

Introduction

Cuba stands out as one of the world's leading proponents of low-carbon mobility, placing a strong emphasis on any form of public or shared transportation while limiting the presence of automobiles. This unique setting could be an intriguing opportunity for conducting a live experiment to explore the hypothesis that individuals used to rely on high quality public transportation systems may not aspire to car ownership. However, in recent years, Cuba has faced significant challenges in maintaining the supply and reliability of its public transportation systems. The country has been grappling with a series of crises, including the COVID-19 pandemic and energy shortages, which have compounded the enduring impact of the long-standing and increasingly stringent U.S. embargo. These factors have collectively led to a substantial scarcity of essential materials, affecting various sectors, including transportation. Within the transportation sector, shortages extend to vehicles, tools, spare parts, and even fuel, severely straining the availability and effectiveness of transportation services.

Little is known about mobility patterns in Cuba. To date, the existing literature has focused mainly on Havana and is somewhat outdated. There is thus a geographic and temporal gap in researching other peripheral areas such as Santiago de Cuba. Moreover, no research has been conducted to address the impact of transport scarcity on women's mobility experiences and its implications for their everyday lives. This is of particular interest not only for Cuba, or other developing countries, but also globally, in light of the current climate emergency, when limited availability of resources is just a matter of time.

This research aims to address the following questions: 1) *How do women experience mobility within the context of transport scarcity?* 2) *What determines their travel behavior?* 3) *What impact does the scarcity have on women's daily lives?* By scrutinizing the narratives of women passengers in Santiago de Cuba concerning their daily mobility, this study aims to gain insights into their travel behavior, experiences, coping strategies, and preferences. Additionally, it seeks to explain how these mobility challenges influence their other social roles and engagement in daily activities.

Gendered travel behavior in developing countries

Mobility behavior is influenced by diverse factors including built environment, economic context, and personal characteristics. Women's travel patterns consistently differ from men's, characterized by unequal access to transportation services and higher levels of fear and anxiety during travel, especially among economically disadvantaged women in developing countries.

A wide body of literature has been produced examining gender issues in transportation in the Global South. Studies often aim to both report gender disparities in travel patterns and enhance our understanding of the challenges women face in accessing opportunities. Methodologically, research on women's issues in transportation in developing economies is based primarily on the qualitative approach. Partially, this is due to the lack of reliable representative data in these contexts, and partially, it is done on purpose, achieving what would be impossible through surveys - the depth of discourses on travel experiences, corresponding decision making processes, preferences and implications on family life stemming from limited access to affordable and reliable transport.

Women's travel patterns have been found to mirror the stages of economic development, with access to transportation resources influenced by an individual's economic and social status. Furthermore, their travel behavior is intricately linked to the type of household they inhabit and the corresponding roles and

responsibilities they assume within that household. Additionally, these patterns are influenced by cultural norms and traditions. Women's mobility often exhibits greater complexity and a tendency for trip-chaining, particularly when they need to integrate non-work-related trips with their daily commutes. This leads to an increased number of trips and longer travel durations compared to their male counterparts. In other contexts, the situation is reversed. For example in India and the Arab world, women are less mobile than men, performing less trips and using fewer modal options.

Regarding the use of modes of transport, in environments when reaching destinations on foot is feasible, most of women's trips are walking. When motorized transport is needed due to large distances, women mainly rely on public modes, having limited access to private vehicle. According to a study by Ng and Acker (2018) analyzing mobility patterns in several cities – including Jakarta, Kuala Lumpur and Manila – women tend to use more public transport modes and use taxi services than driving cars or motorcycles. Indeed, in many contexts women make up for the majority of public transport users. Moreover, insights from different countries evidence that women are more likely than men to use informal forms of transport. Sometimes, those are cheaper than other options and poor women choose them due to affordability, while in other occasions, they need to use more expensive forms of paratransit to get to a distant workplace. In Saudi Arabia, women are forced to use taxis also for shopping and leisure activities due to a poor public transport service.

Implications of mobility on women's everyday life

Since women predominantly rely on public transport and walking, women's mobility model contributes to a more sustainable model with reduced energy consumption and emissions. However, this pattern is also associated with notable disparities in access to transportation options.

These disparities are discussed in literature in terms of exclusion since limited transport access directly translates into restricted opportunities. One of the key barriers faced by women is the cost of transportation. Women are more likely than men to experience poverty, lower wages, part-time employment and unemployment, which results in limited access to opportunities. For example, a study in Jordan found that 40% of the women reported a lack of affordable transport as a barrier to getting a job. This lack of access perpetuates a cycle where transportation barriers hinder women's financial independence and employment prospects.

Additionally, the reliance on slower modes of transportation and the heavier burden of care-related responsibilities contribute to time constraints for women. This situation often leads to their exclusion from the labor market due to high opportunity costs. For example, Israeli-Arab women face obstacles in labor market participation due to limited public transportation accessibility and inefficiencies within their towns. In contrast, Jordanian women grapple with low salaries and long commute times, making workforce participation financially less rewarding.

Another significant aspect of the scholarship dedicated to women's travel behavior addresses security issues. Safety concerns often limit women's mobility and, consequently, their engagement in activities. Some research explores different approaches to address gender-based violence and harassment in public transport, such as the examination of pros and cons of gender-segregated carriages or women-only vehicles. Findings by Martinez et al. (2019) from Lima suggest that infrastructure investments that enhance convenience and safety for women using public transport can have positive impacts on their labor market participation.

Transport in Cuba

Transport availability and mobility patterns in Cuba are influenced by a complex interplay of historical, socio-economic, and political factors. The country's low car-ownership rates and limited public transport services stem from its tumultuous history, including the economic crisis of the Special Period following the collapse of the Soviet Union. This crisis, compounded by the ongoing US embargo, led to severe scarcity of resources across all sectors, forcing Cuba to adopt a low-consumption lifestyle. The government implemented measures such as rationing food, energy, and oil, resulting in a significant decline in oil imports and shortages in vehicles and spare parts.

Public transport in Cuba faced challenges as it struggled to accommodate new passengers who transitioned from cars due to oil shortages, while also coping with supply cuts. Various solutions were implemented to address these mobility needs, including purchasing bicycles from China, adapting tracks for public transport, and introducing mandatory car-pooling of state-owned vehicles. Additionally, efforts were made to decentralize sectors such as education and health care and relocate industries closer to residential areas to reduce reliance on motorized transport.

In recent years, Cuba has faced additional challenges including an energy crisis since 2018 and the impact of the COVID-19 pandemic, further exacerbating its transportation woes. In Santiago, these difficulties manifest as a limited number of public transport vehicles, scarcity of spare parts, and severe fuel shortages, resulting in longer waiting times and hindering people's mobility and access to opportunities.

Methods

This research uses multimethod approach, primarily based on 16 semi-structured interviews with women depending on collective transport in Santiago de Cuba, supported by shorter intercept interviews with women passengers at PT stops and onboard and in situ ethnographic observations.

The data for our research was obtained through fieldwork conducted by the authors while they were hosted at the Universidad de Oriente in Santiago de Cuba.

The researchers conducted fieldwork in May and June 2022, during Cuba's recovery from the COVID-19 pandemic, and again in February 2023 amidst the global gas crisis, providing valuable insights into the country's economic challenges and transportation sector.

To understand the mobility experiences of women passengers, we conducted in-depth interviews with 16 women relying on public transport. Using a semi-structured approach, interviews were recorded and transcribed verbatim to capture participants' perspectives accurately. Intercept interviews at transportation stops provided additional insights, allowing spontaneous conversations to better understand travel experiences. Ethnographic observations were conducted to familiarize with transportation dynamics and capture passengers' experiences in action. Data from interviews and observations underwent systematic analysis, combining inductive and deductive coding techniques to identify patterns and themes.

Preliminary findings

The preliminary findings show that the context of material scarcity translates into unpredictability and unreliability of transportation system in Santiago de Cuba. Being mobile becomes an everyday challenge.

The abovementioned difficult circumstances constrain mobility in individual motorized vehicles, but since private vehicles are hardly available, most residents in Santiago – regardless of who they are – rely on any form of public/collective transport. Some people are more or less occasionally able to choose to walk longer distances or have the luck to have a bicycle. If they depend on motorized vehicles, being mobile requires work on their side. Since the demand for PT is high, the impacts of scarcity on the service makes mobility arduous, hectic and limited. Transport scarcity requires an active participation from passengers, who actively look for transport opportunities and need to be flexible and quick in reconsidering which option suits them. Upon arrival at the stop, passengers need to find out what potential opportunities they have at the moment. They need to look around, interact with other people (passengers or employees) to ask about the current situation, approach an oncoming vehicle to check if this might be a convenient option for them. Finding transport therefore involves commitment and focus. Distraction can mean not catching the next transport. Long waiting times affect people's daily life and schedules. Prolonged waiting can sometimes be addressed by paying more for a more expensive transport mode. However this option is not possible for everybody or not everyday but rather in exceptional situations. A variety in service (public and private) that has different prices means a continuous rethinking and recalculation.

Modal choice and modal preference in a context of modal scarcity have a different meaning in a reality of material/energy abundance, where — albeit exceptions exist and this is dependent on the local/geographical context — modal choice reflect social privilege and the more privilege (in terms of class/race/gender) choose individual mobility, while the less privileged are "condemned" to use PT. In Santiago, in response to a question about modal preferences, a popular voice referred to no preference other than getting to the destination as soon as possible.

Navigating the city consumes significant time, particularly affecting women who face reduced leisure and sleep due to caregiving responsibilities. Unpredictable transport and long waits induce stress and frustration, hampering planning. Mobility demands both physical and cognitive effort, with passenger experiences often uncomfortable, especially for vulnerable groups such as seniors, pregnant women, and those with children, exacerbated by Cuba's hot weather. Limited affordable transportation options force some women to undertake exhausting journeys on foot. Balancing breadwinning and caregiving roles, women experience heightened stress and sleep deprivation. The unreliability of the transportation system complicates daily activity planning.

In conclusion, transport scarcity has a negative impact on women's health, well-being and family life.