]	[0.902,1.147]	[0.903,1.153]	[0.810,1.086]	[0.766,1.047]	[0.799,1.106]	[0.638,1.337]	[0.638,1.337]	[0.638,1.337]
	Unemployed	0.908*	0.967	0.980	0.913	0.991	1.017	0.948	1.010	1.055	0.686*	0.686*	0.686*
		[0.811,1.017]	[0.871,1.073]	[0.886,1.084]	[0.805,1.035]	[0.874,1.123]	[0.896,1.154]	[0.813,1.105]	[0.858,1.189]	[0.892,1.248]	[0.462,1.018]	[0.462,1.018]	[0.462,1.018]
	Educ, ≤ prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec	1.015	1.057	1.040	1.025	1.059	1.042	1.175***	1.165**	1.168**	1.281*	1.281*	1.281*
		[0.937,1.100]	[0.982,1.139]	[0.968,1.117]	[0.939,1.120]	[0.969,1.158]	[0.952,1.140]	[1.054,1.311]	[1.035,1.310]	[1.034,1.318]	[0.958,1.713]	[0.958,1.713]	[0.958,1.713]
	Educ, ≥ coll	1.385***	1.378***	1.304***	1.496***	1.467***	1.399***	1.856***	1.718***	1.687***	1.846***	1.846***	1.846***
		[1.253,1.531]	[1.256,1.512]	[1.192,1.426]	[1.340,1.671]	[1.313,1.640]	[1.251,1.566]	[1.621,2.124]	[1.484,1.990]	[1.450,1.962]	[1.318,2.586]	[1.318,2.586]	[1.318,2.586]
HH var.	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid	0.917**	0.997	1.021	0.982	1.014	1.030	1.046	1.137**	1.098*	0.551***	0.551***	0.551***
		[0.852,0.987]	[0.931,1.068]	[0.956,1.091]	[0.904,1.066]	[0.933,1.101]	[0.948,1.120]	[0.946,1.157]	[1.021,1.266]	[0.983,1.227]	[0.418,0.726]	[0.418,0.726]	[0.418,0.726]
	Income, high	1.012	1.100**	1.168***	1.088*	1.077	1.163***	1.341***	1.352***	1.304***	0.968	0.968	0.968
		[0.925,1.108]	[1.011,1.196]	[1.076,1.267]	[0.984,1.204]	[0.973,1.191]	[1.050,1.289]	[1.186,1.517]	[1.184,1.544]	[1.137,1.496]	[0.706,1.327]	[0.706,1.327]	[0.706,1.327]
	Single parent	1.362***	1.157*	1.141*	1.450***	1.252**	1.155	1.094	0.997	1.063	1.566	1.566	1.566
		[1.156,1.606]	[0.993,1.347]	[0.986,1.322]	[1.209,1.740]	[1.041,1.505]	[0.960,1.390]	[0.876,1.365]	[0.786,1.265]	[0.832,1.358]	[0.900,2.726]	[0.900,2.726]	[0.900,2.726]
	N of children	0.891***	0.914***	0.945***	0.911***	0.913***	0.936***	0.902***	0.896***	0.938**	0.892	0.892	0.892
		[0.857,0.927]	[0.881,0.949]	[0.912,0.979]	[0.871,0.952]	[0.872,0.955]	[0.894,0.980]	[0.856,0.950]	[0.848,0.946]	[0.888,0.992]	[0.771,1.030]	[0.771,1.030]	[0.771,1.030]
	HH size	1.002	1.007	1.001	0.993	1.014	1.008	0.928***	0.946***	0.952***	0.848***	0.848***	0.848***
		[0.983,1.021]	[0.988,1.025]	[0.983,1.020]	[0.971,1.015]	[0.991,1.038]	[0.985,1.033]	[0.902,0.955]	[0.918,0.975]	[0.922,0.983]	[0.787,0.913]	[0.787,0.913]	[0.787,0.913]
	lnalpha	1.637***	1.409***	1.317***	1.986***	2.032***	2.078***	2.930***	3.422***	3.668***	13.071***	13.071***	13.071***
		[1.588,1.687]	[1.367,1.453]	[1.277,1.358]	[1.925,2.048]	[1.971,2.096]	[2.016,2.143]	[2.836,3.026]	[3.316,3.531]	[3.556,3.784]	[11.52,14.82]	[11.52,14.82]	[11.52,14.82]
	Pseudo R2	0.002	0.002	0.001	0.003	0.001	0.001	0.006	0.003	0.002	0.020	0.020	0.020
	AIC	78,116	95,500	104,792	70,197	85,948	93,606	55,946	64,663	67,884	5,499	5,499	5,499

Notes: Exponentiated coefficients. Signif. codes: *** = p < 0.01 , ** = 0.01 ≤ p < 0.05, * = 0.05 ≤ p < 0.1.

Table A3. *Bogota - Sociodemographic predictors of POI isochrones*

y	Isochrone	LTS≤3			LTS≤2			LTS≤2 & s<6%			Bicycle-lane-only		
		10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min
Individual var.	Women	1.007	1.006	1.007	1.003	1.003	1.006	1.017	1.020	1.024	1.077	1.097*	1.101*
		[0.978,1.037]	[0.974,1.038]	[0.974,1.041]	[0.974,1.033]	[0.972,1.036]	[0.973,1.040]	[0.971,1.065]	[0.971,1.071]	[0.975,1.076]	[0.986,1.178]	[0.995,1.209]	[0.996,1.218]
	Age 18-64	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age <18 yrs	0.997	1.019	1.031	1.004	1.019	1.031	1.030	1.056	1.059	1.224*	1.219*	1.202
		[0.934,1.064]	[0.951,1.093]	[0.959,1.109]	[0.941,1.071]	[0.951,1.093]	[0.959,1.109]	[0.929,1.142]	[0.948,1.176]	[0.949,1.181]	[0.991,1.512]	[0.965,1.539]	[0.947,1.525]
	Age ≥65 yrs	1.220***	1.261***	1.256***	1.207***	1.253***	1.250***	1.233***	1.267***	1.295***	0.677***	0.760***	0.866*
		[1.165,1.277]	[1.201,1.325]	[1.194,1.322]	[1.153,1.264]	[1.193,1.316]	[1.187,1.315]	[1.147,1.325]	[1.175,1.366]	[1.200,1.397]	[0.589,0.779]	[0.652,0.886]	[0.741,1.013]
	Student	1.130***	1.129***	1.120***	1.120***	1.124***	1.115***	1.090*	1.084*	1.104**	0.860*	0.888	0.928
		[1.070,1.194]	[1.065,1.198]	[1.054,1.191]	[1.060,1.183]	[1.059,1.192]	[1.049,1.186]	[0.999,1.188]	[0.990,1.187]	[1.007,1.210]	[0.721,1.025]	[0.731,1.078]	[0.762,1.130]
	Hkpr/fam	0.944***	0.963	0.977	0.955**	0.966	0.979	0.962	0.949	0.937*	0.574***	0.579***	0.582***
	wkr	[0.905,0.985]	[0.920,1.008]	[0.932,1.025]	[0.915,0.996]	[0.923,1.012]	[0.933,1.026]	[0.899,1.029]	[0.885,1.019]	[0.873,1.006]	[0.504,0.654]	[0.502,0.668]	[0.503,0.673]
	Unemployed	1.032	1.046	1.046	1.032	1.045	1.046	1.081*	1.092**	1.093**	0.798***	0.846*	0.888
		[0.979,1.087]	[0.990,1.106]	[0.987,1.109]	[0.980,1.087]	[0.988,1.105]	[0.987,1.109]	[0.996,1.173]	[1.002,1.189]	[1.002,1.192]	[0.682,0.934]	[0.713,1.004]	[0.745,1.059]
	Educ, ≤ prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec	1.181***	1.190***	1.176***	1.182***	1.188***	1.174***	1.198***	1.231***	1.256***	2.051***	2.072***	2.067***
		[1.136,1.227]	[1.141,1.241]	[1.126,1.229]	[1.137,1.229]	[1.139,1.238]	[1.124,1.226]	[1.127,1.274]	[1.154,1.313]	[1.176,1.340]	[1.821,2.311]	[1.818,2.361]	[1.806,2.367]
	Educ, ≥ coll	1.426***	1.427***	1.406***	1.412***	1.410***	1.391***	1.423***	1.505***	1.593***	2.112***	2.212***	2.330***
		[1.364,1.490]	[1.361,1.497]	[1.338,1.477]	[1.351,1.475]	[1.345,1.479]	[1.323,1.461]	[1.328,1.524]	[1.400,1.618]	[1.480,1.713]	[1.858,2.402]	[1.923,2.544]	[2.018,2.692]
HH var.	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid	1.330***	1.339***	1.327***	1.331***	1.335***	1.323***	1.397***	1.451***	1.475***	1.669***	1.617***	1.682***
		[1.286,1.375]	[1.292,1.388]	[1.279,1.378]	[1.288,1.376]	[1.288,1.383]	[1.274,1.373]	[1.327,1.472]	[1.374,1.533]	[1.396,1.558]	[1.510,1.845]	[1.450,1.804]	[1.503,1.883]
	Income,	1.325***	1.338***	1.350***	1.300***	1.311***	1.329***	1.178***	1.256***	1.338***	2.299***	2.254***	2.363***
		[1.274,1.379]	[1.282,1.396]	[1.291,1.411]	[1.249,1.352]	[1.257,1.369]	[1.271,1.389]	[1.107,1.252]	[1.178,1.340]	[1.254,1.428]	[2.046,2.583]	[1.985,2.560]	[2.071,2.696]
	Single	1.010	0.967	0.959	0.992	0.962	0.957	1.050	0.986	0.980	1.779***	1.942***	1.900***
		[0.937,1.089]	[0.892,1.048]	[0.882,1.043]	[0.921,1.069]	[0.887,1.043]	[0.880,1.040]	[0.934,1.182]	[0.872,1.115]	[0.865,1.110]	[1.407,2.250]	[1.504,2.509]	[1.462,2.471]
	N of	0.887***	0.890***	0.898***	0.889***	0.891***	0.899***	0.856***	0.843***	0.831***	0.473***	0.451***	0.461***
		[0.869,0.905]	[0.871,0.910]	[0.878,0.919]	[0.872,0.908]	[0.871,0.911]	[0.878,0.920]	[0.829,0.884]	[0.816,0.872]	[0.804,0.859]	[0.443,0.506]	[0.419,0.485]	[0.428,0.497]
	HH size	0.948***	0.952***	0.955***	0.949***	0.954***	0.956***	0.980**	0.973***	0.968***	1.007	1.025*	1.024
		[0.939,0.958]	[0.942,0.963]	[0.944,0.966]	[0.940,0.959]	[0.943,0.964]	[0.945,0.967]	[0.964,0.996]	[0.957,0.989]	[0.952,0.984]	[0.981,1.034]	[0.996,1.056]	[0.994,1.055]
	lnalpha	3.137***	3.635***	3.928***	3.127***	3.655***	3.956***	7.761***	8.501***	8.659***	27.384***	33.095***	35.234***
		[3.106,3.169]	[3.600,3.670]	[3.891,3.966]	[3.096,3.158]	[3.620,3.691]	[3.918,3.994]	[7.670,7.854]	[8.402,8.601]	[8.558,8.761]	[26.74,28.04]	[32.34,33.86]	[34.43,36.05]
	Pseudo R2	0.002	0.002	0.001	0.002	0.002	0.001	0.001	0.002	0.002	0.014	0.012	0.011
	AIC	809,808	933,959	1,004,447	805,231	929,539	1,000,085	472,897	488,217	490,076	98,408	102,951	104,797

Notes: Exponentiated coefficients. Signif. codes: *** = p < 0.01 , ** = 0.01 ≤ p < 0.05, * = 0.05 ≤ p < 0.1.

Table A4. *Buenos Aires - Sociodemographic predictors of POI isochrones*

y	Isochrone	LTS≤3			LTS≤2			LTS≤2 & s<6%			Bicycle-lane-only		
		10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min
Individual var.	Women	1.014	1.010	1.010	1.019	1.015	1.013	1.014	1.009	1.008	1.081**	1.109***	1.140***
		[0.991,1.037]	[0.988,1.032]	[0.988,1.031]	[0.992,1.047]	[0.987,1.044]	[0.985,1.042]	[0.987,1.042]	[0.981,1.038]	[0.979,1.037]	[1.007,1.161]	[1.026,1.198]	[1.049,1.240]
	Age 18-64	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age <18 yrs	1.088***	1.101***	1.107***	1.116***	1.117***	1.110***	1.072***	1.071**	1.076***	0.698***	0.556***	0.571***
		[1.043,1.135]	[1.057,1.146]	[1.064,1.151]	[1.061,1.173]	[1.061,1.176]	[1.054,1.170]	[1.019,1.127]	[1.016,1.128]	[1.019,1.135]	[0.612,0.796]	[0.483,0.642]	[0.487,0.668]
	Age ≥65 yrs	1.192***	1.191***	1.179***	1.229***	1.236***	1.221***	1.187***	1.197***	1.185***	0.982	0.915	1.333***
		[1.152,1.233]	[1.152,1.230]	[1.142,1.217]	[1.181,1.280]	[1.186,1.288]	[1.171,1.274]	[1.140,1.236]	[1.147,1.248]	[1.135,1.238]	[0.886,1.089]	[0.818,1.023]	[1.175,1.512]
	Student	1.061***	1.052***	1.034*	1.077***	1.080***	1.072***	1.037	1.045*	1.043*	1.674***	1.903***	2.092***
		[1.022,1.102]	[1.014,1.091]	[0.998,1.071]	[1.030,1.127]	[1.032,1.131]	[1.023,1.123]	[0.991,1.085]	[0.997,1.095]	[0.994,1.094]	[1.493,1.878]	[1.681,2.155]	[1.825,2.398]
	Hkpr/fam	0.943***	0.956**	0.958**	0.935***	0.946**	0.955*	0.939***	0.946**	0.956*	0.605***	0.510***	0.533***
	wkr	[0.909,0.978]	[0.923,0.990]	[0.926,0.992]	[0.895,0.977]	[0.905,0.990]	[0.912,1.000]	[0.899,0.982]	[0.904,0.990]	[0.912,1.002]	[0.538,0.679]	[0.449,0.579]	[0.465,0.611]
	Unemployed	1.040*	1.038*	1.024	1.050**	1.055**	1.058**	1.034	1.050*	1.045*	1.565***	1.868***	2.180***
		[0.998,1.083]	[0.998,1.079]	[0.986,1.063]	[1.001,1.102]	[1.004,1.108]	[1.006,1.112]	[0.985,1.085]	[0.999,1.104]	[0.993,1.101]	[1.373,1.783]	[1.621,2.153]	[1.872,2.539]
	Educ, ≤ prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec	1.240***	1.252***	1.238***	1.294***	1.303***	1.290***	1.207***	1.230***	1.227***	2.015***	2.241***	2.719***
		[1.205,1.276]	[1.218,1.287]	[1.205,1.272]	[1.250,1.339]	[1.259,1.350]	[1.244,1.337]	[1.166,1.250]	[1.186,1.274]	[1.183,1.273]	[1.842,2.204]	[2.032,2.471]	[2.442,3.028]
	Educ, ≥ coll	1.777***	1.751***	1.660***	1.934***	1.938***	1.861***	1.486***	1.549***	1.553***	3.475***	4.016***	4.148***
		[1.716,1.840]	[1.693,1.811]	[1.607,1.715]	[1.856,2.016]	[1.857,2.022]	[1.782,1.944]	[1.425,1.549]	[1.483,1.617]	[1.484,1.624]	[3.129,3.860]	[3.583,4.502]	[3.658,4.704]
HH var.	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid	1.111***	1.112***	1.113***	1.122***	1.120***	1.123***	1.081***	1.080***	1.092***	2.880***	3.766***	5.369***
		[1.081,1.143]	[1.082,1.141]	[1.084,1.142]	[1.086,1.160]	[1.083,1.159]	[1.085,1.163]	[1.046,1.117]	[1.043,1.117]	[1.054,1.131]	[2.635,3.147]	[3.416,4.152]	[4.844,5.950]
	Income,	1.395***	1.392***	1.364***	1.483***	1.506***	1.493***	1.279***	1.304***	1.327***	3.746***	4.545***	6.105***
		[1.350,1.442]	[1.349,1.437]	[1.323,1.406]	[1.427,1.542]	[1.447,1.567]	[1.433,1.555]	[1.230,1.330]	[1.252,1.358]	[1.272,1.384]	[3.384,4.147]	[4.060,5.087]	[5.416,6.883]
	Single	1.012	0.977	0.992	1.003	1.001	0.997	0.985	0.968	0.973	2.199***	2.910***	2.352***
		[0.961,1.066]	[0.930,1.027]	[0.944,1.041]	[0.943,1.067]	[0.939,1.066]	[0.935,1.064]	[0.926,1.048]	[0.908,1.033]	[0.911,1.040]	[1.851,2.614]	[2.403,3.524]	[1.902,2.908]
	N of	0.999	0.990	0.984***	0.997	0.992	0.986*	0.986*	0.984*	0.976***	0.987	0.967	0.948**
		[0.986,1.011]	[0.978,1.003]	[0.972,0.996]	[0.982,1.012]	[0.976,1.007]	[0.970,1.002]	[0.972,1.002]	[0.969,1.000]	[0.960,0.992]	[0.945,1.030]	[0.922,1.015]	[0.900,0.999]
	HH size	0.960***	0.961***	0.968***	0.953***	0.952***	0.957***	0.973***	0.967***	0.971***	0.848***	0.830***	0.825***
		[0.952,0.967]	[0.954,0.968]	[0.961,0.975]	[0.945,0.962]	[0.943,0.961]	[0.948,0.967]	[0.964,0.982]	[0.958,0.976]	[0.961,0.981]	[0.827,0.870]	[0.806,0.854]	[0.798,0.853]
	lnalpha	1.890***	1.742***	1.653***	2.653***	2.799***	2.927***	2.690***	2.902***	3.085***	16.726***	19.751***	24.059***
		[1.872,1.909]	[1.725,1.759]	[1.637,1.669]	[2.626,2.679]	[2.772,2.826]	[2.899,2.955]	[2.663,2.718]	[2.873,2.931]	[3.055,3.116]	[16.35,17.10]	[19.32,20.18]	[23.55,24.57]
	Pseudo R2	0.004	0.004	0.003	0.004	0.004	0.003	0.002	0.002	0.002	0.027	0.029	0.025
	AIC	862,464	1,036,083	1,135,452	789,100	936,505	1,017,206	723,341	841,613	905,336	109,491	112,375	116,284

Notes: Exponentiated coefficients. Signif. codes: *** = p < 0.01 , ** = 0.01 ≤ p < 0.05, * = 0.05 ≤ p < 0.1.

Table A5. *Mexico City - Sociodemographic predictors of POI isochrones*

y	Isochrone	LTS≤3			LTS≤2			LTS≤2 & s<6%			Bicycle-lane-only		
		10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min
Individual var.	Women	1.059***	1.052***	1.059***	1.046***	1.055***	1.074***	1.049***	1.045**	1.042**	1.046	1.018	1.012
		[1.039,1.079]	[1.034,1.072]	[1.040,1.078]	[1.020,1.074]	[1.028,1.084]	[1.045,1.104]	[1.012,1.087]	[1.005,1.086]	[1.002,1.084]	[0.979,1.117]	[0.947,1.094]	[0.940,1.089]
	Age 18-64 yrs	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age <18 yrs	1.068***	1.080***	1.087***	1.046	1.055*	1.066**	1.034	1.056	1.081*	1.065	1.079	1.086
		[1.024,1.113]	[1.037,1.125]	[1.044,1.132]	[0.988,1.108]	[0.995,1.119]	[1.002,1.133]	[0.956,1.118]	[0.969,1.150]	[0.990,1.181]	[0.919,1.233]	[0.921,1.264]	[0.925,1.276]
	Age ≥65 yrs	1.250***	1.225***	1.211***	1.252***	1.235***	1.260***	1.306***	1.316***	1.323***	1.197***	1.155**	1.150**
		[1.211,1.290]	[1.189,1.262]	[1.175,1.248]	[1.200,1.307]	[1.181,1.291]	[1.204,1.319]	[1.231,1.386]	[1.234,1.403]	[1.239,1.414]	[1.071,1.337]	[1.023,1.304]	[1.016,1.302]
	Student	0.933***	0.931***	0.923***	0.943**	0.922***	0.915***	0.980	0.963	0.956	0.875**	0.879*	0.881*
		[0.900,0.968]	[0.899,0.964]	[0.891,0.957]	[0.897,0.991]	[0.876,0.970]	[0.867,0.965]	[0.915,1.049]	[0.894,1.037]	[0.886,1.033]	[0.771,0.994]	[0.766,1.008]	[0.766,1.014]
	Hkpr/fam wkr	0.830***	0.840***	0.833***	0.836***	0.814***	0.773***	0.857***	0.878***	0.902***	0.688***	0.729***	0.745***
		[0.807,0.853]	[0.818,0.863]	[0.810,0.856]	[0.804,0.869]	[0.782,0.847]	[0.742,0.806]	[0.812,0.904]	[0.829,0.930]	[0.850,0.957]	[0.623,0.759]	[0.655,0.811]	[0.668,0.831]
	Unemployed	0.900***	0.911***	0.921***	0.872***	0.896***	0.917***	0.807***	0.824***	0.832***	1.260***	1.343***	1.347***
		[0.871,0.930]	[0.883,0.940]	[0.892,0.950]	[0.834,0.912]	[0.856,0.938]	[0.874,0.961]	[0.759,0.858]	[0.771,0.881]	[0.777,0.891]	[1.124,1.411]	[1.186,1.521]	[1.186,1.529]
	Educ, ≤ prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec	1.058***	1.066***	1.061***	1.057***	1.044***	1.050***	1.079***	1.094***	1.099***	1.085**	1.093**	1.101**
		[1.035,1.082]	[1.043,1.090]	[1.038,1.084]	[1.025,1.090]	[1.011,1.077]	[1.016,1.085]	[1.033,1.126]	[1.045,1.146]	[1.048,1.152]	[1.001,1.176]	[1.002,1.192]	[1.007,1.203]
	Educ, ≥ coll	1.520***	1.507***	1.463***	1.558***	1.516***	1.556***	1.547***	1.539***	1.553***	1.139**	1.115**	1.121**
		[1.477,1.565]	[1.466,1.549]	[1.423,1.504]	[1.498,1.621]	[1.456,1.579]	[1.491,1.622]	[1.466,1.633]	[1.451,1.632]	[1.461,1.650]	[1.030,1.259]	[1.000,1.243]	[1.004,1.253]
HH var.	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid	2.926***	3.055***	3.023***	3.261***	3.383***	3.744***	2.847***	2.143***	1.890***	0.521***	0.442***	0.450***
		[2.868,2.985]	[2.996,3.115]	[2.965,3.082]	[3.172,3.352]	[3.288,3.481]	[3.635,3.856]	[2.742,2.955]	[2.058,2.232]	[1.812,1.971]	[0.486,0.559]	[0.410,0.477]	[0.417,0.487]
	Income, high	2.931***	2.821***	2.719***	2.988***	2.661***	2.971***	2.029***	1.586***	1.786***	0.510***	0.459***	0.483***
		[2.845,3.020]	[2.741,2.902]	[2.642,2.798]	[2.869,3.113]	[2.551,2.776]	[2.844,3.104]	[1.919,2.145]	[1.493,1.686]	[1.677,1.903]	[0.460,0.566]	[0.410,0.513]	[0.431,0.542]
	Single parent	1.005	1.005	0.991	0.949	0.991	0.973	0.894**	0.950	0.994	0.841*	0.819*	0.820*
		[0.953,1.060]	[0.955,1.058]	[0.942,1.044]	[0.882,1.021]	[0.919,1.069]	[0.900,1.052]	[0.808,0.989]	[0.852,1.060]	[0.888,1.112]	[0.698,1.013]	[0.670,1.003]	[0.667,1.008]
	N of children	0.958***	0.970***	0.972***	0.978***	0.996	0.991	0.951***	0.966***	0.961***	0.902***	0.897***	0.896***
		[0.949,0.968]	[0.961,0.979]	[0.963,0.982]	[0.964,0.991]	[0.982,1.010]	[0.976,1.005]	[0.933,0.969]	[0.946,0.986]	[0.941,0.981]	[0.871,0.934]	[0.863,0.932]	[0.862,0.932]
	HH size	0.965***	0.970***	0.970***	0.961***	0.958***	0.958***	0.969***	0.979***	0.977***	0.929***	0.929***	0.929***
		[0.960,0.970]	[0.965,0.975]	[0.965,0.975]	[0.954,0.968]	[0.951,0.965]	[0.951,0.965]	[0.959,0.979]	[0.968,0.990]	[0.966,0.988]	[0.911,0.948]	[0.909,0.949]	[0.908,0.950]
	lnalpha	3.538***	3.286***	3.305***	6.666***	7.089***	7.627***	12.580***	14.764***	15.644***	38.619***	47.768***	50.131***
		[3.516,3.560]	[3.266,3.305]	[3.285,3.324]	[6.618,6.715]	[7.040,7.137]	[7.577,7.678]	[12.46,12.70]	[14.62,14.90]	[15.50,15.78]	[37.70,39.55]	[46.68,48.87]	[49.00,51.28]
	Pseudo R2	0.013	0.011	0.009	0.011	0.009	0.009	0.008	0.004	0.003	0.005	0.005	0.005
	AIC	1,676,081	2,150,772	2,410,488	1,138,154	1,390,022	1,520,907	683,701	752,162	769,485	126,566	132,215	133,599

Notes: Exponentiated coefficients. Signif. codes: *** = $p < 0.01$, ** = $0.01 \le p < 0.05$, * = $0.05 \le p < 0.1$.

Table A6. *Santiago - Sociodemographic predictors of POI isochrones*

y	Isochrone	LTS≤3			LTS≤2			LTS≤2 & s<6%			Bicycle-lane-only		
		10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min
Individual var.	Women	1.025**	1.026**	1.030**	1.009	1.016	1.025	0.986	0.985	0.992	0.964	0.992	0.996
		[1.001,1.050]	[1.000,1.053]	[1.003,1.059]	[0.977,1.041]	[0.981,1.053]	[0.986,1.064]	[0.951,1.022]	[0.947,1.025]	[0.952,1.033]	[0.848,1.096]	[0.865,1.138]	[0.867,1.145]
	Age 18-64 yrs	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age <18 yrs	1.167***	1.126***	1.106***	1.025	1.036	1.035	0.945	0.947	0.931	1.514***	1.542***	1.520***
		[1.108,1.228]	[1.064,1.191]	[1.042,1.174]	[0.956,1.098]	[0.958,1.120]	[0.952,1.125]	[0.873,1.023]	[0.868,1.033]	[0.850,1.019]	[1.148,1.997]	[1.148,2.070]	[1.127,2.052]
	Age ≥65 yrs	1.079***	1.152***	1.204***	1.027	1.086***	1.143***	1.020	1.074**	1.109***	1.252**	1.284**	1.345***
		[1.042,1.117]	[1.110,1.196]	[1.158,1.253]	[0.980,1.075]	[1.031,1.144]	[1.081,1.208]	[0.968,1.075]	[1.014,1.138]	[1.044,1.177]	[1.041,1.505]	[1.053,1.565]	[1.099,1.645]
	Student	0.927***	0.970	0.983	0.951*	0.945*	0.948	0.984	0.975	0.986	1.062	1.054	1.070
		[0.890,0.965]	[0.928,1.014]	[0.938,1.030]	[0.900,1.005]	[0.888,1.005]	[0.888,1.012]	[0.924,1.049]	[0.910,1.045]	[0.918,1.060]	[0.856,1.318]	[0.837,1.328]	[0.845,1.354]
	Hkpr/fam	0.936***	0.947***	0.947***	0.922***	0.918***	0.919***	0.937**	0.939**	0.940**	0.929	0.911	0.937
	wkr	[0.904,0.969]	[0.912,0.983]	[0.911,0.986]	[0.880,0.966]	[0.871,0.968]	[0.869,0.972]	[0.889,0.988]	[0.886,0.995]	[0.886,0.998]	[0.771,1.119]	[0.745,1.114]	[0.764,1.150]
	Unemployed	0.975	0.999	1.007	0.990	0.980	0.995	0.965	0.953	0.978	0.830	0.721*	0.702*
		[0.916,1.037]	[0.934,1.068]	[0.938,1.080]	[0.911,1.075]	[0.893,1.076]	[0.901,1.099]	[0.879,1.060]	[0.860,1.056]	[0.880,1.089]	[0.594,1.160]	[0.502,1.035]	[0.486,1.014]
	Educ, ≤ prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec	1.086***	1.091***	1.092***	1.024	1.004	0.998	1.015	0.998	0.980	1.614***	1.535***	1.484***
		[1.054,1.118]	[1.057,1.126]	[1.056,1.129]	[0.985,1.065]	[0.961,1.049]	[0.952,1.045]	[0.972,1.061]	[0.950,1.047]	[0.932,1.031]	[1.378,1.891]	[1.297,1.817]	[1.251,1.759]
	Educ, ≥ coll	1.335***	1.312***	1.291***	1.010	1.014	1.030	0.836***	0.797***	0.770***	2.526***	2.351***	2.273***
		[1.285,1.387]	[1.260,1.368]	[1.236,1.348]	[0.960,1.063]	[0.957,1.073]	[0.969,1.094]	[0.790,0.885]	[0.749,0.848]	[0.722,0.822]	[2.064,3.091]	[1.896,2.916]	[1.828,2.827]
HH var.	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid	1.023	1.035**	1.033**	0.967*	0.957**	0.949**	0.914***	0.906***	0.891***	1.017	1.078	1.113
		[0.994,1.052]	[1.004,1.066]	[1.000,1.066]	[0.931,1.004]	[0.917,0.998]	[0.907,0.992]	[0.877,0.954]	[0.865,0.949]	[0.849,0.935]	[0.875,1.183]	[0.917,1.268]	[0.944,1.312]
	Income, high	1.079***	1.097***	1.097***	0.887***	0.888***	0.882***	0.757***	0.711***	0.667***	2.088***	2.472***	2.690***
		[1.046,1.112]	[1.061,1.134]	[1.059,1.137]	[0.851,0.924]	[0.848,0.930]	[0.840,0.926]	[0.722,0.793]	[0.675,0.748]	[0.633,0.704]	[1.747,2.495]	[2.037,3.000]	[2.209,3.275]
	Single parent	1.032	1.032	1.007	1.075	1.109**	1.101*	1.079	1.168***	1.165***	1.171	1.151	1.138
		[0.966,1.102]	[0.961,1.108]	[0.935,1.086]	[0.984,1.174]	[1.004,1.224]	[0.991,1.223]	[0.977,1.192]	[1.047,1.302]	[1.041,1.304]	[0.825,1.661]	[0.791,1.676]	[0.777,1.665]
	N of children	0.956***	0.949***	0.938***	0.923***	0.911***	0.899***	0.880***	0.854***	0.839***	1.161***	1.238***	1.276***
		[0.943,0.970]	[0.934,0.964]	[0.923,0.954]	[0.905,0.941]	[0.892,0.932]	[0.878,0.920]	[0.861,0.900]	[0.834,0.875]	[0.818,0.860]	[1.059,1.272]	[1.125,1.363]	[1.161,1.403]
	HH size	0.919***	0.925***	0.939***	0.949***	0.940***	0.946***	1.000	1.007	1.010	0.589***	0.549***	0.537***
		[0.912,0.925]	[0.918,0.932]	[0.932,0.947]	[0.939,0.958]	[0.930,0.950]	[0.935,0.957]	[0.989,1.011]	[0.995,1.019]	[0.997,1.023]	[0.563,0.617]	[0.522,0.578]	[0.510,0.566]
	lnalpha	1.698***	1.982***	2.197***	3.031***	3.832***	4.338***	3.821***	4.605***	4.989***	46.519***	54.229***	56.042***
		[1.679,1.716]	[1.962,2.003]	[2.175,2.220]	[2.997,3.065]	[3.791,3.874]	[4.292,4.385]	[3.776,3.866]	[4.552,4.658]	[4.933,5.046]	[45.18,47.89]	[52.70,55.79]	[54.47,57.65]
	Pseudo R2	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.012	0.011	0.011
	AIC	691,188	813,906	886,057	532,912	600,392	631,980	434,252	463,637	473,475	69,923	73,010	73,893

Notes: Exponentiated coefficients. Signif. codes: *** = p < 0.01 , ** = 0.01 ≤ p < 0.05, * = 0.05 ≤ p < 0.1.

Table A7. *Sao Paulo - Sociodemographic predictors of POI isochrones*

y	Isochrone	LTS≤3			LTS≤2			LTS≤2 & s<6%			Bicycle-lane-only		
		10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min	10 min	20 min	30 min
Individual var.	Women	1.051***	1.047***	1.049***	1.046***	1.045***	1.049***	1.082***	1.106***	1.109***	1.236***	1.256***	1.214***
		[1.026,1.076]	[1.022,1.073]	[1.023,1.075]	[1.019,1.075]	[1.015,1.076]	[1.017,1.081]	[1.030,1.137]	[1.050,1.165]	[1.052,1.168]	[1.150,1.329]	[1.159,1.361]	[1.114,1.323]
	Age 18-64 yrs	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age <18 yrs	0.789***	0.803***	0.819***	0.792***	0.789***	0.791***	0.826**	0.809***	0.802***	0.957	1.002	0.957
		[0.739,0.841]	[0.752,0.858]	[0.766,0.876]	[0.736,0.853]	[0.729,0.854]	[0.727,0.859]	[0.711,0.960]	[0.690,0.950]	[0.683,0.942]	[0.791,1.157]	[0.819,1.225]	[0.777,1.179]
	Age ≥65 yrs	1.356***	1.364***	1.376***	1.320***	1.343***	1.367***	1.500***	1.637***	1.638***	1.573***	1.572***	1.554***
		[1.305,1.408]	[1.313,1.418]	[1.324,1.431]	[1.265,1.378]	[1.283,1.406]	[1.303,1.435]	[1.388,1.620]	[1.509,1.776]	[1.510,1.778]	[1.401,1.766]	[1.381,1.790]	[1.353,1.785]
	Student	1.601***	1.599***	1.564***	1.689***	1.714***	1.737***	1.556***	1.620***	1.644***	1.344***	1.241**	1.228**
		[1.509,1.699]	[1.505,1.699]	[1.470,1.665]	[1.578,1.809]	[1.594,1.843]	[1.609,1.876]	[1.355,1.786]	[1.399,1.877]	[1.418,1.906]	[1.126,1.605]	[1.028,1.497]	[1.011,1.491]
	Hkpr/fam wkr	0.804***	0.821***	0.831***	0.876***	0.862***	0.841***	0.908*	0.880**	0.878**	0.642***	0.631***	0.650***
		[0.767,0.842]	[0.782,0.862]	[0.791,0.872]	[0.830,0.924]	[0.814,0.913]	[0.791,0.893]	[0.822,1.004]	[0.793,0.978]	[0.790,0.975]	[0.555,0.741]	[0.537,0.740]	[0.547,0.772]
	Unemployed	0.872***	0.890***	0.897***	0.922***	0.908***	0.907***	0.937**	0.921**	0.927**	0.744***	0.696***	0.679***
		[0.845,0.900]	[0.861,0.919]	[0.868,0.926]	[0.890,0.955]	[0.875,0.944]	[0.871,0.944]	[0.878,1.000]	[0.861,0.987]	[0.865,0.992]	[0.676,0.819]	[0.625,0.775]	[0.605,0.761]
	Educ, ≤ prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec	1.266***	1.277***	1.288***	1.298***	1.300***	1.334***	1.452***	1.606***	1.625***	1.384***	1.212***	1.091
		[1.228,1.305]	[1.238,1.318]	[1.248,1.329]	[1.254,1.343]	[1.253,1.349]	[1.283,1.388]	[1.361,1.550]	[1.500,1.719]	[1.518,1.740]	[1.261,1.520]	[1.091,1.346]	[0.974,1.221]
	Educ, ≥ coll	2.134***	2.161***	2.122***	2.359***	2.427***	2.529***	2.412***	2.611***	2.634***	2.799***	2.455***	2.122***
		[2.056,2.215]	[2.079,2.246]	[2.042,2.206]	[2.261,2.461]	[2.318,2.540]	[2.410,2.654]	[2.225,2.614]	[2.399,2.842]	[2.419,2.867]	[2.501,3.133]	[2.162,2.787]	[1.852,2.432]
HH var.	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid	1.647***	1.676***	1.663***	1.853***	1.919***	1.987***	1.596***	1.688***	1.669***	1.546***	1.528***	1.397***
		[1.600,1.695]	[1.627,1.727]	[1.614,1.714]	[1.793,1.915]	[1.853,1.988]	[1.914,2.063]	[1.500,1.698]	[1.582,1.801]	[1.563,1.782]	[1.414,1.691]	[1.382,1.691]	[1.252,1.559]
	Income, high	2.988***	3.197***	3.122***	3.855***	4.240***	4.565***	3.554***	3.760***	3.674***	2.520***	2.796***	2.743***
		[2.892,3.088]	[3.091,3.307]	[3.018,3.230]	[3.714,4.001]	[4.074,4.413]	[4.376,4.762]	[3.315,3.810]	[3.494,4.047]	[3.413,3.954]	[2.282,2.782]	[2.501,3.126]	[2.430,3.095]
	Single parent	1.042	1.014	0.988	1.005	1.036	1.004	0.961	0.915	0.901	1.348***	1.345***	1.535***
		[0.979,1.109]	[0.951,1.081]	[0.926,1.054]	[0.936,1.079]	[0.960,1.118]	[0.926,1.088]	[0.842,1.098]	[0.795,1.052]	[0.783,1.037]	[1.115,1.630]	[1.089,1.661]	[1.225,1.922]
	N of children	1.000	0.998	1.006	1.008	1.002	1.018	1.068***	1.054***	1.059***	1.064**	1.164***	1.137***
		[0.983,1.018]	[0.981,1.016]	[0.988,1.024]	[0.988,1.028]	[0.981,1.022]	[0.996,1.040]	[1.032,1.104]	[1.017,1.094]	[1.021,1.099]	[1.005,1.127]	[1.093,1.240]	[1.063,1.216]
	HH size	0.857***	0.859***	0.869***	0.823***	0.823***	0.819***	0.844***	0.852***	0.851***	0.860***	0.840***	0.830***
		[0.849,0.866]	[0.850,0.868]	[0.860,0.878]	[0.814,0.832]	[0.814,0.833]	[0.808,0.829]	[0.826,0.862]	[0.832,0.871]	[0.832,0.871]	[0.833,0.887]	[0.812,0.869]	[0.800,0.860]
	lnalpha	2.703***	2.867***	2.908***	3.464***	4.013***	4.512***	11.392***	12.660***	12.754***	23.145***	30.142***	34.808***
		[2.680,2.726]	[2.844,2.891]	[2.884,2.933]	[3.433,3.496]	[3.978,4.048]	[4.473,4.551]	[11.20,11.58]	[12.45,12.86]	[12.54,12.96]	[22.58,23.72]	[29.44,30.85]	[34.02,35.61]
	Pseudo R2	0.015	0.013	0.011	0.020	0.017	0.015	0.020	0.019	0.019	0.017	0.013	0.011
	AIC	930,012	1,117,966	1,219,582	755,637	879,636	940,720	207,640	211,861	212,145	103,006	108,174	110,888

Notes: Exponentiated coefficients. Signif. codes: *** = $p < 0.01$, ** = $0.01 \le p < 0.05$, * = $0.05 \le p < 0.1$.

Table A8. *Total trips - Predictors of the number of bicycle trips – Zero-inflation models*

		BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
	Explanatory var.		95% CI	Sig.		95% CI	Sig.		95% CI	Sig.		95% CI	Sig.		95% CI	Sig.
Count Models	Accessibility index	0.93	[0.82,1.07]		0.92	[0.68,1.24]		1.04	[0.94,1.15]		0.95	[0.80,1.12]		0.92	[0.61,1.37]	
	LTS 1 & 2 (%)	1.08	[0.45,2.59]		1.33	[0.48,3.68]		0.70	[0.34,1.43]		0.44	[0.23,0.83]	***	0.21	[0.03,1.42]	
	Bike lane (total km)	0.98	[0.82,1.18]					0.89	[0.71,1.11]		0.92	[0.73,1.16]		1.04	[0.75,1.44]	
	Spd lmt (avg km/h)	0.95	[0.85,1.05]		1.01	[0.96,1.06]		0.98	[0.95,1.00]	*	0.96	[0.86,1.07]		0.95	[0.87,1.03]	
	Road (total km)	1.00	[0.97,1.03]		1.00	[0.96,1.04]		0.99	[0.97,1.00]		1.00	[0.96,1.04]		1.03	[0.92,1.14]	
	Slope (avg %)	0.96	[0.87,1.06]		0.99	[0.86,1.14]		0.97	[0.91,1.03]		0.93	[0.85,1.02]		0.97	[0.88,1.06]	
	Women	1.18	[0.71,1.95]		1.85	[0.92,3.73]	*	1.52	[1.16,2.00]	***	1.16	[0.22,6.09]		0.88	[0.25,3.10]	
	Age 18-64 yrs		ref.			ref.			ref.			ref.			ref.	
	Age <18 yrs	0.62	[0.30,1.26]		0.15	[0.01,2.07]		0.93	[0.54,1.61]		0.21	[0.02,1.75]		1.25	[0.45,3.45]	
	Age ≥65 yrs	2.01	[0.59,6.78]		1.66	[0.88,3.12]		1.11	[0.82,1.52]		0.62	[0.37,1.04]	*	2.04	[0.44,9.43]	
	Student	1.61	[0.83,3.12]		0.91	[0.29,2.83]		0.30	[0.16,0.57]	***	1.22	[0.69,2.15]		0.37	[0.10,1.43]	
	Hkpr/family wkr	1.55	[0.56,4.28]		1.36	[0.80,2.31]		1.38	[1.00,1.89]	**	1.44	[0.58,3.58]		1.60	[0.20,13.09]	
	Unemployed	1.68	[0.69,4.08]		2.07	[0.38,11.1]		1.42	[0.99,2.05]	*	1.89	[0.56,6.40]		0.93	[0.39,2.19]	
	Head of HH	1.16	[0.74,1.82]		0.64	[0.45,0.93]	**	0.86	[0.67,1.11]		1.32	[0.87,1.98]		0.93	[0.54,1.61]	
	Single parent	1.99	[0.82,4.81]		1.11	[0.42,2.98]		1.71	[0.89,3.32]		1.27	[0.31,5.25]				
	Num. of children	1.24	[0.70,2.22]		1.28	[1.08,1.52]	***	1.24	[1.11,1.39]	***	1.19	[0.93,1.54]		1.23	[0.87,1.73]	
	Education, ≤ prim		ref.			ref.			ref.			ref.			ref.	
	Education, sec	1.70	[1.06,2.71]	**	0.84	[0.61,1.15]		0.80	[0.63,1.03]	*	0.49	[0.21,1.12]	*	1.00	[0.51,1.97]	
	Education, ≥ coll	1.86	[1.02,3.40]	**	0.37	[0.13,1.08]	*	1.14	[0.73,1.77]		1.15	[0.25,5.30]		0.81	[0.16,4.05]	
	Income, low		ref.			ref.			ref.			ref.			ref.	
	Income, middle	0.80	[0.56,1.14]		0.84	[0.63,1.12]		0.70	[0.46,1.08]	*	0.99	[0.64,1.55]		0.97	[0.49,1.94]	
	Income, high	0.97	[0.48,1.97]		0.82	[0.56,1.19]		0.87	[0.41,1.82]		1.21	[0.44,3.34]		1.56	[0.66,3.70]	
	HH size	0.99	[0.89,1.10]		0.90	[0.80,1.01]	*	0.94	[0.90,0.98]	***	0.93	[0.74,1.18]		1.07	[0.81,1.40]	
	Intercept	0.74	[0.02,35.8]		0.30	[0.02,5.31]		1.51	[0.32,7.16]		2.30	[0.03,157.5]		4.96	[0.02,1249]	
Zero-Inflation Models	Accessibility index	0.88	[0.74,1.05]		1.13	[0.83,1.55]		1.03	[0.91,1.17]		0.86	[0.57,1.30]		0.81	[0.43,1.55]	
	LTS 1 & 2 (%)				1.66	[0.54,5.06]		0.55	[0.23,1.30]					0.77	[0.11,5.11]	
	Bike lane (total km)	0.84	[0.67,1.06]					0.66	[0.51,0.87]	***	0.52	[0.30,0.93]	**	0.76	[0.52,1.10]	
	Spd lmt (avg km/h)	0.94	[0.83,1.07]		1.03	[0.97,1.08]		1.00	[0.97,1.03]		0.95	[0.80,1.12]		0.98	[0.89,1.07]	
	Road (total km)	1.04	[1.00,1.09]	*	1.05	[1.01,1.10]	**	1.03	[1.01,1.04]	***	1.05	[0.98,1.11]		1.06	[0.96,1.18]	
	Slope (avg %)	1.16	[1.04,1.30]	***	1.17	[1.01,1.35]	**	1.18	[1.11,1.25]	***	0.83	[0.70,1.00]	**	1.06	[0.96,1.16]	
	Women	3.46	[1.93,6.21]	***	3.51	[1.87,6.59]	***	4.83	[3.03,7.72]	***	6.02	[1.43,25.37]	**	5.37	[1.62,17.82]	***
	Age 18-64 yrs		ref.			ref.			ref.			ref.			ref.	
	Age <18 yrs	0.35	[0.15,0.82]	**	0.10	[0.00,2.05]		0.94	[0.44,1.99]		0.99	[0.02,48.77]		1.24	[0.30,5.11]	
	Age ≥65 yrs	10.38	[3.42,31.5]	***	4.95	[2.76,8.89]	***	1.85	[1.34,2.57]	***	2.25	[0.89,5.69]	*	9.09	[2.41,34.24]	***
	Student	1.39	[0.66,2.92]		2.26	[0.39,13.1]		0.34	[0.12,0.93]	**	1.03	[0.44,2.43]		1.02	[0.18,5.72]	
	Hkpr/family wkr	2.68	[1.00,7.15]	**	1.58	[1.00,2.50]	**	1.53	[1.09,2.14]	**	4.97	[1.24,19.96]	**	9.71	[1.36,69.36]	**
	Unemployed	4.67	[1.86,11.7]	***	4.57	[0.81,25.9]	*	2.46	[1.69,3.58]	***	6.91	[2.23,21.35]	***	2.44	[1.10,5.44]	**
	Head of HH	1.44	[0.87,2.40]		0.66	[0.46,0.95]	**	0.80	[0.59,1.09]		1.37	[0.74,2.51]		1.06	[0.62,1.81]	
	Single parent	1.41	[0.58,3.40]		1.62	[0.65,4.04]		1.65	[0.84,3.23]		1.03	[0.19,5.65]		2.13	[0.62,7.25]	
	Num. of children	0.84	[0.43,1.64]		0.94	[0.80,1.12]		1.03	[0.91,1.18]		1.14	[0.82,1.58]		0.84	[0.60,1.16]	
	Education, ≤ prim		ref.			ref.			ref.			ref.			ref.	
	Education, sec	1.90	[1.05,3.44]	**	1.27	[0.91,1.77]		1.20	[0.89,1.61]		0.74	[0.21,2.66]		1.35	[0.71,2.59]	
	Education, ≥ coll	2.28	[1.09,4.79]	**	0.68	[0.20,2.33]		3.15	[1.90,5.22]	***	2.99	[0.24,36.48]		0.90	[0.19,4.19]	
	Income, low		ref.			ref.			ref.			ref.			ref.	
	Income, middle	1.07	[0.70,1.63]		0.76	[0.55,1.04]	*	1.44	[0.89,2.35]		1.37	[0.73,2.59]		1.21	[0.61,2.39]	
	Income, high	1.89	[0.85,4.17]		0.83	[0.55,1.25]		2.07	[0.91,4.68]	*	1.74	[0.41,7.39]		1.97	[0.81,4.77]	
	HH size	1.06	[0.93,1.20]		0.98	[0.87,1.11]		0.99	[0.94,1.03]		0.97	[0.69,1.36]		1.23	[0.96,1.58]	
	Intercept	2.51	[0.05,122.]		0.79	[0.03,19.1]		1.60	[0.24,10.8]		9.92	[0.03,3484]		4.84	[0.01,1584]	
	Pseudo R2	0.08			0.06			0.11			0.07			0.10		

Notes: Exponentiated coefficients. Signif. codes: *** = p < 0.01, ** = 0.01 ≤ p < 0.05, * = 0.05 ≤ p < 0.1.

Table A9. *Work trips - Predictors of the number of bicycle trips – Zero-inflation models*

		BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
	Explanatory var.		95% CI	Sig.		95% CI	Sig.		95% CI	Sig.		95% CI	Sig.		95% CI	Sig.
Count Models	Accessibility index	0.99	[0.85,1.17]		0.89	[0.51,1.55]		1.00	[0.89,1.12]		1.07	[0.83,1.37]		0.93	[0.69,1.25]	
	LTS 1 & 2 (%)	0.86	[0.36,2.02]		1.44	[0.27,7.60]		1.10	[0.55,2.22]		0.59	[0.26,1.31]		0.17	[0.03,0.95]	**
	Bike lane (total km)	1.20	[1.00,1.45]	*	0.54	[0.26,1.11]	*	0.94	[0.80,1.10]		0.70	[0.34,1.41]		1.06	[0.77,1.45]	
	Spd lmt (avg km/h)	0.99	[0.89,1.10]		1.05	[0.95,1.16]		0.99	[0.96,1.01]		0.98	[0.85,1.13]		0.92	[0.85,0.99]	**
	Road (total km)	0.98	[0.94,1.02]		0.99	[0.91,1.08]		0.97	[0.96,0.99]	***	1.00	[0.94,1.06]		1.06	[0.93,1.20]	
	Slope (avg %)	0.84	[0.80,0.89]	***	0.87	[0.73,1.04]		0.86	[0.84,0.89]	***	1.04	[0.85,1.28]		1.00	[0.89,1.12]	
	Women	0.95	[0.33,2.70]		0.35	[0.05,2.44]		0.87	[0.67,1.15]		0.23	[0.19,0.28]	***	1.92	[0.41,8.90]	
	Age 18-64 yrs		ref.			ref.			ref.			ref.			ref.	
	Age <18 yrs	1.65	[1.21,2.24]	***				1.19	[0.69,2.05]		0.28	[0.19,0.40]	***	1.18	[0.38,3.67]	
	Age ≥65 yrs							0.66	[0.37,1.16]					2.35	[0.72,7.71]	
	Student	0.68	[0.30,1.57]					0.19	[0.11,0.34]	***				0.23	[0.07,0.78]	**
	Hkpr/family wkr							0.02	[0.01,0.04]	***				1.55	[0.28,8.44]	
	Unemployed							1.27	[0.65,2.47]					1.04	[0.36,3.04]	
	Head of HH	0.85	[0.45,1.61]		0.74	[0.40,1.39]		0.98	[0.70,1.36]		1.15	[0.55,2.41]		1.04	[0.56,1.93]	
	Single parent	0.80	[0.37,1.75]					1.61	[0.37,7.05]							
	Num. of children	1.03	[0.63,1.66]		1.22	[0.86,1.73]		1.19	[1.05,1.36]	***	1.29	[0.88,1.87]		1.29	[0.97,1.72]	*
	Education, ≤ prim		ref.			ref.			ref.			ref.			ref.	
	Education, sec	1.72	[0.75,3.93]		0.54	[0.28,1.03]	*	0.67	[0.55,0.82]	***	0.27	[0.09,0.83]	**	0.70	[0.35,1.41]	
	Education, ≥ coll	0.81	[0.24,2.70]		1.39	[0.05,40.6]		2.44	[1.40,4.23]	***				0.43	[0.07,2.65]	
	Income, low		ref.			ref.			ref.			ref.			ref.	
	Income, middle	0.72	[0.51,1.00]	**	0.72	[0.45,1.16]		0.46	[0.34,0.62]	***	1.28	[0.64,2.55]		0.94	[0.49,1.82]	
	Income, high	0.70	[0.34,1.41]		0.87	[0.38,1.97]		0.37	[0.25,0.56]	***	1.62	[0.68,3.84]		1.32	[0.65,2.71]	
	HH size	0.92	[0.83,1.02]	*	1.02	[0.92,1.14]		0.93	[0.87,0.98]	**	1.02	[0.83,1.25]		1.11	[0.86,1.42]	
	Intercept	0.31	[0.01,15.0]		0.02	[0.00,5.56]		0.91	[0.19,4.31]		0.63	[0.00,318.8]		13.43	[0.21,853.3]	
Zero-Inflation Models	Accessibility index	0.91	[0.68,1.22]		1.04	[0.44,2.48]		0.95	[0.77,1.16]		1.07	[0.71,1.61]		0.81	[0.51,1.27]	
	LTS 1 & 2 (%)				2.29	[0.12,44.3]		0.80	[0.25,2.56]					0.74	[0.12,4.64]	
	Bike lane (total km)	1.21	[0.88,1.65]					0.56	[0.43,0.74]	***	0.35	[0.10,1.20]	*	0.76	[0.53,1.07]	
	Spd lmt (avg km/h)	1.00	[0.81,1.25]		1.08	[0.92,1.27]		1.00	[0.96,1.05]		0.98	[0.81,1.19]		0.95	[0.87,1.04]	
	Road (total km)	1.03	[0.94,1.13]		1.06	[0.95,1.18]		1.02	[0.99,1.04]		1.04	[0.95,1.12]		1.08	[0.96,1.23]	
	Slope (avg %)	0.98	[0.87,1.10]		0.97	[0.74,1.26]		1.02	[0.98,1.07]		1.04	[0.79,1.37]		1.09	[0.96,1.23]	
	Women	7.78	[2.11,28.6]	***	0.62	[0.03,13.6]		5.07	[3.55,7.25]	***				10.55	[2.78,40.0]	***
	Age 18-64 yrs		ref.			ref.			ref.			ref.			ref.	
	Age <18 yrs				0.43	[0.26,0.72]	***	0.51	[0.18,1.44]					1.51	[0.30,7.52]	
	Age ≥65 yrs				12.82	[2.41,68.3]	***	1.94	[0.88,4.29]	*				8.31	[2.24,30.8]	***
	Student	0.13	[0.02,1.11]	*	5.33	[1.95,14.5]	***	0.09	[0.03,0.32]	***				0.66	[0.12,3.64]	
	Hkpr/family wkr				24.37	[3.55,167.2]	***	0.03	[0.01,0.15]	***				25.42	[2.47,261.2]	***
	Unemployed	9.28	[4.63,18.6]	***	5.00	[1.67,15.0]	***	8.83	[3.98,19.6]	***				10.02	[3.30,30.4]	***
	Head of HH	1.08	[0.38,3.07]		0.59	[0.22,1.57]		1.01	[0.60,1.69]		1.08	[0.37,3.14]		1.22	[0.65,2.28]	
	Single parent				1.66	[0.49,5.66]		2.25	[0.42,12.2]					5.56	[0.73,42.3]	*
	Num. of children	0.75	[0.29,1.90]		1.09	[0.66,1.79]		1.07	[0.87,1.31]		1.27	[0.76,2.12]		0.86	[0.64,1.17]	
	Education, ≤ prim		ref.			ref.			ref.			ref.			ref.	
	Education, sec	2.10	[0.49,8.94]		0.68	[0.20,2.34]		1.38	[0.95,2.00]	*	0.19	[0.03,1.19]	*	1.08	[0.55,2.12]	
	Education, ≥ coll	0.35	[0.03,3.56]		3.65	[0.05,250.0]		17.83	[9.29,34.2]	***				0.54	[0.09,3.34]	
	Income, low		ref.			ref.			ref.			ref.			ref.	
	Income, middle	0.91	[0.47,1.77]		0.52	[0.26,1.06]	*	0.76	[0.45,1.28]		1.47	[0.51,4.19]		1.20	[0.62,2.34]	
	Income, high	1.65	[0.46,5.92]		0.85	[0.23,3.18]		0.56	[0.29,1.09]	*	2.45	[0.76,7.85]		1.89	[0.87,4.07]	*
	HH size	0.87	[0.71,1.06]		1.12	[0.95,1.32]		0.96	[0.89,1.05]		0.99	[0.73,1.33]		1.26	[0.98,1.62]	*
	Intercept	1.11	[0.00,1748]		0.02	[0.00,462.3]		0.85	[0.06,12.2]		7.47	[0.00,18435]		9.46	[0.07,1276]	
	Pseudo R2	0.08			0.07			0.11			0.06			0.13		

Notes: Exponentiated coefficients. Signif. codes: *** = $p < 0.01$, ** = $0.01 \le p < 0.05$, * = $0.05 \le p < 0.1$.

Table A10. *Nonwork trips - Predictors of the number of bicycle trips – Zero-inflation models*

		BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
	Explanatory var.		95% CI	Sig.		95% CI	Sig.		95% CI	Sig.		95% CI	Sig.		95% CI	Sig.
Count Models	Accessibility index	1.12	[0.95,1.33]		0.97	[0.69,1.35]		0.97	[0.80,1.17]		0.97	[0.68,1.38]		1.70	[1.20,2.41]	***
	LTS 1 & 2 (%)	2.23	[0.42,11.9]		1.47	[0.48,4.47]		0.43	[0.15,1.21]							
	Bike lane (total km)	0.84	[0.63,1.12]					1.11	[0.72,1.72]		1.23	[0.72,2.11]		0.47	[0.12,1.88]	
	Spd lmt (avg km/h)	1.00	[0.86,1.17]		0.99	[0.93,1.04]		0.97	[0.93,1.00]	*	1.02	[0.88,1.18]		1.20	[0.94,1.53]	
	Road (total km)	0.99	[0.94,1.05]		0.99	[0.95,1.03]		1.01	[0.99,1.04]		1.01	[0.93,1.10]		1.18	[0.96,1.44]	
	Slope (avg %)	1.00	[0.91,1.09]		1.04	[0.87,1.25]		0.99	[0.94,1.03]		0.88	[0.77,1.01]	*	0.99	[0.65,1.51]	
	Women	0.74	[0.34,1.63]		0.85	[0.43,1.67]		0.91	[0.56,1.47]		2.71	[1.02,7.22]	**			
	Age 18-64 yrs		ref.			ref.			ref.			ref.			ref.	
	Age <18 yrs	1.48	[0.30,7.34]		0.28	[0.05,1.58]		2.02	[0.56,7.27]		0.96	[0.20,4.55]		3.33	[0.24,46.4]	
	Age ≥65 yrs	1.29	[0.18,9.36]		0.31	[0.06,1.74]		0.85	[0.43,1.69]		2.28	[0.57,9.14]				
	Student	0.13	[0.00,7.48]		1.40	[0.71,2.76]		0.40	[0.10,1.63]		1.55	[0.51,4.76]		1.58	[0.14,17.7]	
	Hkpr/family wkr	1.08	[0.49,2.35]		1.06	[0.72,1.57]		1.30	[0.90,1.90]		2.36	[0.72,7.67]				
	Unemployed	1.23	[0.51,2.97]		1.44	[0.80,2.56]		1.37	[0.89,2.13]		5.81	[1.56,21.7]	***	0.44	[0.06,3.18]	
	Head of HH	1.46	[0.67,3.18]		0.69	[0.46,1.05]	*	0.94	[0.61,1.44]		0.96	[0.47,1.96]		1.44	[0.20,10.6]	
	Single parent	1.34	[0.56,3.22]		0.83	[0.37,1.83]		1.71	[0.82,3.58]		1.10	[0.24,5.09]				
	Num. of children	1.89	[1.25,2.86]	***	1.18	[0.94,1.48]		1.40	[1.18,1.67]	***	1.81	[1.11,2.93]	**	1.63	[0.32,8.35]	
	Education, ≤ prim		ref.			ref.			ref.			ref.			ref.	
	Education, sec	1.58	[0.72,3.48]		1.18	[0.75,1.88]		1.09	[0.71,1.68]		0.36	[0.12,1.07]	*	5.30	[1.42,19.8]	**
	Education, ≥ coll	1.27	[0.58,2.78]		0.42	[0.16,1.15]	*	0.94	[0.55,1.63]		0.84	[0.24,2.89]		2.04	[0.21,19.3]	
	Income, low		ref.			ref.			ref.			ref.			ref.	
	Income, middle	0.60	[0.27,1.30]		0.87	[0.60,1.27]		0.66	[0.43,1.02]	*	0.95	[0.32,2.76]		0.20	[0.04,1.03]	*
	Income, high	1.69	[0.75,3.79]		0.81	[0.52,1.25]		0.90	[0.37,2.18]		1.61	[0.50,5.21]		0.45	[0.07,2.86]	
	HH size	1.21	[0.98,1.50]	*	1.05	[0.90,1.22]		1.00	[0.95,1.06]		0.84	[0.67,1.07]		0.64	[0.21,2.00]	
	Intercept	0.03	[0.00,12.3]		1.03	[0.04,26.6]		2.08	[0.21,20.7]		0.10	[0.00,204.9]		0.00	[0.00,0.10]	***
Zero-Inflation Models	Accessibility index	1.10	[0.89,1.36]		1.42	[1.02,1.97]	**	0.98	[0.81,1.18]		0.99	[0.70,1.42]		1.31	[1.05,1.63]	**
	LTS 1 & 2 (%)				1.94	[0.45,8.34]		0.47	[0.16,1.37]		3.6	[1.34,9.77]	***	1.63	[0.39,6.83]	
	Bike lane (total km)	0.68	[0.49,0.97]	**				1.03	[0.70,1.53]		0.95	[0.54,1.65]		0.39	[0.10,1.57]	
	Spd lmt (avg km/h)	1.03	[0.90,1.18]		1.04	[0.97,1.12]		1.00	[0.96,1.04]		1.02	[0.87,1.18]		1.17	[0.95,1.45]	
	Road (total km)	1.04	[0.98,1.10]		1.05	[1.00,1.10]	*	1.03	[1.01,1.05]	***	1.04	[0.95,1.14]		1.25	[1.02,1.54]	**
	Slope (avg %)	1.19	[1.09,1.30]	***	1.29	[1.08,1.54]	***	1.19	[1.13,1.24]	***	0.84	[0.71,0.99]	**	1.09	[0.71,1.67]	
	Women	1.20	[0.58,2.45]		0.87	[0.49,1.56]		1.65	[1.04,2.61]	**	6.76	[2.53,18.1]	***	7.26	[3.83,13.8]	***
	Age 18-64 yrs		ref.			ref.			ref.			ref.			ref.	
	Age <18 yrs	1.02	[0.18,5.87]		1.06	[0.26,4.34]		3.07	[0.82,11.4]	*	3.18	[0.63,16.1]		1.23	[0.05,31.4]	
	Age ≥65 yrs	3.15	[0.45,22.0]		0.29	[0.05,1.63]		0.67	[0.34,1.32]		2.94	[0.81,10.7]	*	7.08	[2.56,19.6]	***
	Student	0.24	[0.00,24.7]		1.21	[0.59,2.50]		0.48	[0.11,2.06]		0.63	[0.19,2.10]		2.97	[0.17,52.6]	
	Hkpr/family wkr	0.65	[0.32,1.31]		0.33	[0.21,0.52]	***	0.45	[0.31,0.65]	***	1.25	[0.45,3.47]		0.86	[0.19,3.87]	
	Unemployed	0.96	[0.40,2.30]		0.74	[0.42,1.32]		0.68	[0.45,1.03]	*	1.87	[0.54,6.53]		0.15	[0.02,0.98]	**
	Head of HH	1.59	[0.78,3.27]		0.76	[0.52,1.13]		0.86	[0.57,1.30]		0.84	[0.40,1.77]		1.48	[0.22,9.97]	
	Single parent	0.69	[0.28,1.66]		1.55	[0.53,4.52]		1.10	[0.53,2.29]		0.53	[0.12,2.24]		0.39	[0.07,2.19]	
	Num. of children	0.78	[0.56,1.08]		0.61	[0.50,0.73]	***	1.02	[0.87,1.20]		1.45	[0.90,2.31]		1.19	[0.24,5.98]	
	Education, ≤ prim		ref.			ref.			ref.			ref.			ref.	
	Education, sec	1.46	[0.64,3.30]		1.57	[1.05,2.34]	**	0.97	[0.66,1.45]		0.69	[0.23,2.06]		3.88	[0.88,17.2]	*
	Education, ≥ coll	1.79	[0.79,4.05]		0.81	[0.31,2.11]		1.06	[0.63,1.78]		1.34	[0.39,4.53]		1.33	[0.13,13.9]	
	Income, low		ref.			ref.			ref.			ref.			ref.	
	Income, middle	0.72	[0.33,1.58]		0.90	[0.61,1.34]		1.23	[0.81,1.88]		1.45	[0.48,4.37]		0.23	[0.04,1.34]	*
	Income, high	2.44	[1.12,5.31]	**	0.85	[0.51,1.42]		2.17	[0.92,5.11]	*	1.31	[0.38,4.54]		0.39	[0.06,2.35]	
	HH size	1.36	[1.08,1.70]	***	1.29	[1.11,1.50]	***	1.05	[0.98,1.12]		1.03	[0.81,1.32]		0.82	[0.28,2.41]	
	Intercept	0.83	[0.01,65.6]		3.91	[0.07,224.4]		18.46	[1.67,204.3]	**	1.42	[0.00,5358]		0.01	[0.00,15.5]	
	Pseudo R2	0.08			0.09			0.06			0.06			0.08		

Notes: Exponentiated coefficients. Signif. codes: *** = p < 0.01, ** = 0.01 ≤ p < 0.05, * = 0.05 ≤ p < 0.1.

Table A11. *Predictors of bicycle mode choice for weekday total (all) trips by gender*

		Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
		Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Physical env. var.	Accessibility			1.05	1.00	0.92	0.66***	1.01	1.01	1.01	1.02	1.10***	1.05
				[0.98,1.12]	[0.89,1.11]	[0.83,1.02]	[0.54,0.81]	[0.96,1.06]	[0.93,1.10]	[0.95,1.09]	[0.92,1.15]	[1.04,1.16]	[0.95,1.16]
	LTS 1 & 2			0.89	3.52	0.88	0.77	1.3	1.12	0.61	0.15***	0.34***	0.31*
	(%)			[0.37,2.17]	[0.74,16.73]	[0.47,1.65]	[0.30,1.99]	[0.91,1.86]	[0.63,1.99]	[0.32,1.17]	[0.06,0.42]	[0.19,0.61]	[0.08,1.21]
	Bicycle lane			1.12***	1.17**	0.66		1.28***	1.13	1.29***	1.36***	1.27***	1.68***
	(total km)			[1.03,1.22]	[1.03,1.34]	[0.34,1.29]		[1.17,1.41]	[0.97,1.32]	[1.17,1.42]	[1.18,1.58]	[1.14,1.41]	[1.35,2.08]
	Speed limit			1.00	0.99	1.00	0.96	0.98**	0.97***	1.00	0.97	0.98	0.96
	(avg km/h)			[0.97,1.04]	[0.94,1.04]	[0.97,1.03]	[0.91,1.01]	[0.97,1.00]	[0.95,0.99]	[0.98,1.02]	[0.94,1.01]	[0.95,1.02]	[0.88,1.04]
	Road			0.97***	0.97***	0.96***	0.95***	0.96***	0.98***	0.97***	0.98	0.97*	0.92**
	(total km)			[0.95,0.98]	[0.94,0.99]	[0.93,0.98]	[0.92,0.98]	[0.96,0.97]	[0.96,0.99]	[0.96,0.99]	[0.95,1.01]	[0.95,1.00]	[0.86,0.99]
	Slope			0.85***	0.83***	0.91***	0.80***	0.86***	0.80***	1.00	1.06	0.93***	0.89***
	(avg %)			[0.82,0.88]	[0.80,0.87]	[0.85,0.97]	[0.72,0.89]	[0.84,0.87]	[0.77,0.83]	[0.95,1.04]	[0.99,1.13]	[0.89,0.96]	[0.81,0.97]
Individual var.	Age 18-64 yrs			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs			1.36**	1.93***	1.63***	1.25	0.73**	1.47***	0.20***	0.38***	1.54	0.35*
				[1.00,1.85]	[1.30,2.85]	[1.15,2.33]	[0.86,1.81]	[0.55,0.97]	[1.09,1.98]	[0.13,0.31]	[0.20,0.73]	[0.54,4.34]	[0.10,1.16]
	Age ≥ 65 yrs			0.30***	0.03***	0.46***	0.09***	0.72***	0.40***	0.49***	0.13***	0.22***	0.16**
				[0.20,0.44]	[0.00,0.19]	[0.34,0.61]	[0.04,0.20]	[0.61,0.84]	[0.28,0.57]	[0.38,0.63]	[0.06,0.30]	[0.12,0.42]	[0.03,0.84]
	Student			1.05	1.24	0.31***	0.49***	0.59***	0.99	1.01	1.43*	0.23***	3.28**
				[0.80,1.37]	[0.85,1.80]	[0.20,0.49]	[0.30,0.79]	[0.45,0.77]	[0.73,1.34]	[0.75,1.36]	[0.95,2.17]	[0.08,0.65]	[1.30,8.26]
	Hkpr/fam wkr			0.41***	0.64***	0.67	0.81	0.63	1.02	0.81	0.42***		0.32**
				[0.24,0.71]	[0.48,0.86]	[0.29,1.56]	[0.62,1.05]	[0.27,1.47]	[0.86,1.21]	[0.26,2.59]	[0.28,0.63]		[0.10,0.99]
	Unemployed			0.40***	0.38***	0.29***	1.03	0.57***	0.76*	0.50***	0.11**	0.35***	0.73
				[0.28,0.58]	[0.20,0.72]	[0.21,0.41]	[0.70,1.51]	[0.47,0.69]	[0.56,1.02]	[0.32,0.79]	[0.01,0.81]	[0.25,0.50]	[0.33,1.58]
	Head of HH			0.85*	1.08	1.04	0.96	1.05	1.07	1.00	1.1	0.89	0.86
				[0.71,1.02]	[0.80,1.46]	[0.87,1.24]	[0.73,1.26]	[0.94,1.16]	[0.86,1.33]	[0.83,1.20]	[0.76,1.59]	[0.72,1.11]	[0.48,1.53]
	Single parent			1.37	0.75	0.94	0.54*	1.23	0.86	1.22	0.87	0.53	0.87
				[0.54,3.50]	[0.43,1.30]	[0.41,2.16]	[0.28,1.06]	[0.63,2.43]	[0.54,1.37]	[0.36,4.10]	[0.37,2.02]	[0.07,4.05]	[0.19,4.04]
	N of children			1.16**	1.88***	1.20***	1.44***	1.09***	1.33***	1.03	1.22**	1.42***	1.15
				[1.03,1.30]	[1.64,2.14]	[1.10,1.30]	[1.29,1.61]	[1.03,1.15]	[1.24,1.44]	[0.91,1.17]	[1.00,1.47]	[1.23,1.64]	[0.77,1.74]
	Educ, ≤ prim			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec			1.05	0.94	0.62***	0.84	0.61***	0.86**	0.57***	1.03	0.72***	1.17
				[0.85,1.29]	[0.72,1.21]	[0.51,0.75]	[0.63,1.11]	[0.55,0.67]	[0.75,1.00]	[0.46,0.69]	[0.67,1.58]	[0.57,0.92]	[0.52,2.62]
	Educ, ≥ coll			0.98	0.85	0.35***	1.11	0.31***	0.69***	0.46***	1.35	0.75*	3.43***
				[0.77,1.24]	[0.61,1.19]	[0.25,0.49]	[0.80,1.55]	[0.27,0.37]	[0.56,0.86]	[0.36,0.58]	[0.84,2.15]	[0.56,1.01]	[1.58,7.44]
HH var.	Income, low			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid			0.77***	0.75**	1.11	1.10	0.54***	0.50***	0.85	0.73*	0.80*	1.10
				[0.65,0.91]	[0.58,0.98]	[0.90,1.36]	[0.82,1.47]	[0.48,0.61]	[0.42,0.61]	[0.70,1.04]	[0.51,1.05]	[0.62,1.01]	[0.57,2.13]
	Income, high			0.58***	0.53***	1.08	0.83	0.48***	0.48***	0.86	0.81	0.75**	0.99
				[0.47,0.72]	[0.36,0.76]	[0.85,1.37]	[0.57,1.19]	[0.39,0.58]	[0.35,0.66]	[0.69,1.07]	[0.55,1.20]	[0.56,1.00]	[0.49,2.00]
	HH size			0.99	0.88***	0.96	0.87***	0.96***	0.95**	0.95*	1.00	0.86***	0.88
				[0.93,1.05]	[0.81,0.97]	[0.90,1.01]	[0.80,0.95]	[0.92,0.99]	[0.91,1.00]	[0.89,1.01]	[0.91,1.10]	[0.78,0.95]	[0.71,1.09]
	Intercept			0.16**	0.04**	0.09***	0.46	0.46**	0.21**	0.17**	0.15	0.38	0.15
				[0.03,0.78]	[0.00,0.56]	[0.02,0.53]	[0.03,7.74]	[0.21,0.99]	[0.06,0.74]	[0.04,0.67]	[0.01,1.74]	[0.07,2.26]	[0.00,6.22]
	Pseudo R2			0.05	0.08	0.04	0.06	0.06	0.07	0.03	0.07	0.06	0.09

Notes: Exponentiated coefficients. Signif. codes: *** = $p < 0.01$, ** = $0.01 \le p < 0.05$, * = $0.05 \le p < 0.1$.

Table A12. *Predictors of bicycle mode choice for weekday work trips by gender*

		Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
		Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Physical env. var.	Accessibility	0.98		1.04	1.01	0.94	0.65***	1.02	1.01	1.01	1.03	1.11***	1.07
		[0.68,1.41]		[0.97,1.12]	[0.89,1.15]	[0.84,1.05]	[0.51,0.83]	[0.97,1.08]	[0.91,1.13]	[0.93,1.09]	[0.90,1.18]	[1.06,1.17]	[0.97,1.18]
	LTS 1 & 2			0.64	1.57	1.10	0.61	1.37	0.92	0.73	0.08***	0.28***	0.27*
	(%)			[0.24,1.65]	[0.27,9.13]	[0.56,2.16]	[0.20,1.85]	[0.92,2.02]	[0.44,1.94]	[0.35,1.51]	[0.02,0.27]	[0.15,0.51]	[0.06,1.08]
	Bicycle lane	1.47		1.13***	1.06	0.73		1.32***	1.28***	1.29***	1.44***	1.28***	1.66***
	(total km)	[0.31,6.96]		[1.03,1.24]	[0.91,1.22]	[0.38,1.41]		[1.19,1.47]	[1.07,1.54]	[1.16,1.45]	[1.22,1.69]	[1.15,1.43]	[1.33,2.08]
	Speed limit	1.04	1.21	1.00	0.97	1.02	0.94**	0.99**	0.97***	1.00	0.98	0.97	0.99
	(avg km/h)	[0.86,1.27]	[0.94,1.55]	[0.96,1.03]	[0.91,1.02]	[0.98,1.05]	[0.89,1.00]	[0.97,1.00]	[0.94,0.99]	[0.97,1.02]	[0.93,1.02]	[0.93,1.01]	[0.91,1.08]
	Road	1.05	0.83***	0.96***	0.97**	0.95***	0.96**	0.96***	0.97**	0.97***	1.01	0.98	0.92**
	(total km)	[0.89,1.24]	[0.72,0.95]	[0.95,0.98]	[0.94,1.00]	[0.93,0.98]	[0.93,1.00]	[0.95,0.97]	[0.96,0.99]	[0.95,0.99]	[0.97,1.04]	[0.95,1.01]	[0.86,1.00]
	Slope	0.94	1.05	0.85***	0.84***	0.92**	0.82***	0.86***	0.78***	0.99	1.02	0.92***	0.90**
	(avg %)	[0.58,1.53]	[0.55,2.01]	[0.82,0.88]	[0.80,0.88]	[0.85,0.99]	[0.72,0.93]	[0.84,0.88]	[0.75,0.81]	[0.95,1.04]	[0.93,1.11]	[0.88,0.96]	[0.82,0.99]
Individual var.	Age 18-64 yrs	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs	0.50		1.45**	1.93***	1.89***	2.01***	0.77*	1.79**	0.14***	0.46*	1.23	0.38
		[0.03,9.68]		[1.03,2.03]	[1.19,3.14]	[1.29,2.76]	[1.26,3.22]	[0.56,1.06]	[1.14,2.83]	[0.08,0.25]	[0.20,1.06]	[0.33,4.52]	[0.10,1.48]
	Age ≥ 65 yrs	1.80		0.16***		0.22***	0.02***	0.44***	0.28***	0.31***	0.08***	0.25***	0.33
		[0.46,7.06]		[0.08,0.30]		[0.15,0.33]	[0.00,0.14]	[0.36,0.54]	[0.14,0.55]	[0.22,0.42]	[0.02,0.33]	[0.11,0.54]	[0.06,1.99]
	Student	0.72	2.37	1.17	1.53*	0.28***	0.30***	0.54***	0.89	0.85	1.78**	0.22**	2.70*
		[0.09,5.52]	[0.21,26.54]	[0.88,1.56]	[0.97,2.42]	[0.17,0.45]	[0.16,0.58]	[0.40,0.73]	[0.56,1.41]	[0.60,1.21]	[1.11,2.85]	[0.06,0.79]	[0.96,7.57]
	Hkpr/fam wkr			0.07***	0.05***	0.36*	0.08***		0.14***				0.11**
				[0.02,0.30]	[0.02,0.13]	[0.11,1.17]	[0.04,0.17]		[0.09,0.21]				[0.02,0.74]
	Unemployed			0.16***	0.13***	0.23***	0.62**	0.28***	0.17***	0.05***		0.08***	0.29**
				[0.09,0.29]	[0.04,0.41]	[0.16,0.33]	[0.40,0.98]	[0.21,0.38]	[0.08,0.34]	[0.01,0.20]		[0.04,0.16]	[0.09,0.93]
	Head of HH	0.65	2.24	0.79**	0.93	1.00	1.00	0.98	1.01	1.03	1.05	0.86	0.80
		[0.17,2.49]	[0.24,21.13]	[0.65,0.97]	[0.61,1.41]	[0.83,1.21]	[0.70,1.44]	[0.88,1.11]	[0.73,1.39]	[0.84,1.27]	[0.66,1.67]	[0.68,1.08]	[0.41,1.53]
	Single parent			0.38	0.69	0.89	0.84	0.95	0.66	0.88	0.71		0.50
				[0.05,2.89]	[0.27,1.77]	[0.36,2.22]	[0.38,1.85]	[0.41,2.20]	[0.32,1.35]	[0.20,3.91]	[0.16,3.26]		[0.07,3.80]
	N of children	1.59	1.98**	1.05	1.39***	1.16***	1.09	1.11***	1.26***	1.02	0.95	1.41***	1.23
		[0.83,3.07]	[1.05,3.74]	[0.91,1.21]	[1.13,1.70]	[1.06,1.27]	[0.92,1.30]	[1.05,1.18]	[1.10,1.43]	[0.89,1.16]	[0.72,1.25]	[1.22,1.64]	[0.80,1.90]
	Educ, ≤ prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec	1.00	2.58	1.11	0.80	0.66***	0.65**	0.56***	0.60***	0.58***	1.05	0.67***	1.16
		[0.22,4.62]	[0.16,40.53]	[0.88,1.41]	[0.57,1.11]	[0.54,0.82]	[0.43,0.99]	[0.50,0.63]	[0.49,0.74]	[0.46,0.71]	[0.60,1.85]	[0.51,0.87]	[0.48,2.83]
	Educ, ≥ coll	0.78		1.16	1.03	0.33***	1.34	0.25***	0.48***	0.43***	1.85**	0.75*	2.74**
		[0.14,4.39]		[0.89,1.52]	[0.69,1.54]	[0.23,0.47]	[0.90,1.99]	[0.22,0.30]	[0.36,0.65]	[0.33,0.56]	[1.00,3.43]	[0.54,1.02]	[1.15,6.52]
HH var.	Income, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid	0.64		0.74***	0.72**	1.10	1.13	0.51***	0.52***	0.88	1.32	0.77**	1.30
		[0.12,3.31]		[0.62,0.90]	[0.53,0.97]	[0.89,1.36]	[0.79,1.60]	[0.45,0.58]	[0.41,0.65]	[0.71,1.09]	[0.83,2.09]	[0.60,1.00]	[0.63,2.71]
	Income, high	1.78	2.79	0.57***	0.43***	1.05	0.77	0.53***	0.45***	0.75**	1.51*	0.66***	1.19
		[0.46,6.93]	[0.29,26.52]	[0.45,0.72]	[0.28,0.67]	[0.82,1.35]	[0.50,1.19]	[0.43,0.66]	[0.31,0.67]	[0.58,0.95]	[0.93,2.48]	[0.48,0.91]	[0.53,2.64]
	HH size	0.83	1.03	0.98	0.95	0.96	0.92*	0.95***	0.93**	0.98	1.01	0.88**	0.83
		[0.52,1.33]	[0.83,1.29]	[0.92,1.05]	[0.85,1.07]	[0.91,1.02]	[0.83,1.01]	[0.92,0.98]	[0.88,0.99]	[0.92,1.05]	[0.90,1.13]	[0.80,0.98]	[0.65,1.06]
	Intercept	0.00	0.00**	0.21*	0.09	0.04***	0.79	0.42**	0.36	0.17**	0.04**	0.69	0.04
		[0.00,11.61]	[0.00,0.14]	[0.04,1.18]	[0.00,1.75]	[0.01,0.28]	[0.03,20.83]	[0.18,0.98]	[0.07,1.73]	[0.04,0.79]	[0.00,0.62]	[0.09,5.14]	[0.00,2.13]
	Pseudo R2	0.04	0.11	0.07	0.11	0.05	0.09	0.07	0.11	0.05	0.08	0.08	0.1

Notes: Exponentiated coefficients. Signif. codes: *** = p < 0.01, ** = 0.01 ≤ p < 0.05, * = 0.05 ≤ p < 0.1.

Table A13*. *Predictors of bicycle mode choice for weekday nonwork trips by gender

		Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
		Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Physical env. var.	Accessibility			1.05	0.97	0.76**	0.65***	0.97	1.01	0.99	0.94	1.04	0.79
				[0.91,1.22]	[0.80,1.18]	[0.58,1.00]	[0.48,0.87]	[0.88,1.07]	[0.90,1.14]	[0.89,1.10]	[0.77,1.16]	[0.94,1.15]	[0.53,1.17]
	LTS 1 & 2			2.52	11.67**	0.36	1.02	0.95	1.24	0.26**	0.28*	0.60	0.90
	(%)			[0.33,18.97]	[1.23,110.26]	[0.06,2.11]	[0.25,4.23]	[0.47,1.92]	[0.56,2.73]	[0.08,0.85]	[0.07,1.13]	[0.18,2.04]	[0.02,39.79]
	Bicycle lane			1.23**	1.28***			1.13	0.95	1.28***	1.27*	1.17	1.69*
	(total km)			[1.04,1.45]	[1.06,1.55]			[0.94,1.36]	[0.76,1.20]	[1.10,1.50]	[0.99,1.62]	[0.90,1.53]	[0.91,3.13]
	Speed limit			0.99	1.00	0.92*	0.98	0.98*	0.97*	1.01	0.98	1.02	0.86*
	(avg km/h)			[0.91,1.07]	[0.93,1.09]	[0.85,1.01]	[0.90,1.06]	[0.96,1.00]	[0.95,1.00]	[0.97,1.05]	[0.92,1.04]	[0.98,1.06]	[0.73,1.02]
	Road			0.96**	0.96**	0.95	0.95**	0.98**	0.98**	0.98	0.95*	0.94*	0.92
	(total km)			[0.93,1.00]	[0.93,0.99]	[0.88,1.01]	[0.91,1.00]	[0.97,1.00]	[0.96,1.00]	[0.95,1.01]	[0.91,1.00]	[0.87,1.01]	[0.78,1.09]
	Slope			0.85***	0.83***	0.88	0.74***	0.86***	0.81***	0.98	1.10**	0.93	0.81
	(avg %)			[0.80,0.91]	[0.78,0.88]	[0.74,1.06]	[0.64,0.86]	[0.83,0.89]	[0.77,0.85]	[0.90,1.07]	[1.01,1.20]	[0.84,1.02]	[0.62,1.06]
Individual var.	Age 18-64 yrs			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs			1.68	0.90	0.93	0.14***	0.54**	0.72	0.29***	0.47	3.60**	0.30
				[0.76,3.72]	[0.36,2.23]	[0.39,2.27]	[0.04,0.44]	[0.32,0.92]	[0.46,1.14]	[0.15,0.57]	[0.17,1.29]	[1.16,11.15]	[0.02,4.48]
	Age ≥ 65 yrs			0.74	0.05***	3.24***	0.22***	1.81***	0.55***	1.06	0.19***	0.16***	0.19
				[0.41,1.35]	[0.01,0.35]	[1.91,5.52]	[0.08,0.57]	[1.38,2.38]	[0.36,0.83]	[0.69,1.62]	[0.07,0.54]	[0.06,0.47]	[0.02,1.92]
	Student			0.40**	0.73	0.62	1.13	0.90	0.92	2.21***	2.18**	0.32*	7.65**
				[0.18,0.89]	[0.34,1.54]	[0.22,1.78]	[0.56,2.28]	[0.57,1.43]	[0.60,1.42]	[1.38,3.53]	[1.10,4.34]	[0.09,1.12]	[1.13,51.62]
	Hkpr/fam wkr			1.59	1.48**	3.95**	2.42***	3.06***	2.70***	4.41***	1.35		2.16
				[0.83,3.04]	[1.03,2.13]	[1.19,13.03]	[1.64,3.58]	[1.30,7.18]	[2.16,3.38]	[1.41,13.83]	[0.84,2.17]		[0.45,10.45]
	Unemployed			1.39	0.86	1.24	1.98*	1.68***	1.99***	3.31***	0.38	2.63***	3.84**
				[0.84,2.30]	[0.40,1.83]	[0.54,2.86]	[0.98,4.03]	[1.28,2.19]	[1.41,2.82]	[1.97,5.54]	[0.05,2.87]	[1.64,4.23]	[1.09,13.46]
	Head of HH			0.97	1.15	1.31	0.93	1.23*	1.06	1.03	1.58*	0.85	1.75
				[0.64,1.45]	[0.75,1.75]	[0.75,2.27]	[0.63,1.36]	[0.97,1.54]	[0.78,1.42]	[0.72,1.47]	[0.96,2.58]	[0.52,1.39]	[0.59,5.21]
	Single parent			4.34***	0.93	2.08	0.36*	2.06	1.15	1.27	1.20	3.09	1.68
				[1.48,12.73]	[0.48,1.80]	[0.51,8.41]	[0.12,1.06]	[0.65,6.57]	[0.63,2.10]	[0.19,8.42]	[0.47,3.10]	[0.37,25.92]	[0.12,24.62]
	N of children			1.50***	2.63***	1.65***	1.85***	1.03	1.38***	1.06	1.35**	1.41*	1.10
				[1.23,1.84]	[2.20,3.14]	[1.31,2.08]	[1.54,2.21]	[0.91,1.17]	[1.25,1.51]	[0.80,1.40]	[1.01,1.80]	[0.96,2.07]	[0.45,2.65]
	Educ, ≤ prim			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec			0.91	1.30	0.24***	0.95	0.85	1.36***	0.42***	1.08	1.14	1.50
				[0.59,1.40]	[0.84,2.02]	[0.11,0.53]	[0.66,1.39]	[0.67,1.07]	[1.08,1.71]	[0.28,0.65]	[0.59,1.97]	[0.65,1.99]	[0.24,9.24]
	Educ, ≥ coll			0.68	0.81	0.51*	0.66	0.70**	1.09	0.50***	1.32	0.98	8.17***
				[0.41,1.13]	[0.47,1.42]	[0.23,1.12]	[0.36,1.22]	[0.52,0.93]	[0.80,1.49]	[0.32,0.77]	[0.66,2.63]	[0.50,1.93]	[1.90,35.12]
HH var.	Income, low			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid			0.88	0.92	1.19	0.93	0.66***	0.49***	0.76	0.53**	0.99	0.77
				[0.61,1.26]	[0.61,1.37]	[0.65,2.20]	[0.64,1.37]	[0.53,0.83]	[0.38,0.62]	[0.51,1.13]	[0.30,0.95]	[0.55,1.78]	[0.19,3.22]
	Income, high			0.61*	0.78	1.24	0.91	0.36***	0.52***	1.48**	0.85	1.53	0.66
				[0.37,1.01]	[0.45,1.35]	[0.61,2.53]	[0.53,1.58]	[0.23,0.55]	[0.34,0.80]	[1.01,2.15]	[0.49,1.48]	[0.86,2.71]	[0.18,2.44]
	HH size			0.97	0.77***	0.85*	0.77***	0.95	0.97	0.79***	0.92	0.75**	1.12
				[0.86,1.10]	[0.68,0.88]	[0.71,1.03]	[0.66,0.90]	[0.89,1.02]	[0.91,1.03]	[0.69,0.90]	[0.78,1.07]	[0.59,0.95]	[0.80,1.55]
	Intercept			0.02**	0.00***	0.48	0.08	0.06***	0.04***	0.06**	0.04*	0.01***	0.24
				[0.00,0.81]	[0.00,0.17]	[0.01,42.26]	[0.00,6.61]	[0.01,0.30]	[0.01,0.19]	[0.00,0.71]	[0.00,1.72]	[0.00,0.16]	[0.00,160.51]
	Pseudo R2			0.04	0.12	0.08	0.13	0.05	0.09	0.05	0.07	0.04	0.1

Notes: Exponentiated coefficients. Signif. codes: *** = p < 0.01, ** = 0.01 ≤ p < 0.05, * = 0.05 ≤ p < 0.1.

Table A14*. Predictors of cycling distances (km) for weekday total (all) trips by gender*

		Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
	Ind. var.	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Physical env. Var.	Accessibility			-0.005	-0.007**	-0.008*	-0.005***	0.002	0	0.002	0	0.010**	0
				[-0.023,0.013]	[-0.014,0.000]	[-0.016,0.000]	[-0.009,-0.001]	[-0.004,0.007]	[-0.002,0.002]	[-0.012,0.017]	[-0.007,0.008]	[0.001,0.020]	[-0.001,0.001]
	LTS 1 & 2			0.259**	0.073	-0.09	-0.033	0.046**	0.007	-0.102**	-0.068**	-0.058***	-0.005
	(%)			[0.004,0.514]	[-0.076,0.223]	[-0.227,0.048]	[-0.094,0.029]	[0.000,0.092]	[-0.010,0.025]	[-0.205,0.002]	[-0.128,-0.008]	[-0.103,-0.013]	[-0.017,0.006]
	Bicycle lane			0.021*	0.003	0.015	0.006	0.024***	0.005*	0.032***	0.016***	0.007*	0.005***
	(total km)			[-0.003,0.046]	[-0.009,0.015]	[-0.024,0.054]	[-0.008,0.021]	[0.010,0.038]	[-0.000,0.010]	[0.014,0.051]	[0.007,0.025]	[-0.000,0.015]	[0.002,0.008]
	Speed limit			-0.002	0.001	-0.002	-0.002*	-0.002**	0	-0.001	-0.001	-0.001	0
	(avg km/h)			[-0.010,0.006]	[-0.004,0.005]	[-0.007,0.003]	[-0.005,0.000]	[-0.004,-	[-0.001,0.000]	[-0.006,0.003]	[-0.003,0.001]	[-0.003,0.001]	[-0.001,0.000]
	Road			-0.009***	-0.006***	-0.003	-0.003**	-0.003***	-0.000*	-0.004**	-0.002	-0.002	-0.001**
	(total km)			[-0.014,-0.004]	[-0.010,-0.003]	[-0.008,0.001]	[-0.005,-0.000]	[-0.005,-	[-0.001,0.000]	[-0.007,-0.000]	[-0.006,0.001]	[-0.003,0.000]	[-0.002,-0.000]
	Slope			-0.031***	-0.013***	-0.015***	-0.005***	-0.008***	-0.001***	-0.003	0.001	-0.003***	0
	(avg %)			[-0.037,-0.025]	[-0.018,-0.009]	[-0.023,-0.007]	[-0.009,-0.001]	[-0.009,-	[-0.002,-0.001]	[-0.009,0.004]	[-0.004,0.007]	[-0.005,-0.001]	[-0.001,0.000]
Individual var.	Age 18-64 yrs			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs			-0.216***	-0.007	-0.065***	0.01	-0.052***	0.002	-0.172***	-0.07	0.002	-0.012
				[-0.300,-0.132]	[-0.059,0.046]	[-0.103,-0.027]	[-0.004,0.024]	[-0.073,-	[-0.007,0.010]	[-0.219,-0.126]	[-0.174,0.033]	[-0.039,0.044]	[-0.027,0.003]
	Age ≥ 65 yrs			-0.245***	-0.045***	-0.085***	-0.032***	-0.049***	-0.005**	-0.113***	-0.028***	-0.027***	-0.006**
				[-0.293,-0.197]	[-0.075,-0.015]	[-0.120,-0.051]	[-0.045,-0.019]	[-0.065,-	[-0.010,-0.001]	[-0.146,-0.080]	[-0.036,-0.020]	[-0.040,-0.013]	[-0.010,-0.001]
	Student			-0.038	-0.009	-0.034**	-0.033***	-0.026**	-0.004	0.018	0.053	-0.045**	0.006
				[-0.119,0.044]	[-0.058,0.040]	[-0.069,0.000]	[-0.049,-0.017]	[-0.046,-	[-0.013,0.004]	[-0.032,0.067]	[-0.040,0.146]	[-0.084,-0.005]	[-0.010,0.022]
	Hkpr/fam wkr			-0.236***	-0.092***	-0.106***	-0.024***	-0.070***	-0.005*	-0.103***	-0.028***	-0.060***	-0.007***
				[-0.281,-0.191]	[-0.125,-0.059]	[-0.157,-0.055]	[-0.041,-0.008]	[-0.089,-	[-0.010,0.001]	[-0.151,-0.056]	[-0.048,-0.008]	[-0.072,-0.048]	[-0.013,-0.002]
	Unemployed			-0.219***	-0.097***	-0.037*	-0.022***	-0.030***	-0.008***	-0.069**	-0.026***	-0.039***	-0.005*
				[-0.283,-0.154]	[-0.125,-0.069]	[-0.080,0.006]	[-0.038,-0.006]	[-0.050,-	[-0.014,-0.003]	[-0.124,-0.013]	[-0.042,-0.010]	[-0.051,-0.027]	[-0.012,0.001]
	Head of HH			-0.013	0.009	0.024	-0.002	0.002	0	0.019	0.003	-0.008	0.002
				[-0.071,0.045]	[-0.030,0.049]	[-0.006,0.053]	[-0.018,0.015]	[-0.014,0.017]	[-0.006,0.006]	[-0.012,0.049]	[-0.009,0.015]	[-0.022,0.005]	[-0.004,0.008]
	Single parent			-0.190*	-0.072**	0.035	-0.032*	0.026	-0.011*	-0.051	-0.02	-0.076***	-0.008**
				[-0.410,0.031]	[-0.142,-0.001]	[-0.193,0.262]	[-0.066,0.002]	[-0.113,0.166]	[-0.024,0.002]	[-0.201,0.099]	[-0.090,0.050]	[-0.092,-0.060]	[-0.014,-0.001]
	N of children			0.057**	0.052***	0.025***	0.013***	0.010**	0.005***	-0.002	0.026	0.022***	0
				[0.010,0.105]	[0.025,0.080]	[0.006,0.043]	[0.004,0.022]	[0.000,0.019]	[0.002,0.009]	[-0.021,0.018]	[-0.024,0.075]	[0.011,0.034]	[-0.004,0.004]
	Educ, ≤ prim			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec			0.007	-0.026	-0.047***	0.005	-0.022***	0.003	-0.076***	-0.025	-0.018***	0
				[-0.055,0.068]	[-0.064,0.012]	[-0.082,-0.012]	[-0.013,0.023]	[-0.037,-	[-0.002,0.008]	[-0.110,-0.042]	[-0.063,0.013]	[-0.032,-0.004]	[-0.005,0.005]
	Educ, ≥ coll			-0.075**	-0.049**	-0.079***	0.012	-0.051***	0.001	-0.092***	-0.011	-0.01	0.003
				[-0.143,-0.006]	[-0.099,0.000]	[-0.108,-0.050]	[-0.007,0.031]	[-0.070,-	[-0.005,0.007]	[-0.130,-0.053]	[-0.076,0.054]	[-0.027,0.008]	[-0.004,0.010]
HH var.	Income, low			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid			-0.095***	-0.021	0.004	0.001	-0.033***	-0.003	-0.007	0.002	-0.011*	0.001
				[-0.148,-0.043]	[-0.058,0.015]	[-0.032,0.040]	[-0.018,0.020]	[-0.043,-	[-0.008,0.002]	[-0.036,0.022]	[-0.024,0.028]	[-0.024,0.002]	[-0.004,0.005]
	Income, high			-0.170***	-0.032	-0.024	-0.008	-0.022***	-0.003	-0.021	0	-0.016**	0.003
				[-0.223,-0.118]	[-0.076,0.012]	[-0.057,0.010]	[-0.029,0.013]	[-0.038,-	[-0.010,0.004]	[-0.050,0.008]	[-0.022,0.021]	[-0.029,-0.002]	[-0.003,0.009]
	HH size			-0.003	-0.001	-0.006*	-0.004***	-0.003**	0	-0.006	0	-0.008***	0
				[-0.019,0.012]	[-0.013,0.011]	[-0.014,0.001]	[-0.007,-0.001]	[-0.006,-	[-0.002,0.002]	[-0.014,0.003]	[-0.005,0.004]	[-0.012,-0.004]	[-0.003,0.002]
	Intercept			0.638***	0.247**	0.406**	0.219***	0.284***	0.035*	0.428***	0.161	0.242***	0.036**
				[0.220,1.056]	[0.014,0.479]	[0.071,0.741]	[0.065,0.374]	[0.170,0.397]	[-0.003,0.073]	[0.116,0.740]	[-0.040,0.362]	[0.124,0.360]	[0.007,0.065]
	R2			0.012	0.004	0.004	0.002	0.005	0.001	0.007	0.003	0.005	0.001

Notes: Signif. codes: *** = p < 0.01, ** = 0.01 ≤ p < 0.05, * = 0.05 ≤ p < 0.1.

***Table A15**. Predictors of cycling distances (km) for weekday work trips by gender*

	Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
Ind. var.	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Accessi-	0.000	-0.001	-0.003	-0.003	-0.009***	-0.003**	0.001	0.000	0.000	0.001	0.010**	0.000
bility	[-0.005,0.005]	[-0.002,0.000]	[-0.020,0.013]	[-0.009,0.003]	[-0.016,-0.002]	[-0.006,0.000]	[-0.003,0.004]	[-0.002,0.002]	[-0.011,0.010]	[-0.005,0.008]	[0.000,0.019]	[-0.001,0.001]
LTS 1 & 2	-0.015	-0.025	0.251**	0.084	-0.012	-0.01	0.046**	0.009	-0.023	-0.035**	-0.043***	-0.005
(%)	[-0.150,0.120]	[-0.080,0.030]	[0.039,0.463]	[-0.036,0.203]	[-0.096,0.072]	[-0.049,0.029]	[0.008,0.084]	[-0.003,0.021]	[-0.104,0.057]	[-0.062,-0.007]	[-0.075,-0.011]	[-0.015,0.005]
Bike lane	0.004	-0.001	0.020**	0.004	0.009	-0.001	0.016***	0.005**	0.026***	0.013***	0.007**	0.004***
(total km)	[-0.011,0.020]	[-0.003,0.001]	[0.000,0.040]	[-0.005,0.013]	[-0.011,0.029]	[-0.010,0.009]	[0.008,0.025]	[0.001,0.010]	[0.010,0.041]	[0.005,0.020]	[0.000,0.014]	[0.001,0.007]
Speed lim.	0.001	0.000	-0.002	0.000	0.001	-0.001	-0.002**	0.000	-0.001	0.000	-0.001	0.000
(avg km/h)	[-0.004,0.005]	[-0.001,0.000]	[-0.009,0.005]	[-0.004,0.003]	[-0.003,0.004]	[-0.003,0.000]	[-0.003,-0.000]	[-0.000,0.000]	[-0.006,0.003]	[-0.001,0.001]	[-0.003,0.000]	[-0.001,0.000]
Road	-0.001	0.000	-0.007***	-0.004***	-0.002	-0.002**	-0.003***	-0.000*	-0.003*	-0.001	-0.001	-0.001*
(total km)	[-0.003,0.002]	[-0.001,0.000]	[-0.011,-0.002]	[-0.006,-	[-0.005,0.002]	[-0.004,-0.000]	[-0.004,-0.002]	[-0.001,0.000]	[-0.007,0.000]	[-0.002,0.001]	[-0.002,0.001]	[-0.002,0.000]
Slope	-0.005	-0.001	-0.025***	-0.009***	-0.010***	-0.002	-0.007***	-0.001***	-0.002	0.000	-0.003***	0.000
(avg %)	[-0.018,0.009]	[-0.003,0.001]	[-0.030,-0.020]	[-0.012,-	[-0.017,-0.004]	[-0.005,0.001]	[-0.008,-0.005]	[-0.001,-0.000]	[-0.007,0.003]	[-0.002,0.003]	[-0.004,-0.001]	[-0.001,0.001]
Age 18-64	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Age < 18	-0.019	-0.005	-0.228***	-0.009	-0.030***	0.006	-0.045***	0.002	-0.131***	-0.015	-0.014	-0.012
	[-0.065,0.028]	[-0.011,0.002]	[-0.305,-0.151]	[-0.055,0.038]	[-0.052,-0.008]	[-0.006,0.017]	[-0.065,-0.026]	[-0.006,0.009]	[-0.169,-0.094]	[-0.037,0.007]	[-0.046,0.017]	[-0.027,0.003]
Age ≥ 65	0.001	0.000	-0.220***	-0.032***	-0.101***	-0.031***	-0.052***	-0.005***	-0.109***	-0.020***	-0.015**	-0.004**
	[-0.020,0.022]	[-0.005,0.006]	[-0.256,-0.184]	[-0.048,-	[-0.127,-0.075]	[-0.040,-0.021]	[-0.064,-0.039]	[-0.009,-0.002]	[-0.140,-0.078]	[-0.025,-0.014]	[-0.027,-0.003]	[-0.008,-0.001]
Student	0.02	0.001	-0.034	-0.007	-0.059***	-0.033***	-0.026***	-0.005	-0.018	0.003	-0.029*	0.005
	[-0.040,0.080]	[-0.004,0.006]	[-0.111,0.042]	[-0.049,0.034]	[-0.084,-0.034]	[-0.045,-0.022]	[-0.045,-0.006]	[-0.013,0.002]	[-0.058,0.022]	[-0.016,0.022]	[-0.061,0.003]	[-0.011,0.021]
Hkpr/fam	-0.006	-0.005	-0.254***	-0.096***	-0.092***	-0.034***	-0.066***	-0.012***	-0.122***	-0.020***	-0.054***	-0.008***
wkr	[-0.023,0.011]	[-0.013,0.002]	[-0.287,-0.221]	[-0.118,-	[-0.142,-0.042]	[-0.045,-0.024]	[-0.076,-0.056]	[-0.016,-0.008]	[-0.150,-0.094]	[-0.026,-0.014]	[-0.064,-0.043]	[-0.013,-0.003]
Unem-	-0.017***	-0.003	-0.246***	-0.089***	-0.082***	-0.021***	-0.046***	-0.012***	-0.122***	-0.028***	-0.047***	-0.007**
ployed	[-0.028,-	[-0.007,0.001]	[-0.292,-0.200]	[-0.109,-	[-0.103,-0.060]	[-0.033,-0.008]	[-0.061,-0.031]	[-0.015,-0.008]	[-0.145,-0.100]	[-0.037,-0.019]	[-0.057,-0.038]	[-0.012,-0.001]
Head HH	0.022	0.000	-0.034	-0.013	0.011	-0.009*	-0.004	0.001	0.011	-0.004	-0.007	0.002
	[-0.027,0.071]	[0.000	[-0.086,0.019]	[-0.035,0.009]	[-0.015,0.038]	[-0.019,0.002]	[-0.018,0.009]	[-0.005,0.006]	[-0.015,0.038]	[-0.014,0.005]	[-0.019,0.006]	[-0.004,0.008]
Single	-0.04	-0.008	-0.184*	-0.038	0.045	-0.011	-0.013	-0.004	-0.033	0.000	-0.066***	-0.007***
parent	[-0.089,0.009]	[-0.020,0.004]	[-0.388,0.019]	[-0.090,0.013]	[-0.153,0.242]	[-0.031,0.010]	[-0.106,0.081]	[-0.015,0.008]	[-0.180,0.115]	[-0.028,0.028]	[-0.081,-0.051]	[-0.013,-0.002]
N child	0.015	0.005	0.054**	0.029**	0.020**	0.001	0.010**	0.001	-0.003	-0.003	0.020***	0.000
	[-0.010,0.041]	[-0.005,0.014]	[0.009,0.099]	[0.002,0.057]	[0.003,0.036]	[-0.004,0.007]	[0.002,0.019]	[-0.002,0.003]	[-0.021,0.016]	[-0.007,0.001]	[0.010,0.031]	[-0.004,0.003]
Educ, ≤prim	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Educ, sec	0.006	0.000	-0.011	-0.022	-0.039**	-0.004	-0.020***	0.000	-0.062***	-0.004	-0.018***	0.000
	[-0.017,0.028]	[-0.005,0.004]	[-0.068,0.046]	[-0.053,0.009]	[-0.070,-0.008]	[-0.015,0.006]	[-0.034,-0.006]	[-0.004,0.004]	[-0.093,-0.031]	[-0.009,0.001]	[-0.031,-0.006]	[-0.005,0.004]
Educ, ≥coll	-0.005	-0.005*	-0.089***	-0.044**	-0.064***	0.005	-0.046***	-0.001	-0.085***	0.018***	-0.007	0.001
	[-0.021,0.012]	[-0.010,0.001]	[-0.152,-0.025]	[-0.083,-	[-0.089,-0.038]	[-0.010,0.019]	[-0.062,-0.030]	[-0.005,0.004]	[-0.120,-0.050]	[0.006,0.030]	[-0.022,0.008]	[-0.006,0.008]
Inc, low	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Inc, mid	0.014	-0.003	-0.082***	-0.007	-0.003	0.005	-0.032***	-0.001	-0.008	-0.005	-0.008	0.000
	[-0.025,0.053]	[-0.008,0.002]	[-0.130,-0.034]	[-0.034,0.020]	[-0.030,0.025]	[-0.006,0.017]	[-0.041,-0.022]	[-0.004,0.003]	[-0.035,0.019]	[-0.018,0.008]	[-0.020,0.004]	[-0.004,0.005]
Inc, high	0.025	-0.002	-0.156***	-0.027*	-0.018	0.000	-0.018**	-0.003	-0.032**	-0.005	-0.016**	0.004
	[-0.020,0.071]	[-0.009,0.005]	[-0.202,-0.109]	[-0.056,0.001]	[-0.045,0.008]	[-0.012,0.012]	[-0.032,-0.004]	[-0.007,0.001]	[-0.057,-0.006]	[-0.022,0.012]	[-0.028,-0.003]	[-0.002,0.010]
HH size	0.001	0.000	0.000	-0.004	-0.005	-0.002*	-0.003**	0.000	-0.003	0.001	-0.005***	0.000
	[-0.006,0.008]	[-0.001,0.001]	[-0.013,0.014]	[-0.011,0.004]	[-0.010,0.001]	[-0.004,0.000]	[-0.006,-0.000]	[-0.001,0.001]	[-0.009,0.004]	[-0.003,0.006]	[-0.009,-0.002]	[-0.003,0.002]
Intercept	-0.004	0.035	0.518***	0.173*	0.193*	0.132***	0.240***	0.015	0.330**	0.046*	0.201***	0.026**
	[-0.295,0.288]	[-0.040,0.111]	[0.151,0.885]	[-0.019,0.366]	[-0.030,0.416]	[0.037,0.226]	[0.146,0.334]	[-0.011,0.040]	[0.030,0.631]	[-0.010,0.103]	[0.116,0.286]	[0.001,0.052]
R2	0.003	0.006	0.013	0.005	0.006	0.003	0.005	0.001	0.007	0.004	0.005	0.001

Notes: Signif. codes: *** = $p < 0.01$, ** = $0.01 \le p < 0.05$, * = $0.05 \le p < 0.1$.

***Table A16**. Predictors of cycling distances (km) for weekday nonwork trips by gender*

		Asuncion		Bogota		Buenos Aires		Mexico City		Santiago		Sao Paulo	
	Ind. var.	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Physical env. Var.	Accessibility			-0.002	-0.004**	0.001	-0.002*	0.001	0.000	0.002	-0.001	0.001	0.000
				[-0.008,0.004]	[-0.007,-0.000]	[-0.003,0.005]	[-0.004,0.000]	[-0.003,0.005]	[-0.001,0.000]	[-0.006,0.010]	[-0.004,0.002]	[-0.001,0.002]	[-0.000,0.000]
	LTS 1 & 2			0.007	-0.01	-0.078	-0.022	0.000	-0.002	-0.079**	-0.034	-0.015	0.000
	(%)			[-0.131,0.145]	[-0.079,0.059]	[-0.187,0.031]	[-0.054,0.009]	[-0.026,0.026]	[-0.014,0.010]	[-0.140,-0.017]	[-0.086,0.018]	[-0.045,0.015]	[-0.004,0.004]
	Bicycle lane			0.001	-0.001	0.006	0.007	0.008	-0.001	0.006	0.003	0.001	0.001
	(total km)			[-0.012,0.015]	[-0.008,0.006]	[-0.027,0.040]	[-0.003,0.018]	[-0.003,0.019]	[-0.002,0.001]	[-0.002,0.015]	[-0.001,0.008]	[-0.003,0.004]	[-0.001,0.002]
	Speed limit			0.000	0.001	-0.003	-0.001*	-0.001	-0.000*	0.000	-0.001	0.000	0.000
	(avg km/h)			[-0.003,0.003]	[-0.002,0.003]	[-0.006,0.001]	[-0.002,0.000]	[-0.002,0.001]	[-0.001,0.000]	[-0.001,0.001]	[-0.003,0.001]	[-0.001,0.001]	[-0.000,0.000]
	Road			-0.003**	-0.003***	-0.001	0.000	0.000	0.000	0.000	-0.002	-0.001	0.000
	(total km)			[-0.005,-0.000]	[-0.004,-0.001]	[-0.004,0.001]	[-0.001,0.001]	[-0.001,0.000]	[-0.000,0.000]	[-0.001,0.000]	[-0.005,0.001]	[-0.002,0.001]	[-0.000,0.000]
	Slope			-0.006***	-0.005***	-0.004*	-0.003***	-0.001***	-0.001***	-0.001	0.001	-0.001*	-0.000**
	(avg %)			[-0.009,-0.003]	[-0.007,-0.002]	[-0.009,0.001]	[-0.005,-0.001]	[-0.002,-	[-0.001,-0.000]	[-0.003,0.002]	[-0.004,0.005]	[-0.001,0.000]	[-0.000,-0.000]
Individual var.	Age 18-64 yrs			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs			0.012	0.002	-0.035**	0.004	-0.007**	0.000	-0.041***	-0.055	0.017	0.000
				[-0.017,0.040]	[-0.018,0.022]	[-0.066,-0.004]	[-0.004,0.012]	[-0.014,-	[-0.003,0.003]	[-0.065,-0.016]	[-0.155,0.045]	[-0.010,0.044]	[-0.001,0.001]
	Age ≥ 65 yrs			-0.025	-0.012	0.015	-0.001	0.002	0.000	-0.004	-0.008***	-0.011***	-0.001
				[-0.056,0.007]	[-0.038,0.013]	[-0.007,0.037]	[-0.008,0.006]	[-0.008,0.012]	[-0.003,0.003]	[-0.015,0.007]	[-0.014,-0.003]	[-0.018,-0.005]	[-0.003,0.001]
	Student			-0.004	-0.002	0.025**	0.000	0.000	0.001	0.035***	0.05	-0.015	0.001
				[-0.027,0.020]	[-0.018,0.015]	[0.001,0.048]	[-0.010,0.011]	[-0.006,0.006]	[-0.002,0.004]	[0.011,0.060]	[-0.039,0.140]	[-0.039,0.008]	[-0.000,0.002]
	Hkpr/fam wkr			0.018	0.004	-0.014***	0.010*	-0.004	0.007***	0.019	-0.008	-0.006***	0.001
				[-0.012,0.048]	[-0.019,0.026]	[-0.023,-0.006]	[-0.001,0.022]	[-0.020,0.012]	[0.004,0.011]	[-0.022,0.059]	[-0.026,0.011]	[-0.010,-0.002]	[-0.001,0.002]
	Unemployed			0.027	-0.008	0.045**	-0.002	0.016**	0.003	0.054**	0.002	0.008**	0.001
				[-0.018,0.073]	[-0.027,0.011]	[0.008,0.081]	[-0.010,0.007]	[0.003,0.029]	[-0.001,0.007]	[0.008,0.100]	[-0.011,0.015]	[0.001,0.015]	[-0.001,0.004]
	Head of HH			0.021*	0.023	0.012*	0.007	0.006*	0.000	0.008	0.007**	-0.002	0.000
				[-0.004,0.046]	[-0.009,0.054]	[-0.001,0.025]	[-0.004,0.018]	[-0.000,0.012]	[-0.004,0.003]	[-0.005,0.021]	[-0.000,0.014]	[-0.007,0.003]	[-0.001,0.002]
	Single parent			-0.006	-0.033	-0.01	-0.021**	0.039	-0.007***	-0.018*	-0.02	-0.010***	-0.001
				[-0.072,0.061]	[-0.080,0.013]	[-0.056,0.036]	[-0.043,0.000]	[-0.067,0.145]	[-0.012,-0.002]	[-0.040,0.004]	[-0.078,0.039]	[-0.016,-0.004]	[-0.003,0.002]
	N of children			0.003	0.023***	0.005	0.012***	-0.001	0.005***	0.001	0.028	0.002	0.000
				[-0.012,0.019]	[0.009,0.037]	[-0.003,0.013]	[0.005,0.019]	[-0.004,0.002]	[0.002,0.007]	[-0.006,0.007]	[-0.020,0.077]	[-0.001,0.005]	[-0.001,0.001]
	Educ, ≤ prim			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, sec			0.018	-0.004	-0.008	0.009	-0.002	0.003**	-0.014**	-0.021	0.000	0.000
				[-0.005,0.040]	[-0.023,0.015]	[-0.022,0.007]	[-0.003,0.022]	[-0.008,0.004]	[0.001,0.006]	[-0.025,-0.002]	[-0.058,0.016]	[-0.006,0.006]	[-0.001,0.001]
	Educ, ≥ coll			0.014	-0.006	-0.015**	0.007	-0.005	0.002	-0.007	-0.029	-0.003	0.002*
				[-0.009,0.037]	[-0.037,0.026]	[-0.029,-0.002]	[-0.004,0.019]	[-0.013,0.003]	[-0.002,0.006]	[-0.021,0.007]	[-0.092,0.034]	[-0.010,0.005]	[-0.000,0.004]
HH var.	Income, low			ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, mid			-0.013	-0.014	0.007	-0.004	-0.001	-0.002	0.001	0.007	-0.003	0.000
				[-0.034,0.007]	[-0.036,0.007]	[-0.016,0.029]	[-0.016,0.007]	[-0.006,0.004]	[-0.005,0.001]	[-0.009,0.010]	[-0.015,0.029]	[-0.008,0.002]	[-0.001,0.002]
	Income, high			-0.015	-0.005	-0.005	-0.008	-0.004	0.000	0.011*	0.005	0.000	-0.001
				[-0.036,0.007]	[-0.037,0.027]	[-0.025,0.014]	[-0.021,0.005]	[-0.010,0.001]	[-0.005,0.006]	[-0.001,0.022]	[-0.008,0.017]	[-0.006,0.006]	[-0.002,0.000]
	HH size			-0.003	0.003	-0.002	-0.002***	0.000	0.000	-0.003	-0.002**	-0.003***	0.000
				[-0.010,0.004]	[-0.005,0.010]	[-0.007,0.003]	[-0.003,-0.001]	[-0.001,0.001]	[-0.001,0.001]	[-0.007,0.002]	[-0.003,-0.000]	[-0.004,-0.001]	[-0.000,0.000]
	Intercept			0.12	0.073	0.213*	0.087**	0.044	0.02	0.098**	0.114	0.041	0.01
				[-0.067,0.308]	[-0.037,0.184]	[-0.037,0.464]	[-0.000,0.175]	[-0.019,0.107]	[-0.006,0.046]	[0.022,0.174]	[-0.076,0.305]	[-0.037,0.119]	[-0.003,0.022]
	R2			0.001	0.001	0.001	0.003	0.001	0.001	0.005	0.002	0.001	0.001

Notes: Signif. codes: *** = p < 0.01, ** = 0.01 ≤ p < 0.05, * = 0.05 ≤ p < 0.1.

Table A17. Pooled model with interactions – Predictors of bicycle mode choice

		ASUNCION			BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
	Explanatory variables	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.
Physical env.	Accessibility index		0.91		1.05	1.04	1.05	0.91	0.92	0.76	1.01	1.02	0.97	1.01	1.01	0.99	1.10	1.11	1.04
	LTS 1 & 2 (%)				0.89	0.63	2.52	0.88	1.10	0.36	1.30	1.37	0.95	0.61	0.73	0.26	0.34	0.28	0.60
	Bicycle lane (total km)		1.38		1.12	1.13	1.23				1.28	1.32	1.13	1.29	1.29	1.28	1.27	1.28	1.17
	Speed limit (avg km/h)		1.05		1.00	1.00	0.99	1.00	1.02	0.92	0.98	0.99	0.98	1.00	1.00	1.01	0.98	0.97	1.02
	Road (total km)		1.07		0.97	0.97	0.96	0.96	0.95	0.95	0.96	0.96	0.98	0.97	0.97	0.98	0.97	0.98	0.94
	Slope (avg %)		0.92		0.85	0.85	0.85	0.90	0.91	0.88	0.86	0.86	0.86	1.00	1.00	0.98	0.93	0.92	0.93
Individual var.	Age 18-64 yrs		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs		0.22		1.36	1.45	1.68	1.63	1.89	0.93	0.73	0.77	0.54	0.20	0.14	0.29	1.54	1.23	3.60
	Age ≥ 65 yrs		1.33		0.30	0.13	0.74	0.46	0.22	3.24	0.72	0.44	1.81	0.49	0.31	1.06	0.22	0.25	0.16
	Student		0.98		1.05	1.17	0.40	0.31	0.28	0.62	0.59	0.54	0.90	1.01	0.85	2.21	0.23	0.22	0.32
	Hkpr/fam wkr				0.41	0.07	1.59	0.67	0.36	3.95	0.63		3.06	0.81		4.41			
	Unemployed				0.40	0.16	1.39	0.29	0.23	1.24	0.57	0.28	1.68	0.50	0.04	3.31	0.35	0.08	2.63
	Head of HH		0.66		0.85	0.80	0.97	1.04	1.00	1.31	1.05	0.98	1.23	1.00	1.03	1.03	0.89	0.86	0.85
	Single parent				1.37	0.38	4.34	0.94	0.89	2.08	1.23	0.95	2.06	1.22	0.88	1.27	0.53		3.09
	Num. of children		1.53		1.16	1.05	1.50	1.20	1.16	1.65	1.09	1.11	1.03	1.03	1.02	1.06	1.42	1.41	1.41
	Educ, ≤ primary		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, secondary		0.75		1.05	1.11	0.91	0.62	0.67	0.24	0.61	0.56	0.85	0.57	0.58	0.42	0.72	0.67	1.14
	Educ, ≥ college		0.45		0.98	1.16	0.68	0.35	0.32	0.51	0.31	0.25	0.70	0.46	0.43	0.50	0.75	0.75	0.98
HH var.	Income, low		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, middle		0.49		0.77	0.74	0.88	1.11	1.10	1.19	0.54	0.51	0.66	0.85	0.88	0.76	0.80	0.77	0.99
	Income, high		1.81		0.58	0.57	0.61	1.08	1.05	1.24	0.48	0.53	0.36	0.86	0.75	1.48	0.75	0.66	1.53
	HH size		0.83		0.99	0.98	0.97	0.96	0.96	0.85	0.96	0.95	0.95	0.95	0.98	0.79	0.86	0.88	0.75
	Intercept		0.00		0.16	0.21	0.02	0.10	0.04	0.48	0.46	0.42	0.06	0.17	0.17	0.06	0.38	0.69	0.01
Physical env. var.	W x Accessibility				0.95	0.97	0.92	0.73	0.70	0.85	1.00	0.99	1.04	1.01	1.02	0.96	0.95	0.96	0.76
	W x LTS 1 & 2				3.94	2.17	4.63	0.88	0.56	2.81	0.86	0.69	1.31	0.25	0.11	1.07	0.89	0.91	1.51
	W x Bicycle lane				1.05	0.94	1.04				0.88	1.00	0.85	1.06	1.11	0.99	1.33	1.30	1.44
	W x Speed limit		1.16		0.98	0.97	1.02	0.96	0.93	1.06	0.99	0.98	0.99	0.97	0.98	0.97	0.97	1.02	0.85
	W x Road		0.78		1.00	1.01	1.00	1.00	1.01	1.01	1.01	1.02	1.00	1.00	1.03	0.97	0.95	0.94	0.99
	W x Slope		1.10		0.98	0.99	0.98	0.89	0.90	0.84	0.93	0.91	0.94	1.06	1.02	1.12	0.96	0.97	0.87
Individual var.	W x Age 18-64 yrs		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	W x Age < 18 yrs				1.42	1.24	0.53	0.76	1.07	0.15	2.01	2.72	1.34	1.92	3.21	1.60	0.25	0.36	0.08
	W x Age ≥ 65 yrs				0.09		0.06	0.19	0.08	0.07	0.56	0.49	0.30	0.27	0.25	0.18	0.68	1.16	1.18
	W x Student		4.48		1.18	1.23	1.81	1.57	1.10	1.82	1.67	2.54	1.03	1.42	1.98	0.99	16.83	15.38	20.39
	W x Hkpr/fam wkr				1.55	0.76	0.93	1.20	0.22	0.61	1.62		0.88	0.51		0.31			
	W x Unemployed				0.94	0.88	0.62	3.54	2.70	1.60	1.32	0.96	1.19	0.22		0.12	2.36	4.34	1.25
	W x Head of HH		3.01		1.27	1.26	1.19	0.93	1.00	0.71	1.02	1.37	0.86	1.10	1.00	1.53	1.03	0.99	1.97
	W x Single parent				0.54	1.64	0.21	0.58	0.94	0.17	0.70	0.87	0.56	0.71	0.83	0.95	1.78		0.51
	W x Num. of children		1.25		1.62	1.28	1.75	1.21	0.94	1.12	1.23	1.05	1.33	1.18	0.92	1.27	0.78	0.80	0.80
	W x Educ, ≤ primary		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	W x Educ, secondary		2.45		0.89	0.67	1.43	1.35	0.98	3.96	1.42	1.17	1.60	1.82	1.86	2.56	1.75	2.00	1.27
	W x Educ, ≥ college				0.87	0.80	1.20	3.21	4.14	1.32	2.19	2.73	1.57	2.94	4.46	2.67	5.29	4.72	7.66
HH var.	W x Income, low		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	W x Income, middle				0.98	0.97	1.04	0.99	1.03	0.78	0.93	1.05	0.73	0.85	1.45	0.70	1.43	1.81	0.76
	W x Income, high		1.24		0.90	0.78	1.27	0.76	0.73	0.73	1.00	0.88	1.46	0.95	1.92	0.58	1.38	1.92	0.42
	W x HH size		1.28		0.89	0.96	0.79	0.91	0.95	0.90	1.00	0.99	1.02	1.05	1.04	1.16	1.02	0.95	1.49
	Women		0.00		0.24	0.59	0.16	4.79	18.23	0.17	0.47	0.39	0.56	0.87	0.24	0.68	0.31	0.04	28.76
	Pseudo R2		0.088		0.081	0.109	0.085	0.061	0.087	0.113	0.084	0.111	0.069	0.080	0.100	0.072	0.114	0.134	0.090

Notes: Exponentiated coefficients. Blue/Red highlighting = a statistically significant positive/negative estimate with at least $p < 0.1$. Nw.= Nonwork.

Table A18. Pooled model with interactions – Predictors of cycling distances (km)

		ASUNCION			BOGOTA			BUENOS AIRES			MEXICO CITY			SANTIAGO			SAO PAULO		
	Explanatory variables	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.	Total	Work	Nw.
Physical env.	Accessibility index		0.0000		-0.0051	-0.0032	-0.0019	-0.0081	-0.0092	0.0012	0.0016	0.0007	0.0009	0.0022	-0.0002	0.0024	0.0104	0.0096	0.0008
	LTS 1 & 2 (%)		-0.0148		0.2586	0.2512	0.0074	-0.0896	-0.0121	-0.0775	0.0461	0.0462	-0.0002	-0.1018	-0.0232	-0.0785	-0.0580	-0.0432	-0.0148
	Bicycle lane (total km)		0.0042		0.0214	0.0200	0.0015	0.0151	0.0091	0.0061	0.0242	0.0164	0.0078	0.0321	0.0256	0.0064	0.0075	0.0069	0.0006
	Speed limit (avg km/h)		0.0006		-0.0019	-0.0017	-0.0003	-0.0020	0.0005	-0.0026	-0.0021	-0.0016	-0.0005	-0.0015	-0.0013	-0.0002	-0.0012	-0.0012	0.0000
	Road (total km)		-0.0005		-0.0093	-0.0066	-0.0027	-0.0032	-0.0019	-0.0014	-0.0033	-0.0032	-0.0002	-0.0036	-0.0033	-0.0003	-0.0015	-0.0009	-0.0006
	Slope (avg %)		-0.0046		-0.0310	-0.0252	-0.0058	-0.0149	-0.0105	-0.0044	-0.0078	-0.0067	-0.0011	-0.0026	-0.0021	-0.0005	-0.0033	-0.0027	-0.0006
Individual var.	Age 18-64 yrs		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Age < 18 yrs		-0.0189		-0.2161	-0.2278	0.0117	-0.0646	-0.0300	-0.0347	-0.0522	-0.0451	-0.0071	-0.1722	-0.1315	-0.0407	0.0024	-0.0142	0.0166
	Age ≥ 65 yrs		0.0011		-0.2447	-0.2200	-0.0248	-0.0855	-0.1008	0.0153	-0.0494	-0.0518	0.0024	-0.1130	-0.1089	-0.0041	-0.0266	-0.0152	-0.0114
	Student		0.0200		-0.0377	-0.0342	-0.0035	-0.0342	-0.0588	0.0247	-0.0258	-0.0258	0.0001	0.0175	-0.0177	0.0352	-0.0447	-0.0293	-0.0153
	Hkpr/fam wkr		-0.0059		-0.2362	-0.2541	0.0179	-0.1063	-0.0920	-0.0144	-0.0696	-0.0657	-0.0038	-0.1035	-0.1220	0.0186	-0.0597	-0.0536	-0.0061
	Unemployed		-0.0165		-0.2187	-0.2461	0.0274	-0.0370	-0.0816	0.0446	-0.0304	-0.0464	0.0160	-0.0686	-0.1222	0.0536	-0.0393	-0.0473	0.0080
	Head of HH		0.0223		-0.0128	-0.0338	0.0210	0.0238	0.0114	0.0124	0.0016	-0.0044	0.0060	0.0189	0.0113	0.0076	-0.0085	-0.0066	-0.0019
	Single parent		-0.0402		-0.1898	-0.1843	-0.0056	0.0347	0.0445	-0.0098	0.0265	-0.0126	0.0391	-0.0509	-0.0327	-0.0182	-0.0761	-0.0661	-0.0100
	Num. of children		0.0153		0.0573	0.0540	0.0034	0.0246	0.0197	0.0048	0.0096	0.0104	-0.0008	-0.0018	-0.0026	0.0008	0.0223	0.0204	0.0019
	Educ, ≤ primary		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Educ, secondary		0.0055		0.0068	-0.0108	0.0176	-0.0470	-0.0391	-0.0078	-0.0222	-0.0202	-0.0021	-0.0761	-0.0622	-0.0139	-0.0184	-0.0184	0.0001
	Educ, ≥ college		-0.0046		-0.0746	-0.0886	0.0141	-0.0791	-0.0637	-0.0154	-0.0514	-0.0462	-0.0052	-0.0918	-0.0846	-0.0073	-0.0096	-0.0069	-0.0027
HH var.	Income, low		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Income, middle		0.0137		-0.0952	-0.0821	-0.0131	0.0042	-0.0025	0.0067	-0.0326	-0.0317	-0.0009	-0.0071	-0.0077	0.0006	-0.0112	-0.0082	-0.0030
	Income, high		0.0254		-0.1702	-0.1556	-0.0146	-0.0236	-0.0183	-0.0053	-0.0223	-0.0180	-0.0043	-0.0211	-0.0319	0.0107	-0.0156	-0.0155	-0.0001
	HH size		0.0006		-0.0031	0.0001	-0.0032	-0.0065	-0.0046	-0.0019	-0.0033	-0.0031	-0.0001	-0.0057	-0.0027	-0.0030	-0.0081	-0.0054	-0.0027
	Intercept		-0.0037		0.6382	0.5180	0.1202	0.4062	0.1928	0.2134	0.2838	0.2402	0.0436	0.4284	0.3304	0.0980	0.2420	0.2008	0.0413
Physical env. var.	W x Accessibility		-0.0007		-0.0019	0.0001	-0.0020	0.0030	0.0062	-0.0032	-0.0015	-0.0003	-0.0012	-0.0020	0.0015	-0.0035	-0.0107	-0.0098	-0.0009
	W x LTS 1 & 2		-0.0103		-0.1853	-0.1676	-0.0177	0.0571	0.0019	0.0553	-0.0388	-0.0371	-0.0016	0.0337	-0.0113	0.0450	0.0529	0.0381	0.0148
	W x Bicycle lane		-0.0052		-0.0186	-0.0158	-0.0028	-0.0087	-0.0099	0.0012	-0.0195	-0.0111	-0.0084	-0.0160	-0.0130	-0.0030	-0.0025	-0.0027	0.0002
	W x Speed limit		-0.0008		0.0025	0.0016	0.0009	-0.0002	-0.0016	0.0014	0.0018	0.0016	0.0002	0.0007	0.0014	-0.0007	0.0009	0.0011	-0.0002
	W x Road		0.0002		0.0032	0.0031	0.0001	0.0005	-0.0005	0.0010	0.0028	0.0028	0.0001	0.0013	0.0028	-0.0015	0.0007	0.0002	0.0005
	W x Slope		0.0038		0.0175	0.0164	0.0011	0.0097	0.0083	0.0014	0.0064	0.0059	0.0005	0.0039	0.0026	0.0013	0.0030	0.0026	0.0004
Individual var.	W x Age 18-64 yrs		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	W x Age < 18 yrs		0.0142		0.2094	0.2193	-0.0098	0.0747	0.0357	0.0390	0.0537	0.0467	0.0070	0.1017	0.1164	-0.0147	-0.0145	0.0022	-0.0167
	W x Age ≥ 65 yrs		-0.0007		0.2001	0.1877	0.0124	0.0538	0.0702	-0.0164	0.0439	0.0463	-0.0025	0.0850	0.0893	-0.0043	0.0211	0.0108	0.0103
	W x Student		-0.0187		0.0290	0.0270	0.0020	0.0014	0.0256	-0.0242	0.0214	0.0206	0.0008	0.0357	0.0206	0.0151	0.0507	0.0347	0.0160
	W x Hkpr/fam wkr		0.0007		0.1442	0.1584	-0.0142	0.0822	0.0575	0.0247	0.0646	0.0534	0.0112	0.0756	0.1018	-0.0263	0.0523	0.0454	0.0069
	W x Unemployed		0.0137		0.1215	0.1570	-0.0355	0.0149	0.0610	-0.0461	0.0219	0.0348	-0.0130	0.0426	0.0941	-0.0515	0.0339	0.0405	-0.0066
	W x Head of HH		-0.0221		0.0223	0.0206	0.0017	-0.0253	-0.0200	-0.0053	-0.0013	0.0052	-0.0065	-0.0160	-0.0156	-0.0004	0.0105	0.0082	0.0023
	W x Single parent		0.0323		0.1180	0.1459	-0.0279	-0.0667	-0.0552	-0.0115	-0.0372	0.0091	-0.0463	0.0310	0.0326	-0.0016	0.0681	0.0588	0.0094
	W x Num. of children		-0.0107		-0.0049	-0.0247	0.0198	-0.0112	-0.0182	0.0070	-0.0044	-0.0098	0.0054	0.0273	-0.0002	0.0275	-0.0222	-0.0206	-0.0016
	W x Educ, ≤ primary		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	W x Educ, secondary		-0.0059		-0.0328	-0.0114	-0.0215	0.0519	0.0347	0.0172	0.0255	0.0202	0.0053	0.0512	0.0581	-0.0069	0.0181	0.0180	0.0002
	W x Educ, ≥ college		-0.0001		0.0251	0.0448	-0.0197	0.0912	0.0684	0.0228	0.0526	0.0456	0.0070	0.0807	0.1025	-0.0218	0.0125	0.0078	0.0047
HH var.	W x Income, low		ref.		ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	W x Income, middle		-0.0170		0.0738	0.0749	-0.0011	-0.0030	0.0079	-0.0110	0.0298	0.0309	-0.0011	0.0090	0.0026	0.0064	0.0118	0.0085	0.0033
	W x Income, high		-0.0271		0.1380	0.1284	0.0097	0.0154	0.0180	-0.0026	0.0195	0.0150	0.0045	0.0207	0.0268	-0.0061	0.0187	0.0193	-0.0007
	W x HH size		-0.0003		0.0021	-0.0038	0.0058	0.0026	0.0025	0.0001	0.0032	0.0031	0.0001	0.0052	0.0039	0.0014	0.0077	0.0051	0.0026
	Women		0.0389		-0.3916	-0.3448	-0.0468	-0.1872	-0.0612	-0.1260	-0.2489	-0.2256	-0.0234	-0.2676	-0.2839	0.0164	-0.2062	-0.1744	-0.0318
	R2		0.0037		0.0137	0.0154	0.0015	0.0060	0.0072	0.0016	0.0059	0.0062	0.0010	0.0080	0.0094	0.0031	0.0065	0.0065	0.0016

Notes: Exponentiated coefficients. Blue/Red highlighting = a statistically significant positive/negative estimate with at least $p < 0.1$. Nw.= Nonwork