# Cycling promotion using financial incentives: A case study in São Paulo, Brazil

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## Keywords
Cycling Promotion, Financial Incentives, Mobility Data Justice, Smart Cities, Urban Computing

## Challenge Addressed / Research Problem Investigated
This research aims to design a financial incentive-based policy for cycling promotion, offering insights for the development of sustainable urban mobility strategies in car-centric cities.

## Abstract
INTRODUCTION
The promotion of cycling as a mode of transportation has been recognized as a key strategy for achieving sustainable urban mobility and improving public health. Regardless, cycling remains a marginal mode of transport in many cities around the world. In São Paulo, Brazil's largest city with more than 12 million inhabitants and 28 million trips daily, only 0.8% of all trips were made by bicycle in 2017 (Metrô São Paulo, 2017). This is far below the potential demand for cycling estimated at 17% by our research group in a recent study (Freire et al., 2023). Despite the expansion of the cycling network from 5.8 km before 2007 to 722 km in 2023 (CET, 2023; City Hall of São Paulo, 2020), the desired related increase in bike trips has not been achieved. In response to this challenge, São Paulo's City Hall approved the Bike SP Program in 2016 (Municipal legislation, 2016), an innovative legislation aimed at encouraging cycling by granting mobility credits to individuals who utilize bicycles as a means of transportation. In the literature, personal economic incentives have been demonstrated to be successful in promoting several health-related behaviors, including smoking cessation, weight loss, physical activity, and vaccination (Kane et al., 2004; Mantzari et al., 2015; Vlaev et al., 2019).

However, the use of financial incentives to promote cycling as a mode of transportation on a large scale in a metropolis is still relatively rare and under-researched.

This lack of relevant large-scale precedents and scientific studies hampered the operationalization of the Bike SP Program. In response, we are designing, conducting, and evaluating a pilot research project in collaboration with municipal agencies and cycle mobility experts. This paper focuses on the design stage of the pilot. Across all stages, we adopt a multidisciplinary approach that combines data science and experimental modeling techniques with social science concepts on mobility data justice and cycling cities. The overall aim of the pilot is to reach a deeper understanding of the complex dynamics between financial incentives, cycling behavior, urban context, and social justice to inform the policy process of upscaling and wider implementation of the Bike SP program in São Paulo.

The objectives of the overall study are to: (1) evaluate the impact of the Bike SP program on the volume of bicycle trips made in São Paulo; (2) estimate the price elasticity of the Bike SP program, i.e., how the bicycle travel demand responds to different remuneration levels; (3) identify the demographic and socioeconomic profiles and the regions of the city that are most responsive to the Bike SP program and should be prioritized for policy targeting; and (4) consider the social justice implications at design, implementation, and evaluation stages. This paper discusses how these objectives can be addressed in the pilot's design phase.

## RESULTS OF THE DESIGN PHASE

The design phase takes place in spring-autumn 2023, with a view toward implementing a six-month pilot with 600 to 900 participants from late 2023 to early 2024. We report initial findings and insights from this stage, specifically around the following four areas.

**Considering a social justice perspective:** The pilot project's recruitment strategy and selection criteria will take into account demographic factors, income disparities, access to cycling infrastructure, and other elements, with an attempt to balance these aspects among participants. This is informed by the five factors identified by Cycling Cities (Oldenziel et al., 2016) and the mobility data justice framework (Behrendt & Sheller, 2023). This framework will be applied in the pilot design to prevent any unintended biases in our data collection and analysis and to ensure that our outcomes do not inadvertently reinforce social injustices.

**Defining implementation variables:** Regarding the pilot's structure, one of the setups under consideration is that we will divide the six-month pilot into three periods of two months each. In the first period, the participants will be randomly assigned to one of three groups: (1) control group - which receives no financial incentive for cycling, (2) low incentive group – which receives a fixed amount of mobility credits for each kilometer traveled by bicycle, and (3) high incentive group - which receives a higher amount of mobility credits for each kilometer. The amounts that each group receives will change at the beginning of every two-month period.

**Mobile app development:** We developed a mobile application[1] so that participants can register their cycling trips during the pilot. The data gathered with the app will be used to compensate users and provide input for the evaluation phase.

**Setting up the evaluation:** We set up the evaluation phase, to assess how financial incentives affect citizens' riding habits, what the social justice implications are, and to weigh the costs

and benefits of the Bike SP Program. We will use data from the pilot project to measure changes in cycling frequency, duration, distance, and mode choice among participants in different socioeconomic and demographic categories. We will also employ data from surveys gathered during the program to measure changes in perceptions, attitudes, and preferences regarding cycling before and after the pilot. The results across groups will be compared using appropriate statistical techniques to test for differences and causal effects. Qualitative observations by the researchers will also be recorded. The cycling cities and mobility data justice framework will be used to identify further challenges and opportunities for scaling up the pilot.

CONCLUSION

This study seeks to enhance our understanding of the connections between financial incentives, cycling behavior, and social justice, thereby supporting the development of inclusive and effective policies for sustainable urban mobility not only in São Paulo but also providing valuable perspectives for cycling research in the Global South. This way, the findings from this research aim to provide practical lessons for urban planners, policymakers, and researchers intending to increase cycling modal share in similar contexts worldwide, as well as serve as a model for addressing the challenges faced by other cities characterized by a car-centric culture. By participating in CRBAM23, we hope to gain valuable insights and knowledge from other researchers in the field of cycling research and contribute to the advancement of cycling promotion strategies.

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[1] Code available at https://gitlab.com/interscity/bikesp/bikespapp.

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