

Is the built-environment at origin, on route, and at destination associated with bicycle commuting? A gender-informed approach

Diana Higuera-Mendieta MD ScM

July 6 of 2021

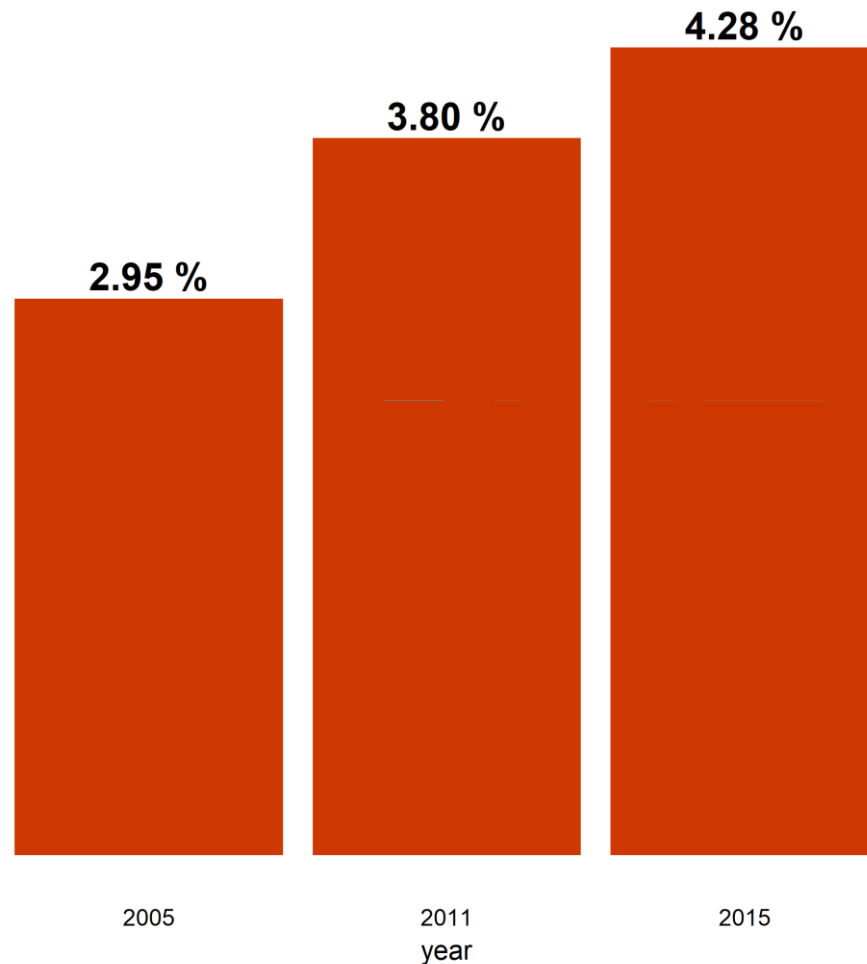
17th International Conference on Urban Health

Co-authors: Pablo Andrés Uriza M.Sc., Sergio Cabrales Ph.D, Luis Angel Guzmán, Ph.D, Andrés Medaglia Ph.D, Olga Lucía Sarmiento Ph.D



Bicycle demand has increased in Bogotá

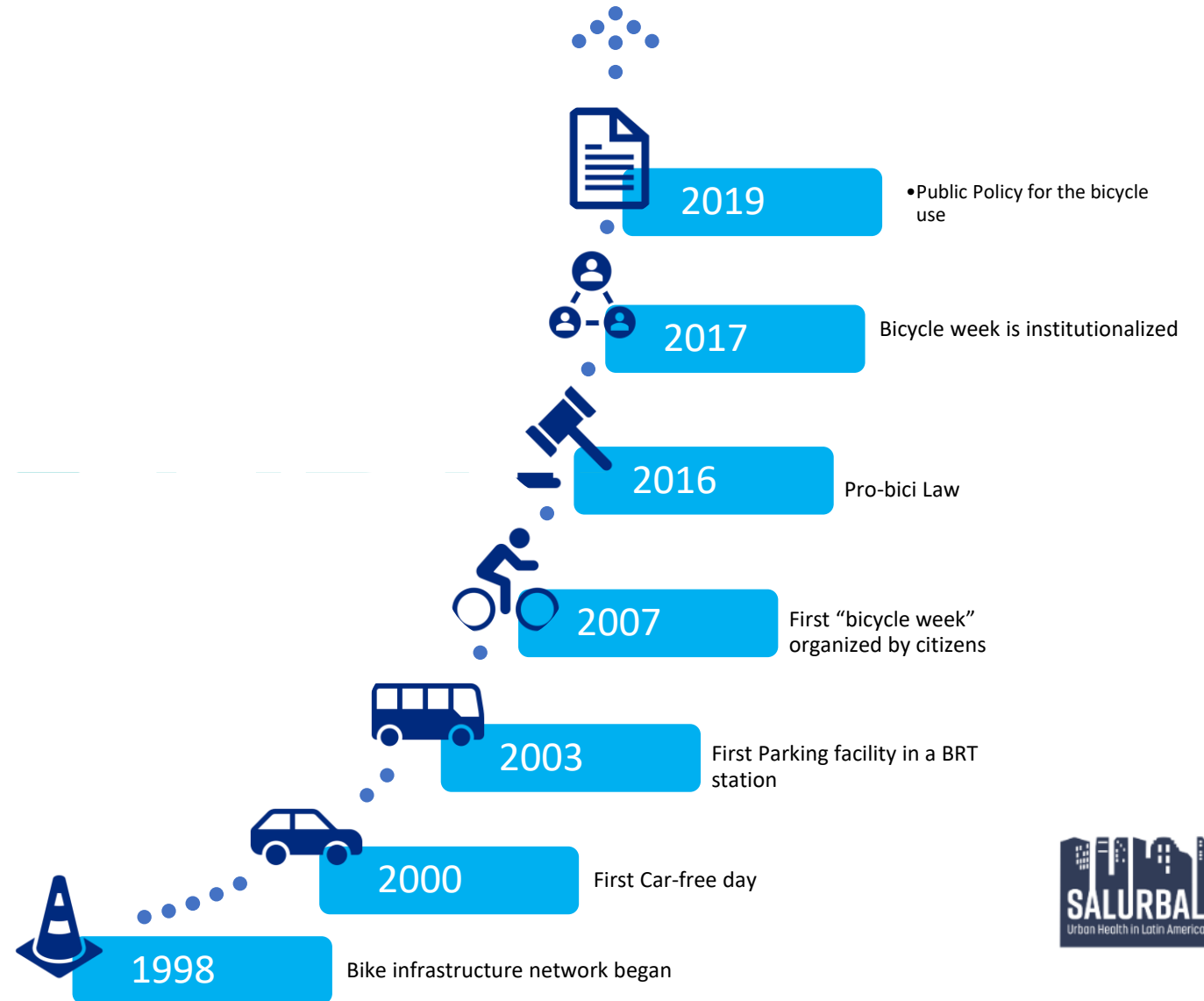
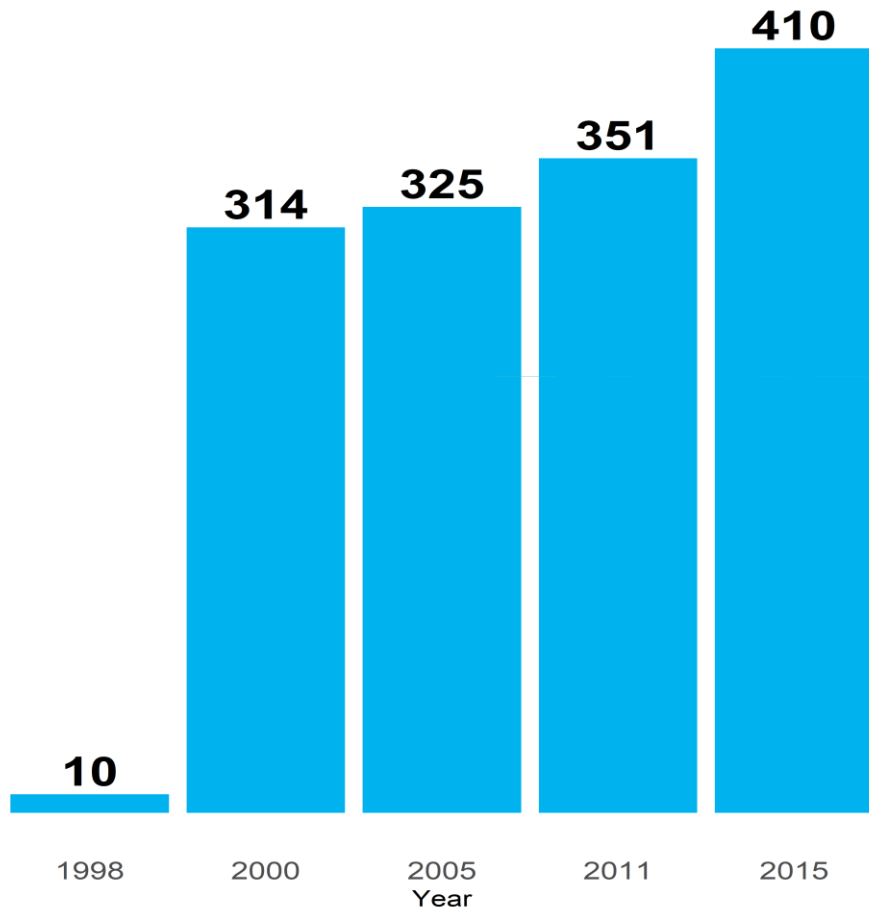
Percentage of bicycle trip share, Bogotá 2005 – 2015 ¹



Source: Alcaldía Mayor de Bogotá

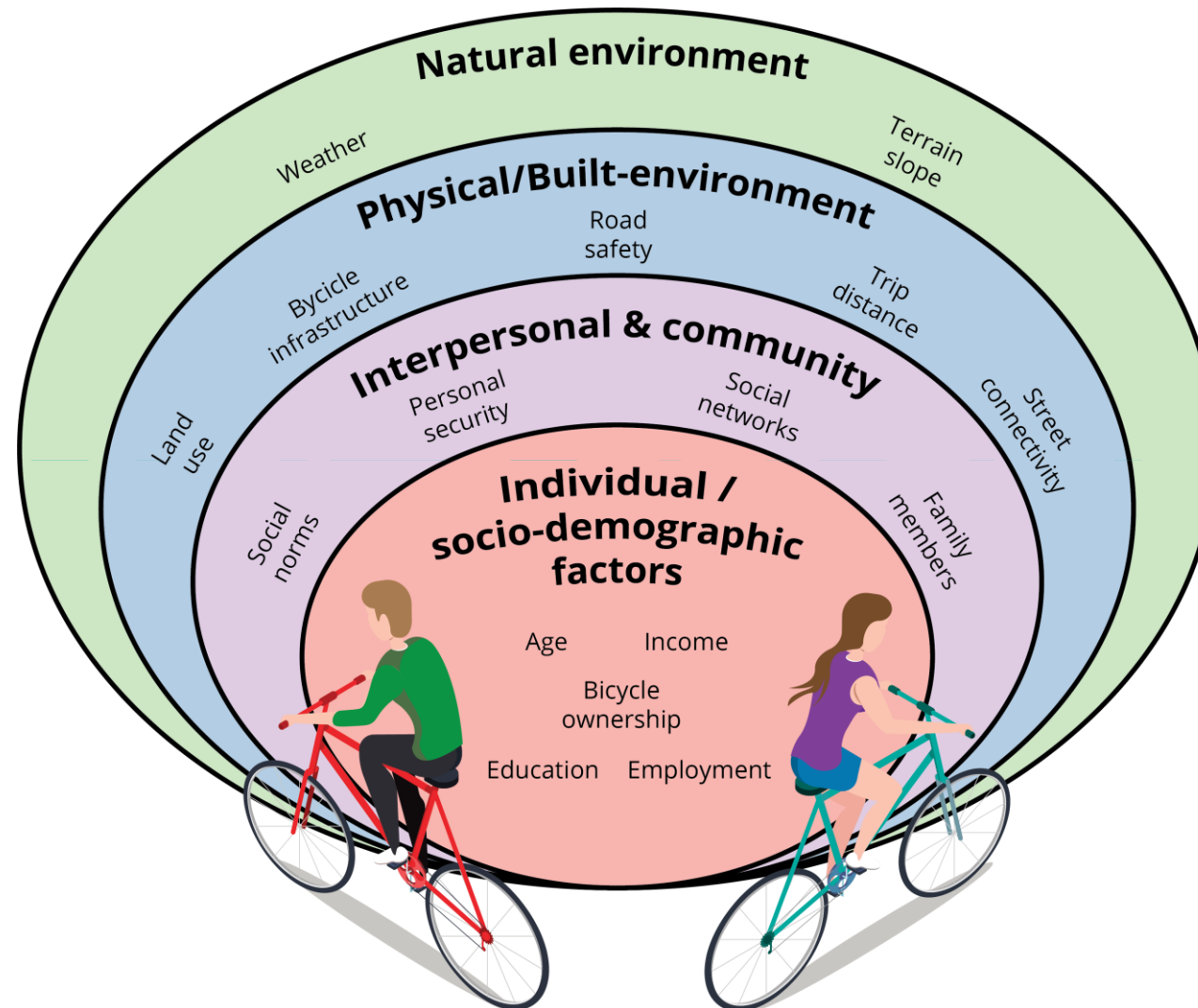
Increase in bicycle infrastructure = Bicycle oriented policies + allocation of resources

Kilometers of bicycle paths, Bogotá 1998 – 2015 ^{1,2}



1. Rosas-Satizábal 2019
 2. Alcaldía de Bogotá, 2019

Several factors influence bicycle commuting at different levels



Aim

To examine the existing gender differences in bicycle commuting in Bogotá by:

1. Describing the trend of standardized number of bicycle commuters during the period 2005 – 2017 stratifying by gender
2. Assessing the socio-demographic, community, built-environment and natural factors associated with bicycle commuting stratifying by gender

Methods

To examine the existing gender differences in bicycle commuting in Bogotá by:

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Methods

DATA SOURCES:

Bicyclists population:

Travel Surveys 2005, 2011, and 2015

Multipurpose survey 2014, and 2017

Demographics for the city:

Total population by sex:

- Total projected official aggregates

STATISTICAL ANALYSIS:

Trend analysis

Smooth trend analysis of the number bicyclists standardized by total population over the period 2005-2017 – Mann kendall test

Methods

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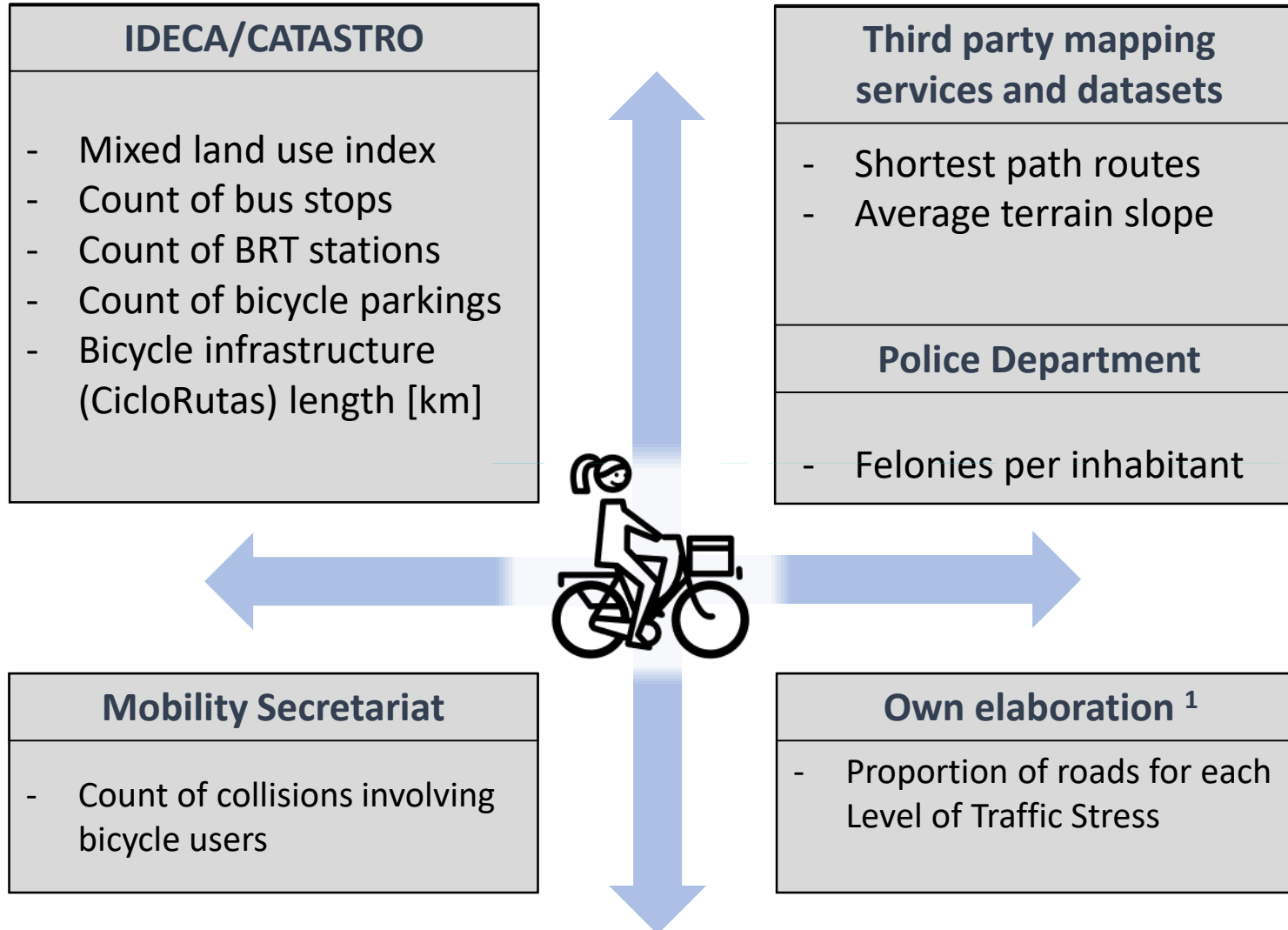
Methods

DATA SOURCES:

- Geocoded trips. Encuesta de movilidad 2015
 - Independent variable: Bicycle commute trip (Binary)
 - Origin and destination longitude-latitude data
 - Estimation of route using minimum distance
 - Socio-demographic independent variables



We used several data sources



1. Huertas, et.al., 2020

Methods

STATISTICAL ANALYSIS:

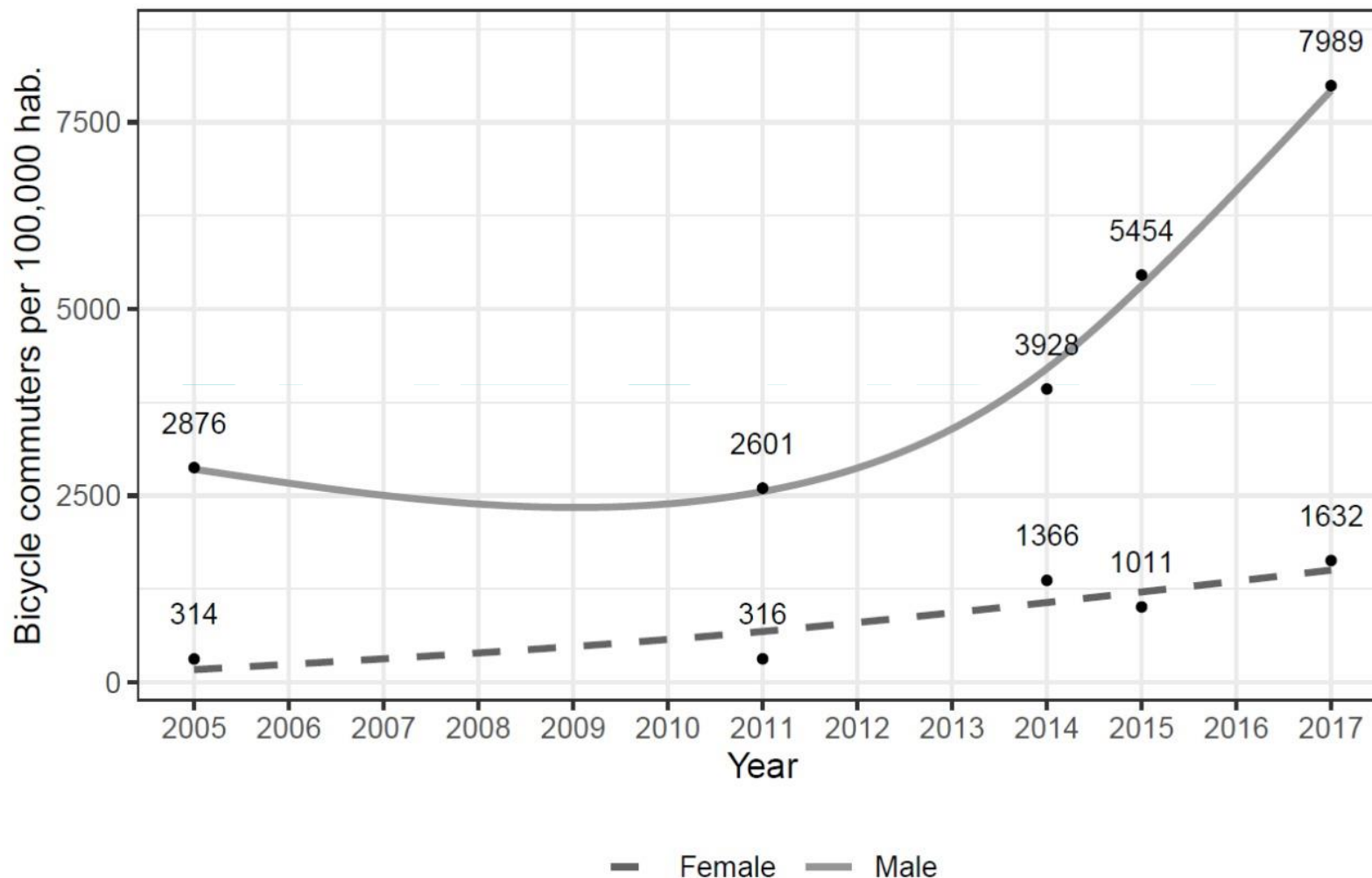
GAM models including socio-demographic, community, built-environment and natural factors at the origin, route and destination, stratifying by sex

Results

To examine the existing gender differences in bicycle commuting in Bogotá by:

1. Describing the trend of standardized number of bicycle commuters during the period 2005 – 2017 stratifying by gender
2. Assessing the socio-demographic, community, built-environment and natural factors associated with bicycle commuting stratifying by gender

The gap between women and men has widened with time



Results

To examine the existing gender differences in bicycle commuting in Bogotá by:

1. Describing the trend of standardized number of bicycle commuters during the period 2005 – 2017 stratifying by gender
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Who are the bicycle commuters?



18 a 29 years-old (43.4%)
No driver license (91.1%)*
Employed (71.4%)
SES 1 y 2 (57.4%)
Average distance 4.89 Km*



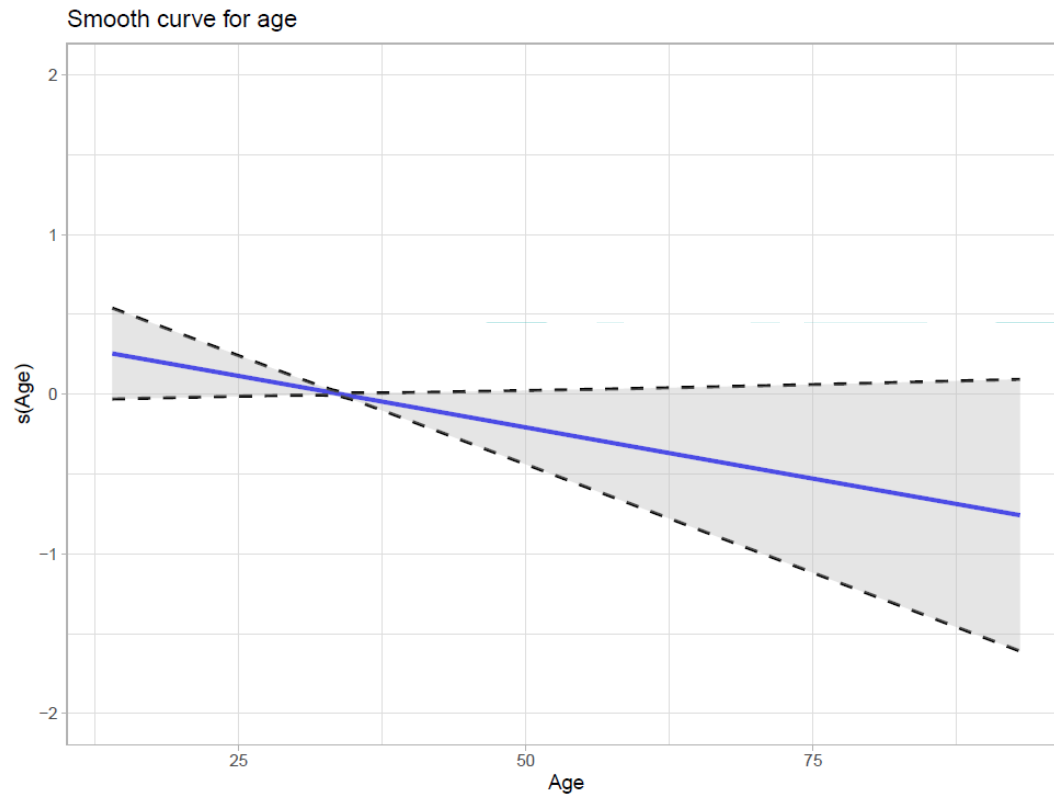
18 a 29 years-old (40.2%)
No driver license (65.6%)*
Employed (82.6%)
SES 1 y 2 (58.9%)
Average distance 7.2 Km*

*p-value < 0.05 when compared to non-bicycle commuter

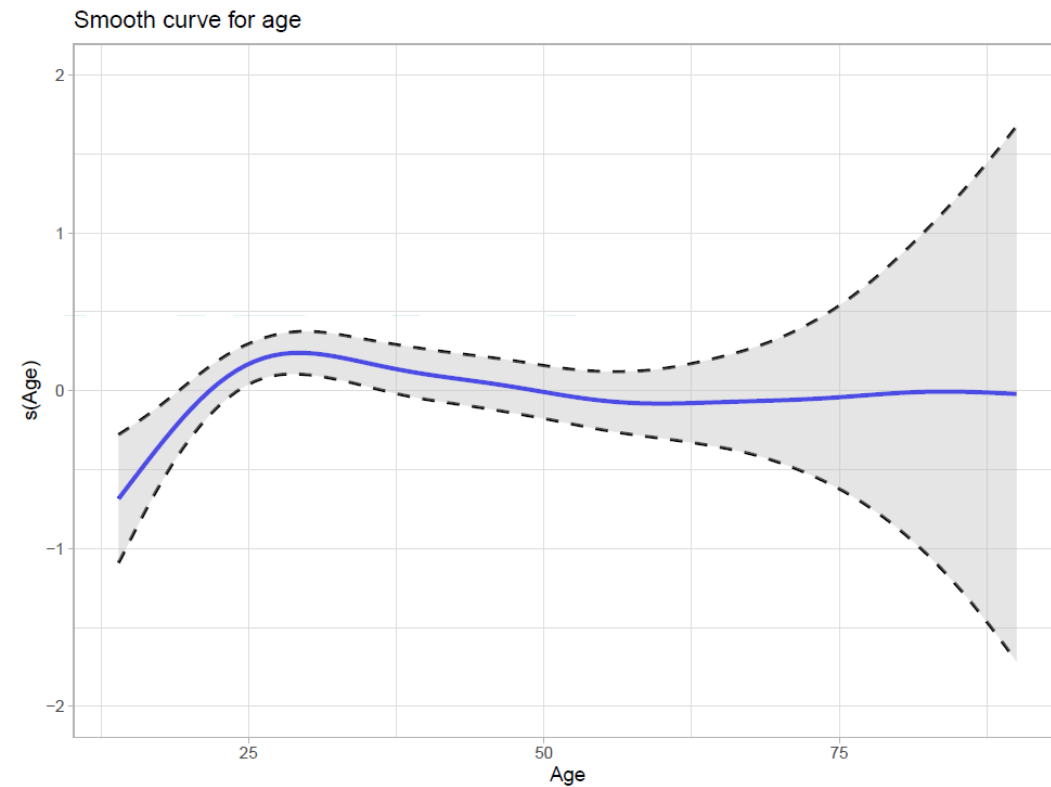
The sociodemographic factors associated with bicycle commuters differed by sex

— Smooth function
■ 95% CI

Women



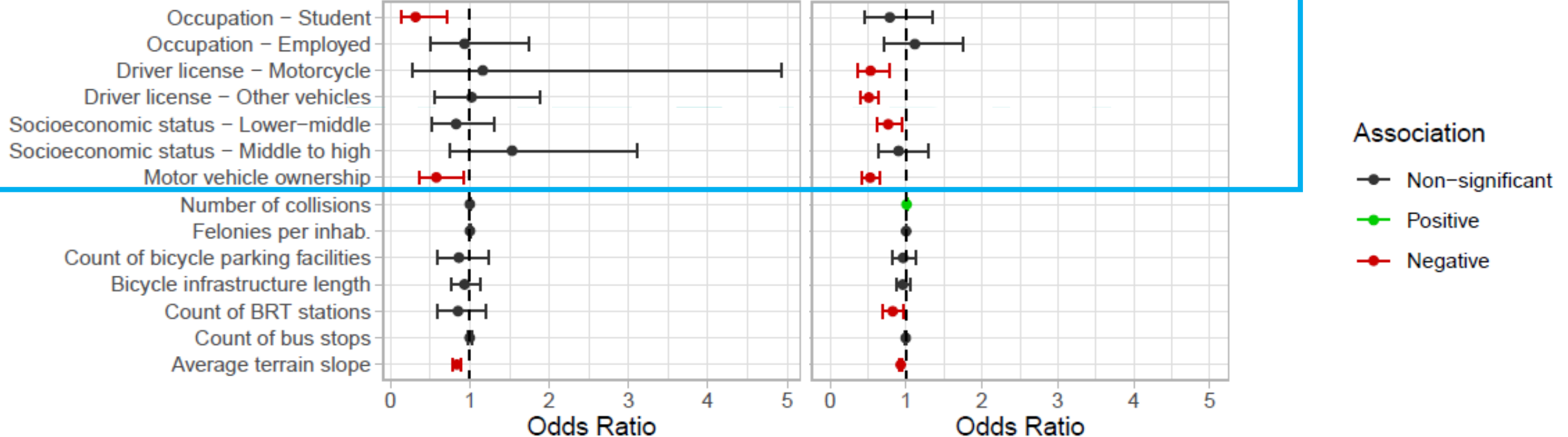
Men



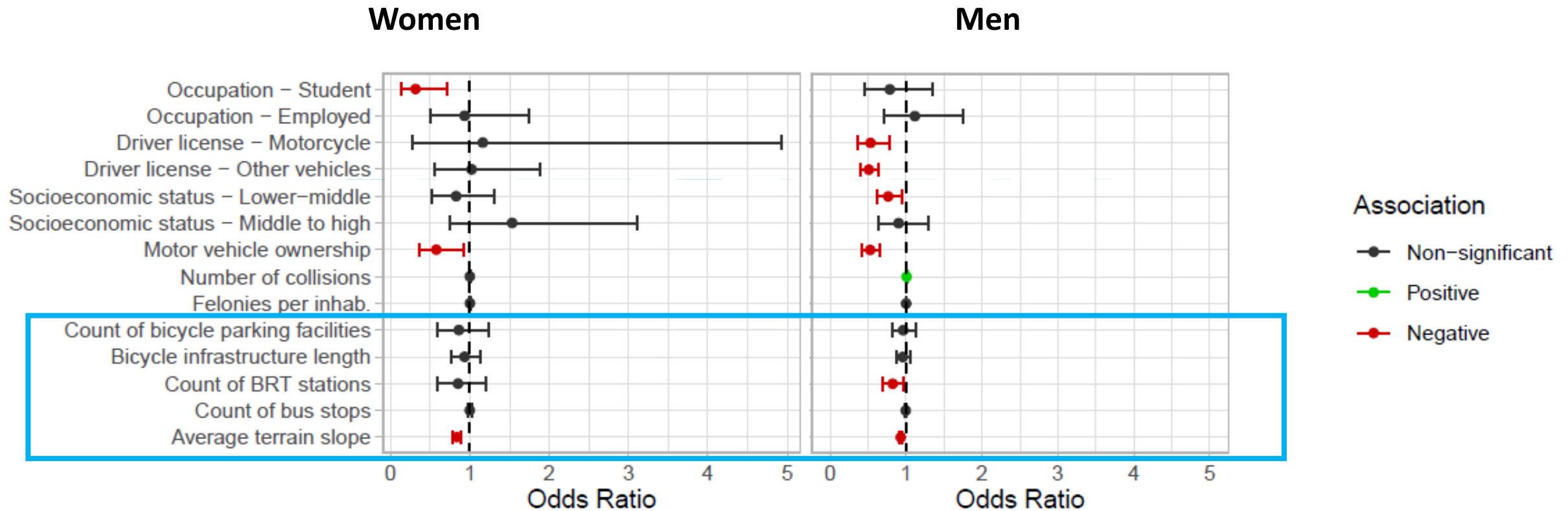
The sociodemographic factors associated with bicycle commuters differ by sex with the exception of motor vehicle ownership

Women

Men

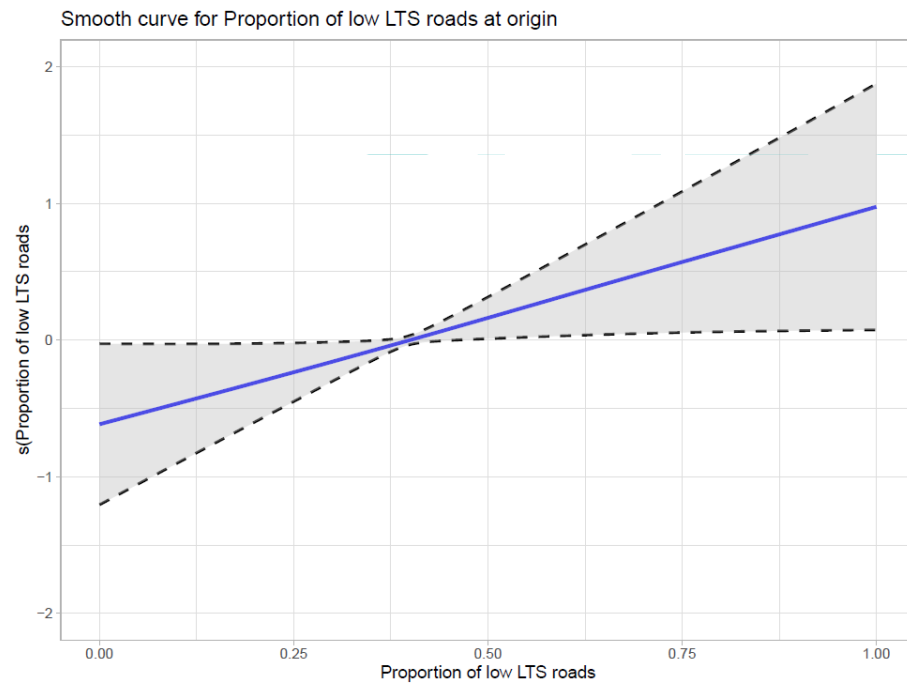


The access to BRT stations in the origin is negatively associated with bicycle commuting in men

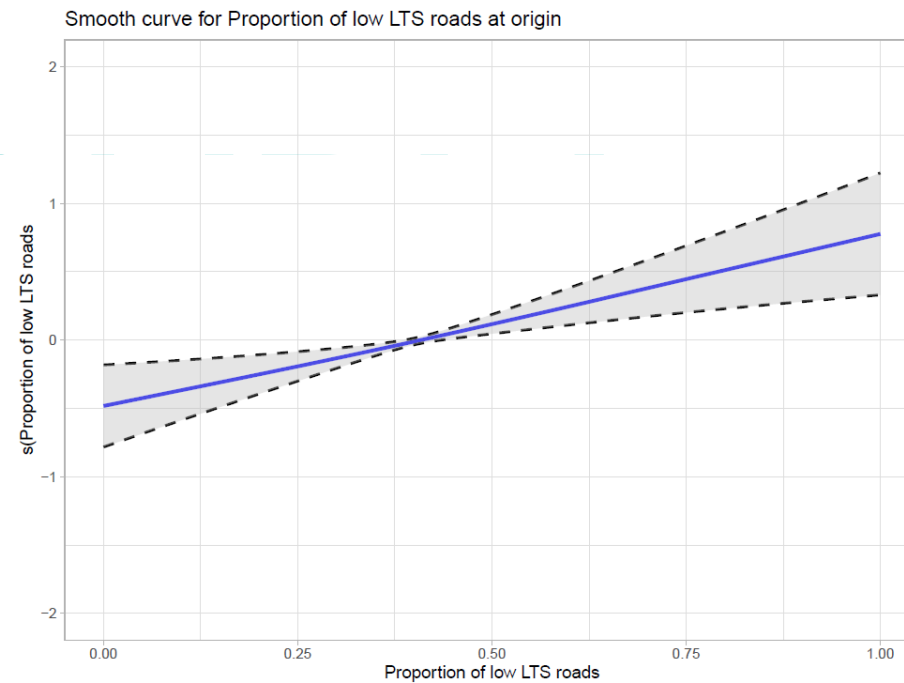


As the proportion of low LTS road segments in the origin increases, the propensity of bicycle commuting increases linearly

Women



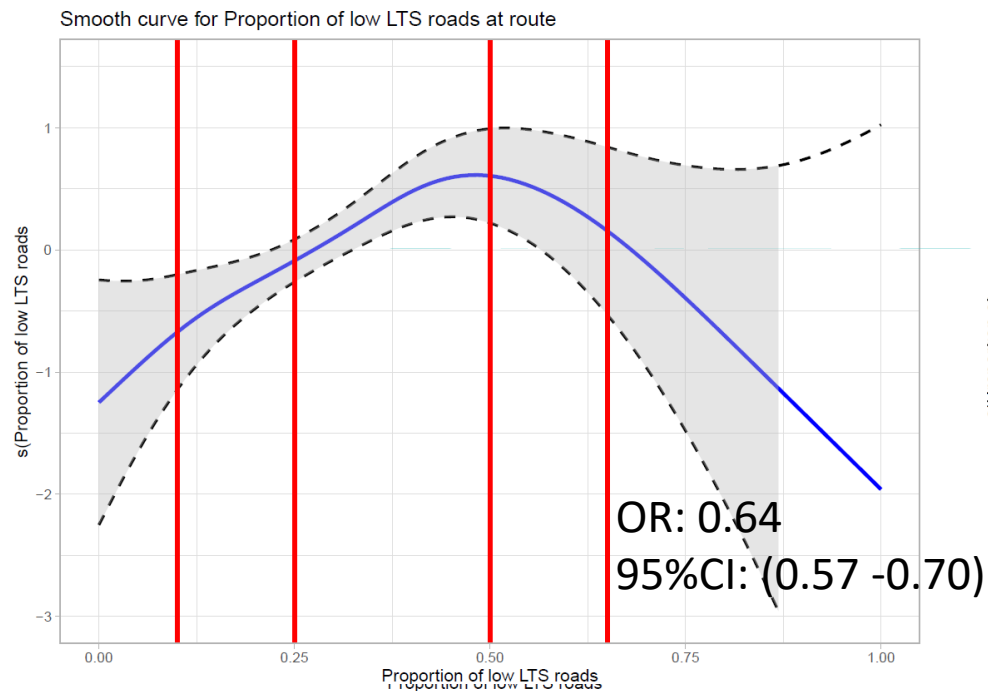
Men



— Smooth function
■ 95% CI

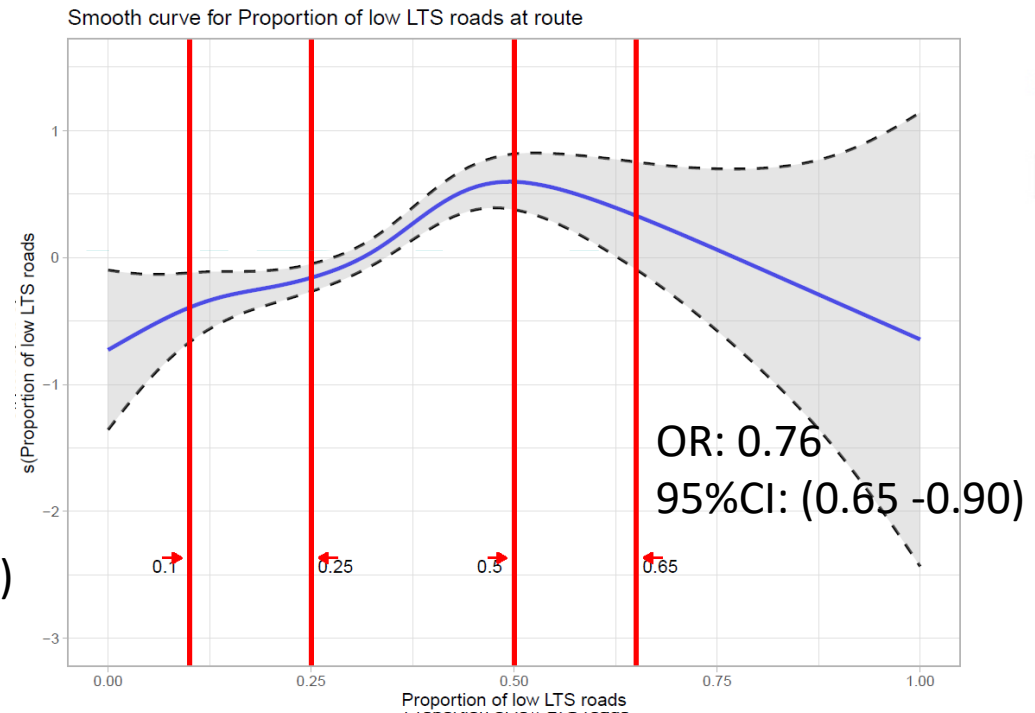
Non-linear relationship of the proportion of low LTS roads in the route

Women



OR: 1.80
95%CI: (1.67 -1.95)

Men



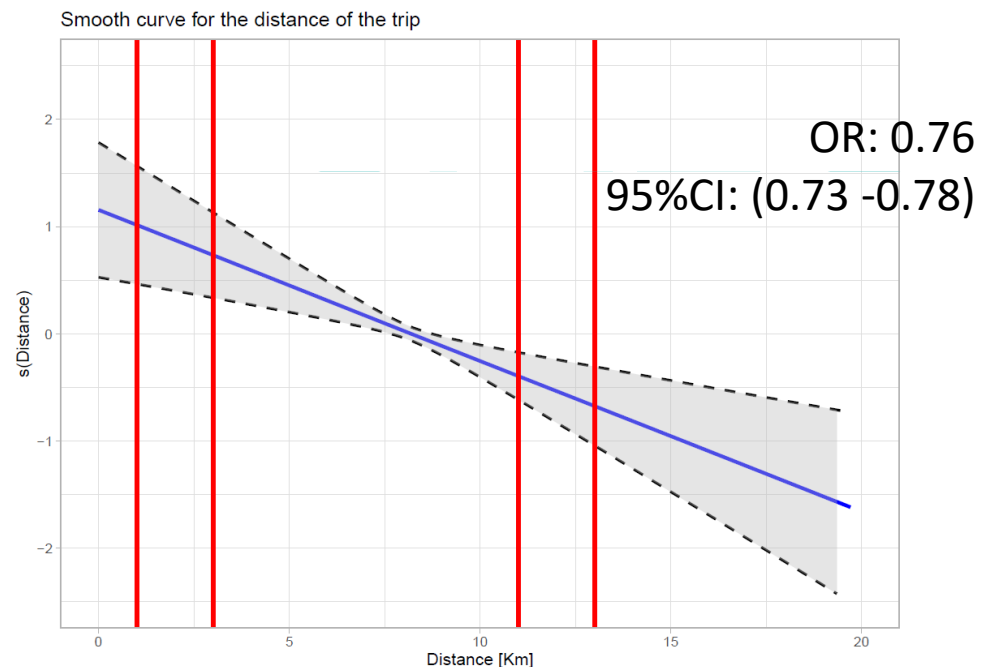
OR: 1.79
95%CI: (1.68 -1.91)

— Smooth function
■ 95% CI

Negative relationship between distance and commuting in women and non-linear relationship in men

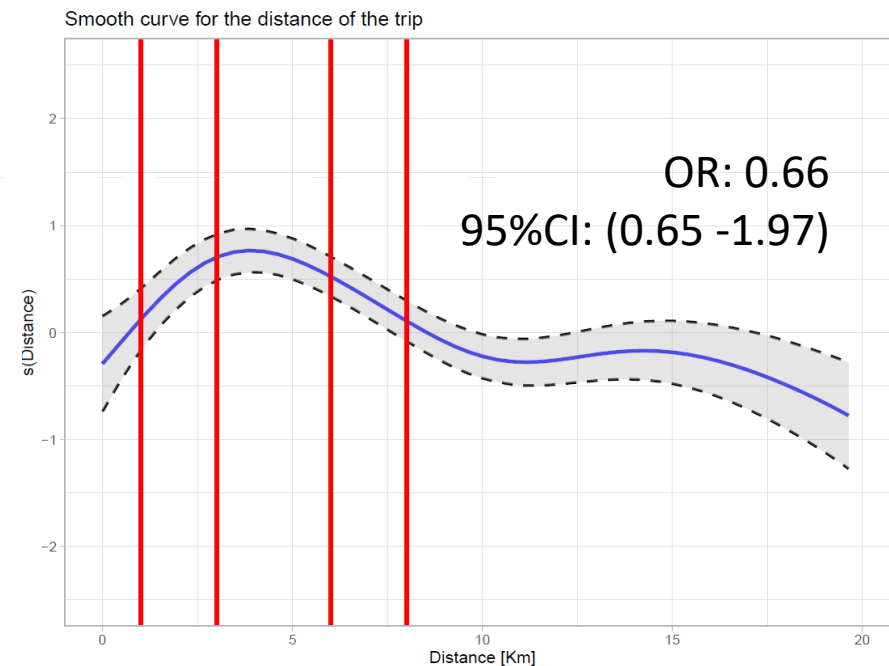
— Smooth function
 ■ 95% CI

Women



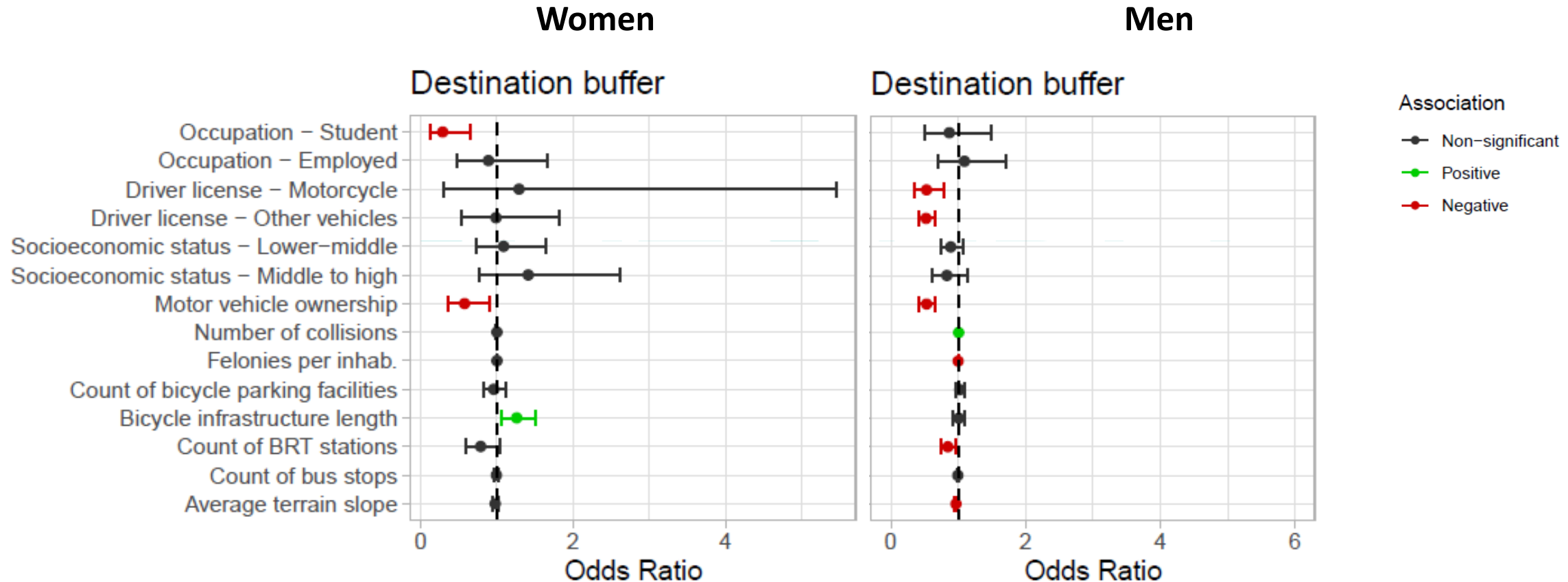
OR: 0.75
 95%CI: (0.72 -0.78)

Men



OR: 1.79
 95%CI: (1.68 -1.91)

In the destination, bicycle path length was positively associated with bicycle commuting among women



Take-home messages

1. The gap between women and men has widened with time in Bogotá
2. There are differential effects by gender of the **socio-demographic**, community and **built-environment** factors on bicycle commuting
3. Distances and trip patterns are different between women and men
4. Safety perception in women needs better measurement
5. Stratified analyses and differential interventions are a good start to bridging the gender gap on bicycle commuting

Thank you!
Gracias!

di-higue@uniandes.edu.co



LAC-URBAN HEALTH
Urban Health Network for Latin America and the Caribbean



Source: Alcaldía Mayor de Bogotá

Level of Traffic Stress

Table 5. Assigning LTS labels to clusters. Semaphore colors shows stress from green (less stress) to red (high stress).

| Variable | Mean | Std. dev. | Cluster 3 | Cluster 1 | Cluster 4 | Cluster 2 |
|--|-----------------------|-----------|----------------|-------------------|-----------------|---------------------------|
| Road width (m) | 7.18 | 1.86 | Narrow | Average | Wide | Wide |
| Number of lanes | 2.01 | 0.36 | Low | Low | High | Average |
| Vehicles speed (km/h) | 17.84 | 7.87 | Low | Average | High | High |
| Traffic density (cars/h) | 108.71 | 46.40 | Low | High | High | High |
| Traffic flow (cars/km) | 1,973.69 | 1,098.12 | Low | Low | High | High |
| Congestion | 0.25 | 0.18 | Low | High | High | High |
| Presence of cycling infrastructure (% of km with) | 0.09 | - | Low | Low | High | None |
| Presence of public transport lines (% of km with) | 0.31 | - | None | None | High | High |
| | LTS assignment | | LTS Low | LTS Medium | LTS High | LTS Extremely High |