

ACCESSIBILITY OF FOOD RETAILERS IN BELO HORIZONTE: AN EXPLORATORY ANALYSIS

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AGENDA

1. CONTEXT

2. RESEARCH QUESTION AND OBJECTIVES

3. METHODOLOGY AND DATA

4. RESULTS AND MAIN FINDINGS

5. POLICY AND PRACTICAL IMPLICATION

6. FURTHER RESEARCH

CONTEXT

Drivers affecting changes in freight flows



2050

**9 billion people
68% in cities**

UN (2018)



2019

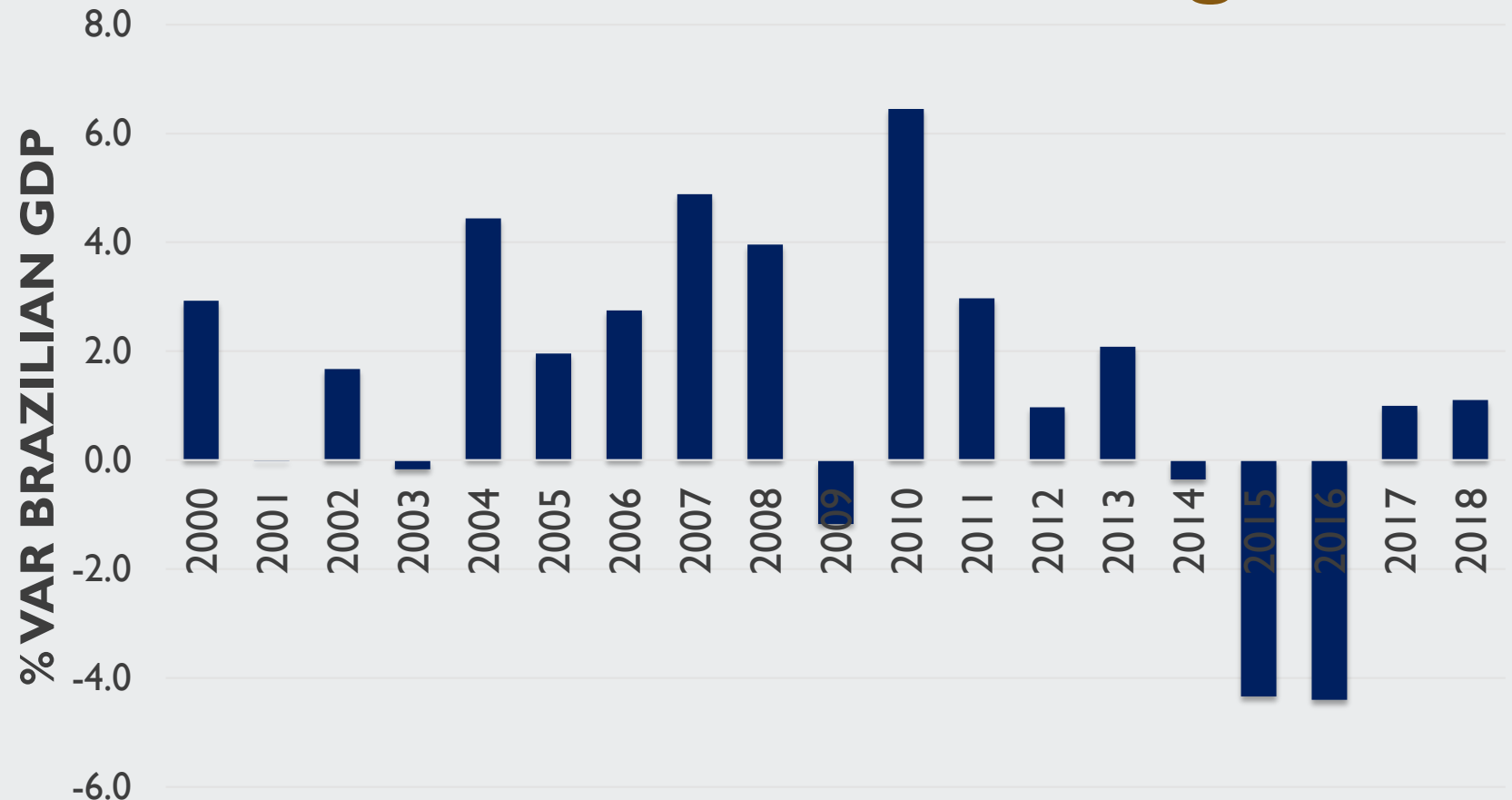
**210 million people
86% of urban population**

IBGE (2019)

CONTEXT

Drivers affecting changes in freight flows

- Rising income
- Economic instability



(IBGE, 2019)

CONTEXT

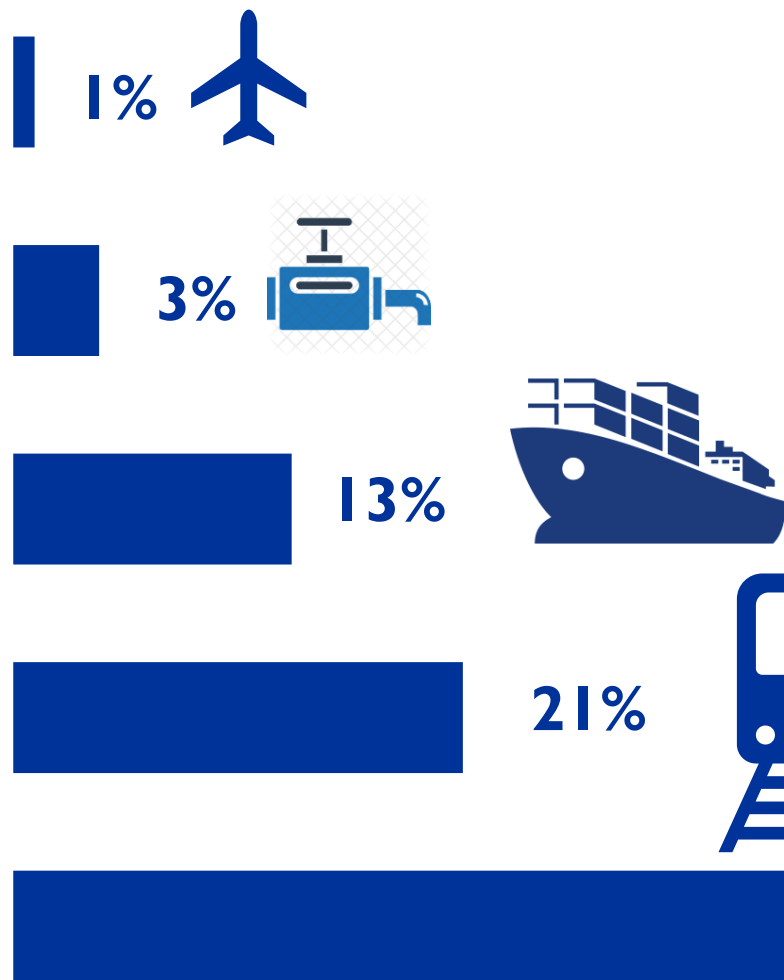
Drivers affecting changes in freight flows



- **Massive road transport strike in May 2018**
- **Dependency on road transport**

CONTEXT

Drivers affecting changes in freight flows



Freight transport share in Brazil (t*km)



62%



(Ilos, 2016)

CONTEXT

Fresh to industrialized



(Herzog, 2009, O'Brien et al., 2016).

CONTEXT

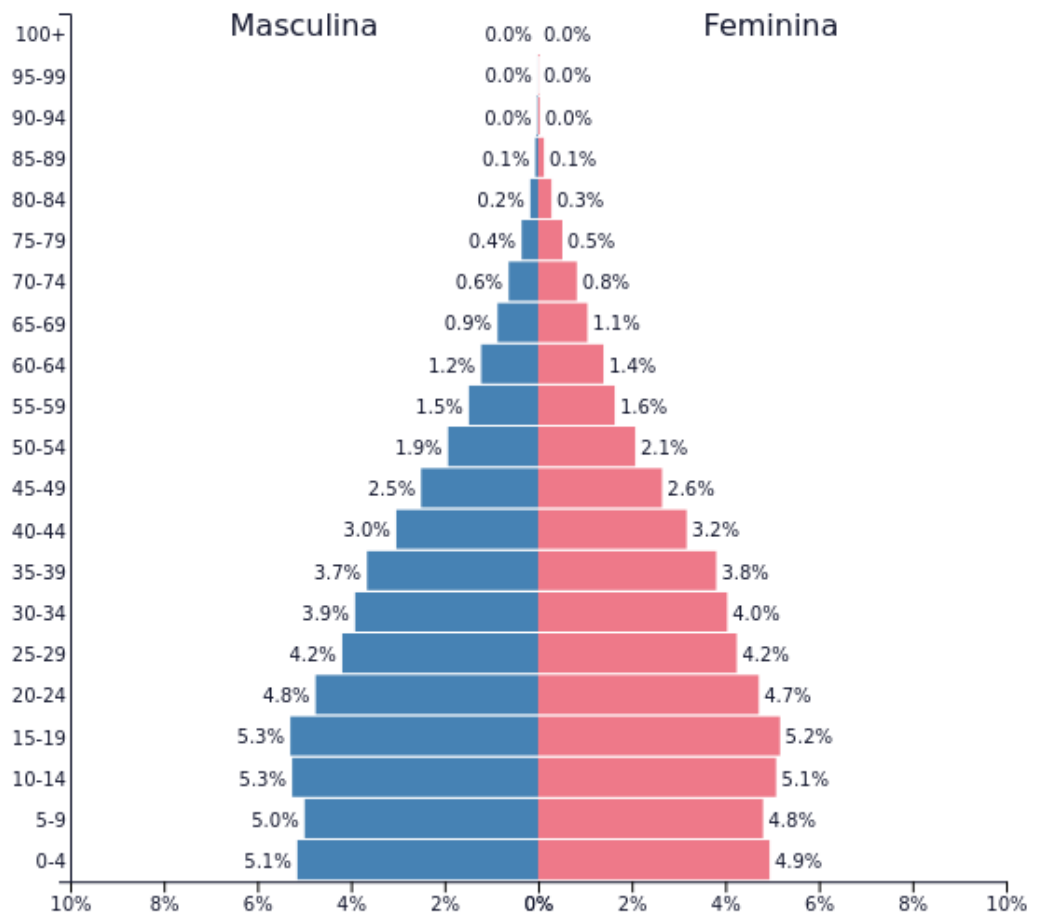
From local markets to global chains



(Herzog, 2009, O'Brien et al., 2016).

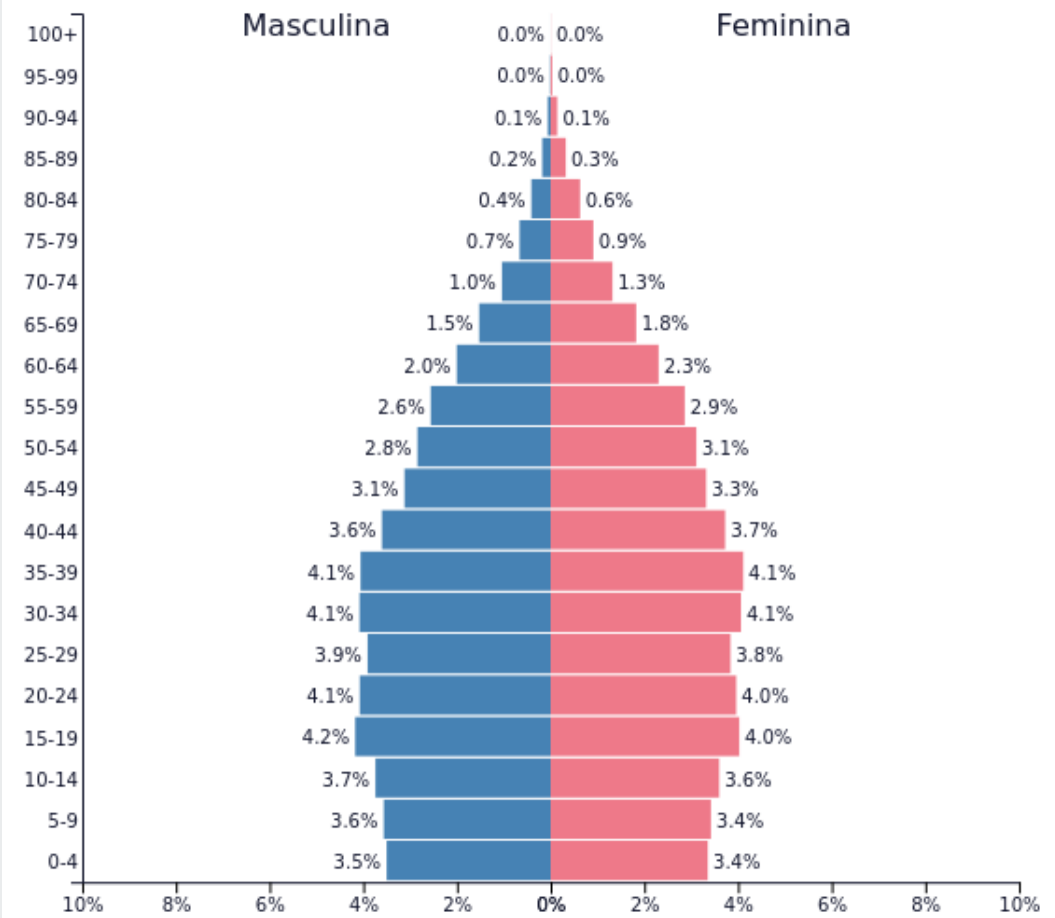
CONTEXT

Aging population



(IBGE, 1999)

Brasil - 1999
População: **173,153,065**



(IBGE, 2019)

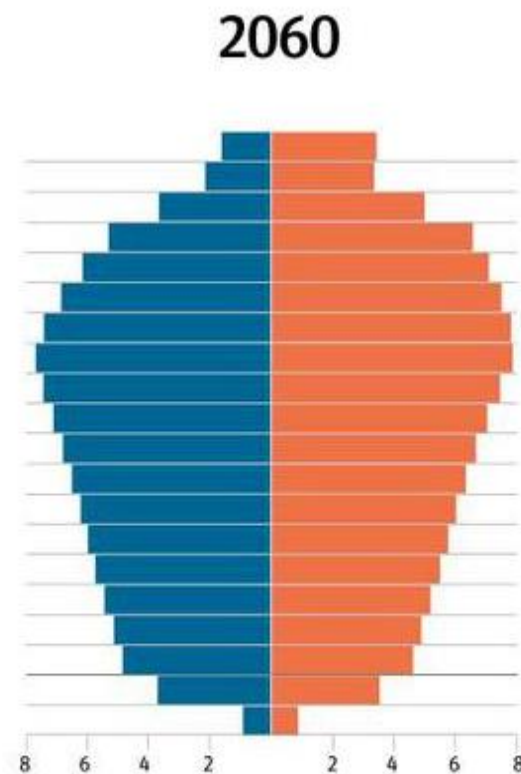
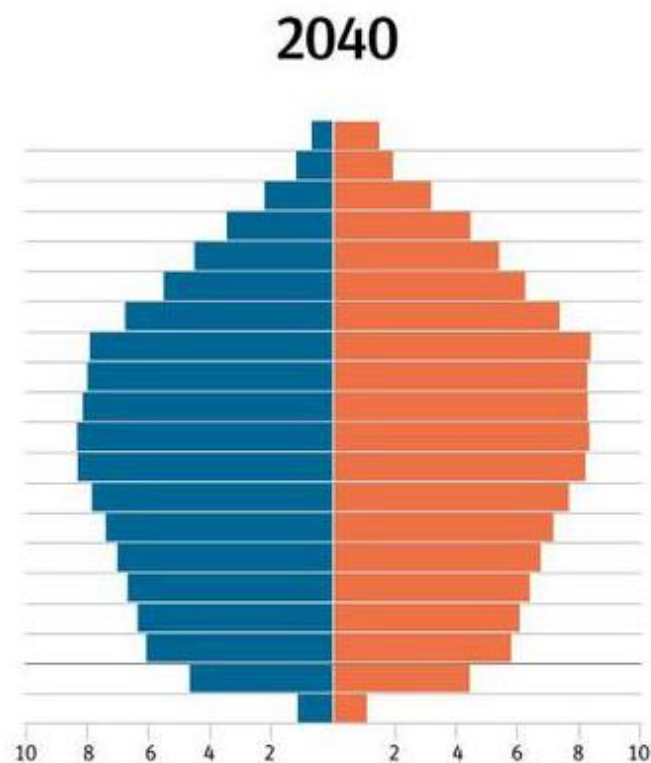
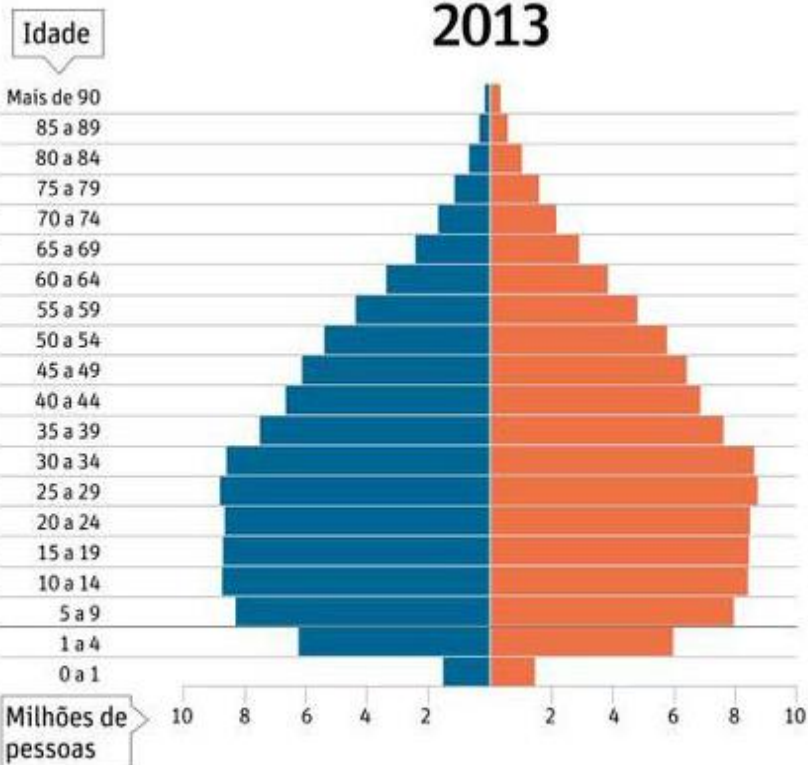
Brasil - 2019
População: **214,457,810**

CONTEXT

Aging population

PIRÂMIDES ETÁRIAS ABSOLUTAS

■ Homens ■ Mulheres



Pessoas com mais de 65 anos serão mais de um quarto dos brasileiros em 2060, segundo projeção do IBGE. O percentual desse grupo representa 7,4% do total de pessoas que vivem no país em 2013

Fonte: IBGE. Diretoria de Pesquisas, Coordenação de População e Indicadores Sociais. Projeção da População por Sexo e Idade para o Brasil, Grandes Regiões e Unidades da Federação, 2013.

(IBGE, 2013).

New purchasing, delivery and business challenges for the food sector

69% of the population connected to the internet

27% of the population consumes online

- Increased purchasing power of C and D classes
- Need for fast food as a result of the lack of time, extra convenience
- improvement in telecommunication infrastructure
- low cost of smartphones

E-commerce growth in 2018: 12%

M-commerce growth in 2018: 41%

First online food delivery companies: mid-2000s

(IBGE, 2018; Bezerra et al., 2013; Machado and Pigatto, 2015, Pigatto et al., 2017)

CONTEXT

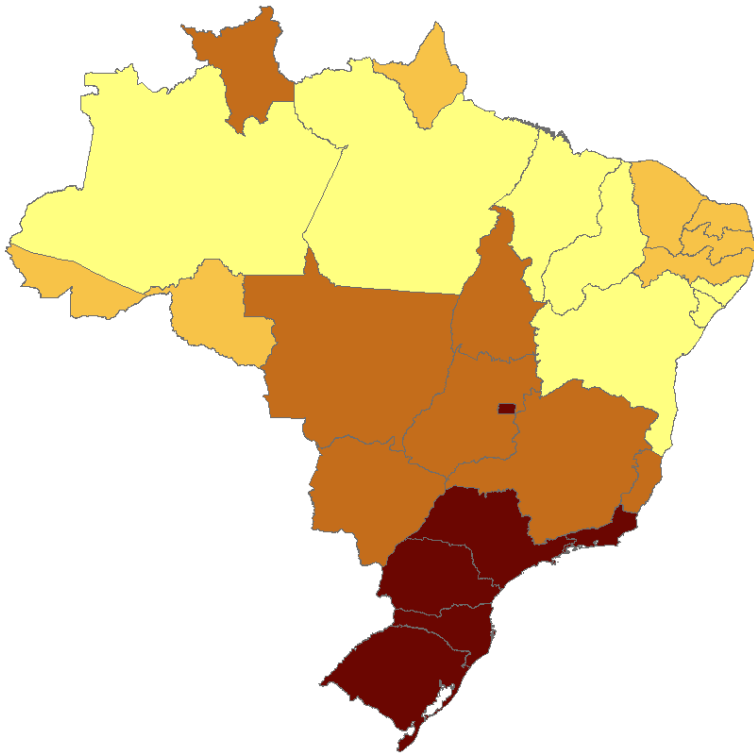


Glovo



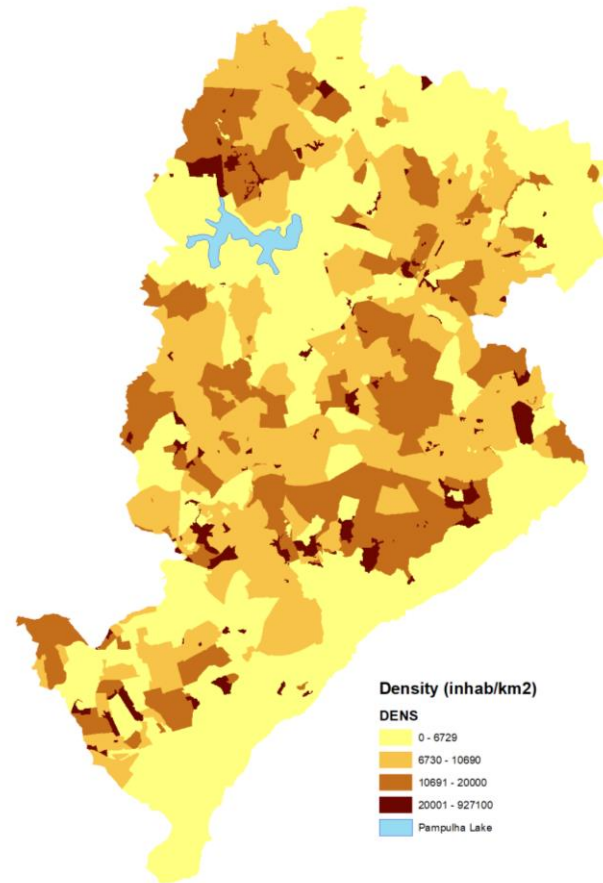
SPATIAL HETEROGENEITY

Human Development Index (2015)

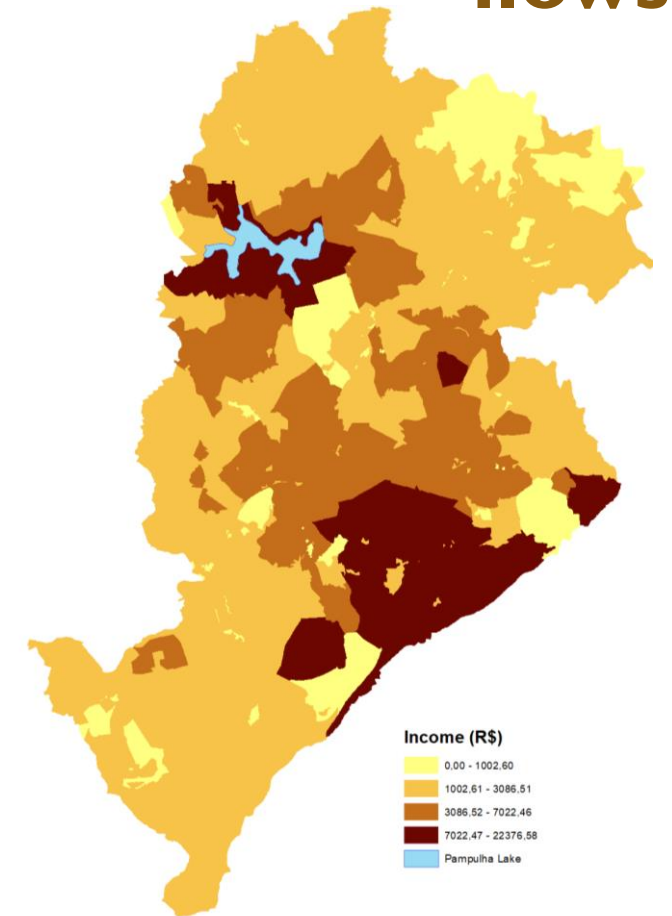


CONTEXT

Drivers affecting changes in freight flows



Population density (inhab/km²)

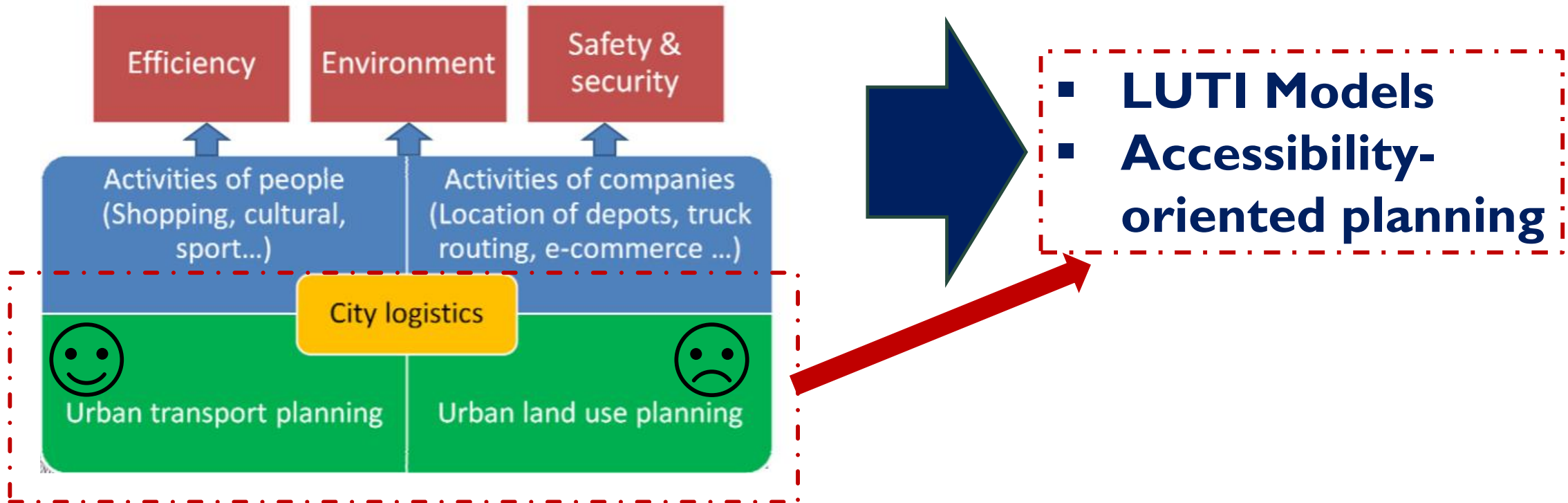


Average household income

CONTEXT

Background

Framework for activities of people and companies in urban areas



(Taniguchi, 2012)

(Fancello et al., 2017; Marcucci and Gatta, 2017; Morganti and Gonzalez-Feliu, 2015, Cui et al., 2015; Giuliano and Kang, 2018).

RESEARCH QUESTION AND OBJETIVE

**Are the consumers accessible concerning Food
retailers' location in Belo Horizonte, Brazil?**

**Spatially meet the concentration of potential
consumers and the spatial structure of food retailers,
identifying accessibility patterns for deliveries in
Belo Horizonte, Brazil**

METHODOLOGY AND DATA

FOOD SYSTEMS

GROCERY RETAILERS OR STORES

- Fresh food retailer
- Local markets
- Supermarkets
- Hypermarkets

FOOD SERVICES (HO.RE.CA)

- Restaurants and bars
- Snacks bars
- Cafeterias
- Bakeries

METHODOLOGY AND DATA

DATA COLLECTION AND SPATIALIZATION

RETAILERS' LOCATION

- Municipal register of contributors (PBH, 2017)

SOCIOECONOMIC AND DEMOGRAPHIC

- Census (IBGE, 2010)



DATA ANALYSIS

SPATIAL PATTERN OF RETAILERS

- Average nearest neighbors – Manhattan distance (Langley and Iba, 1993)

CLUSTER ANALYSIS – SPATIAL STRUCTURE FOR POPULATION AND INCOME

- Getis-Ord G_i^* for InPop index – 2,300 m Manhattan Distance (Getis and Ord, 1992)



ANALYSIS OF THE ACCESSIBILITY SPATIAL STRUCTURE

BOXMAP FOR POTENTIAL ACCESSIBILITY x CLUSTERED AREAS

- Overlaying of InPop index with the accessibility *boxmap*.
- Identification of more suitable areas for active delivery trips concerning the spatial structure.

POTENTIAL ACCESSIBILITY

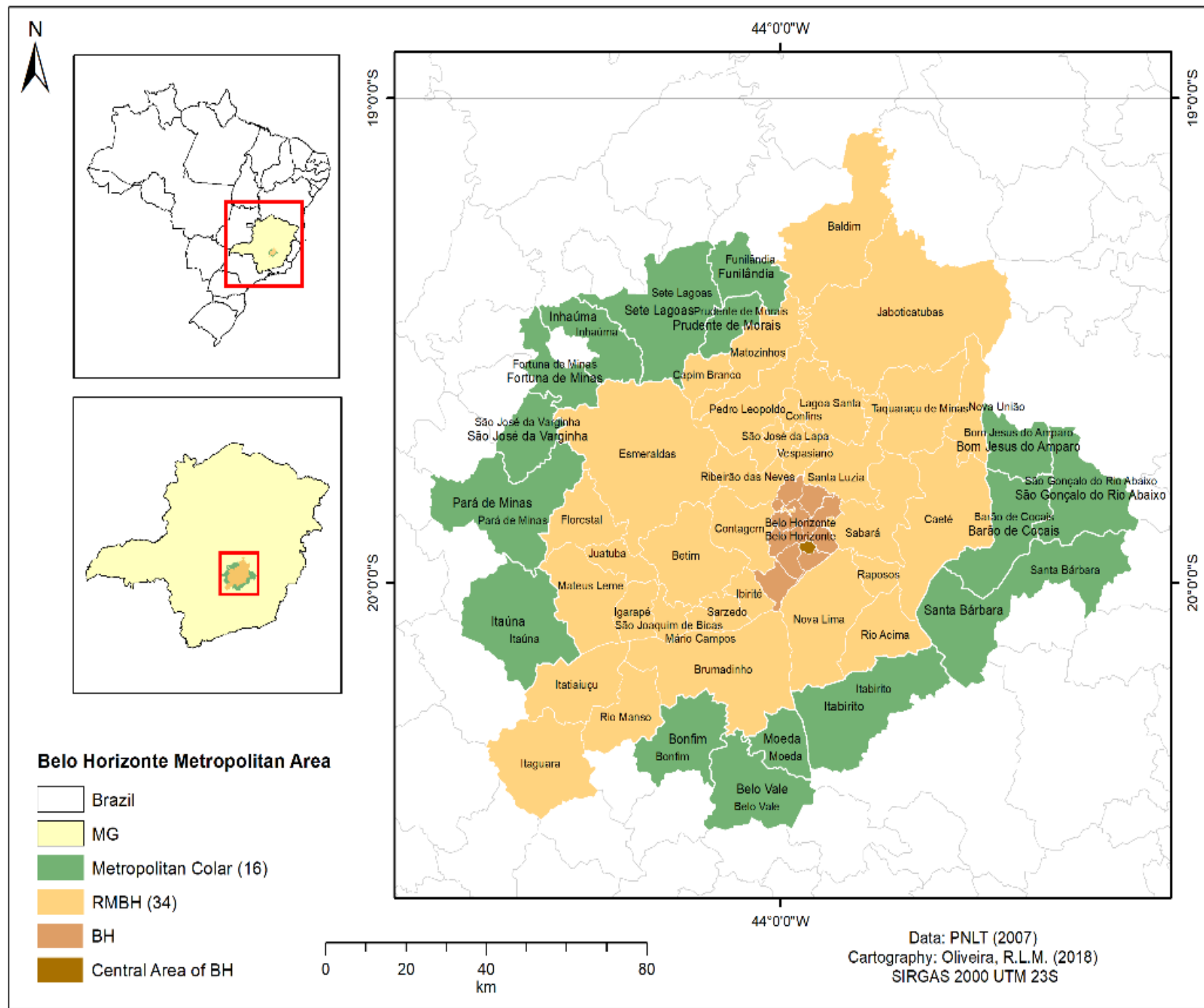
- Network distance within districts (Dijkstra shortest path algorithm)
- Potential attractiveness of each district regarding the food systems

$$A_i = \frac{\sum P_j \times f(D_{ij})}{\sum P_j}$$

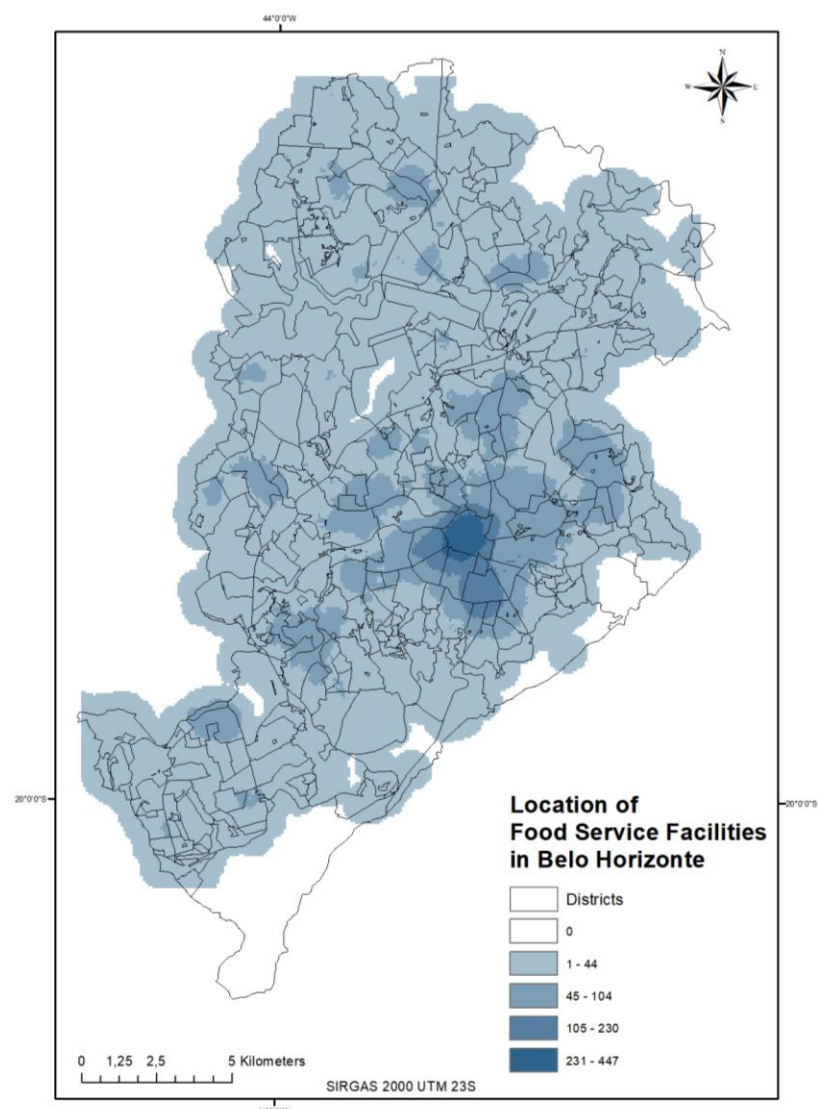
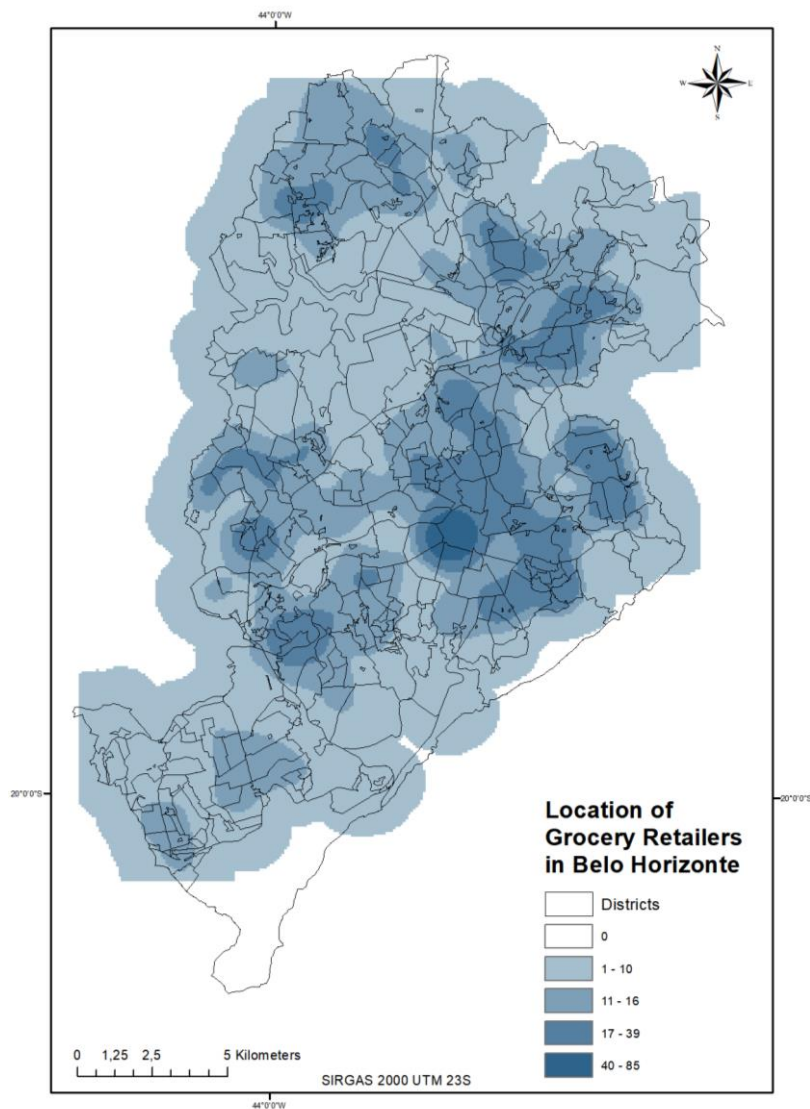
(Hansen, 1959, Geurs and van Wee, 2004)

METRO REGION OF BELO HORIZONTE AND COLLAR

- **BHMR** is the third largest metropolitan region of Brazil
 - 24% of Minas Gerais' population
 - 1/3 of Minas Gerais' gross income.
- **BH**
 - 2,5 million people
 - 330 km²



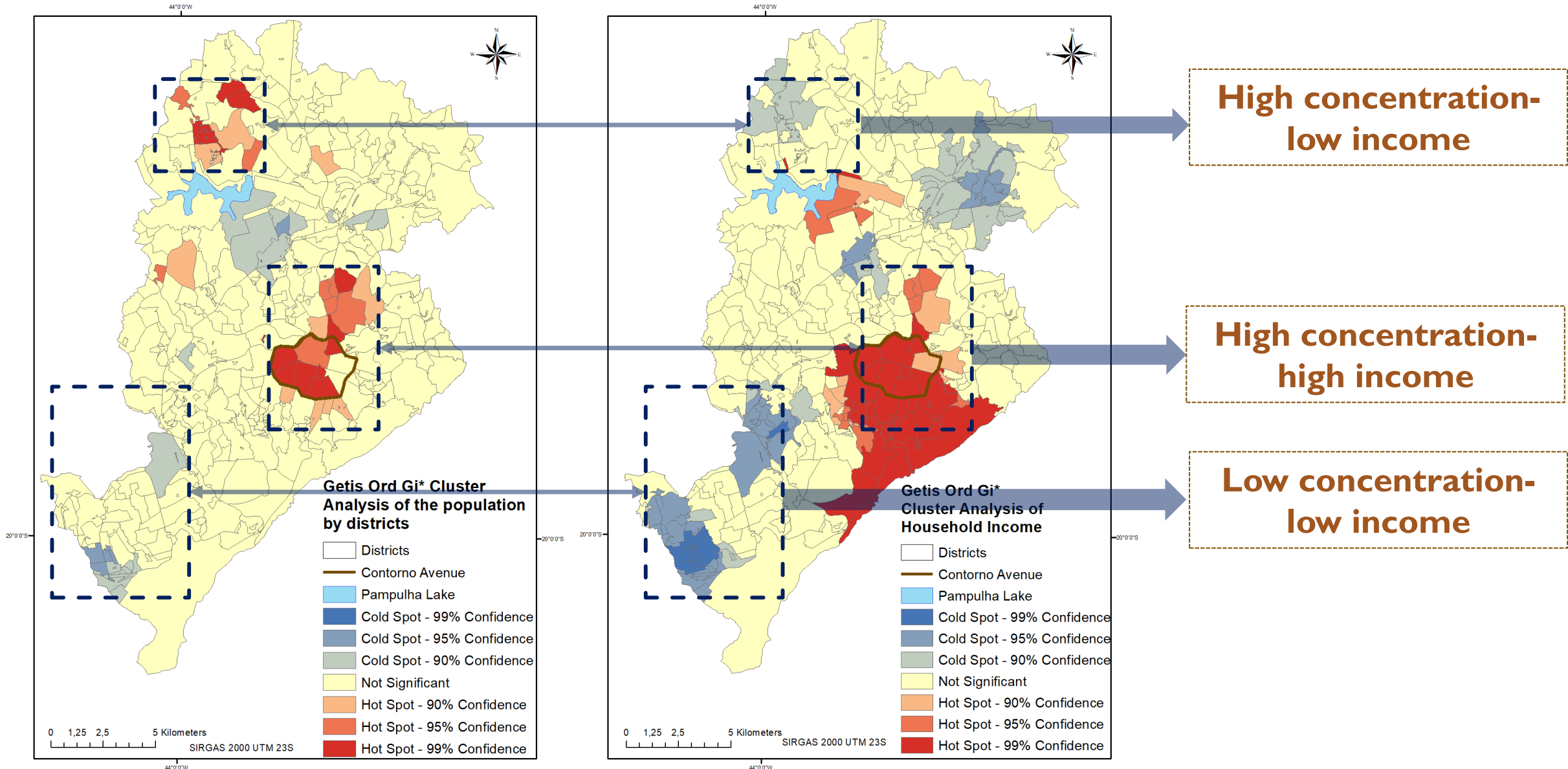
SPATIAL PATTERN OF RETAILERS



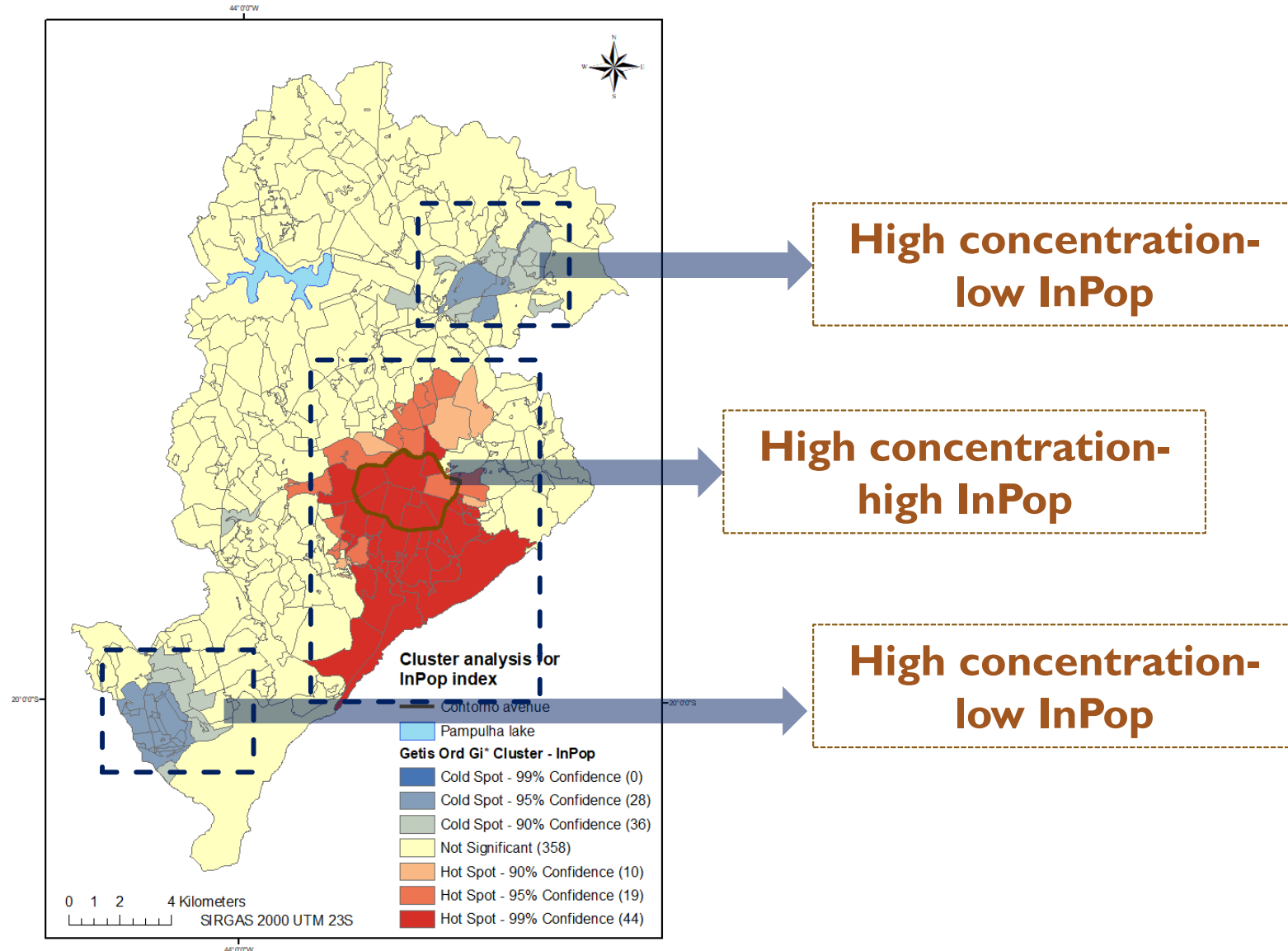
SPATIAL PATTERN OF RETAILERS

Group	Category	Number of retailers	Stores density (stores/km ²)	Number of stores per capita (stores/1,000 inhabitants)	Spatial pattern	p-value
Food service	Restaurants	4,231	12.8	1.7	Clustered	0.00
	Cafes and bars	5,822	17.6	2.3	Clustered	0.00
	Bakeries	1,232	3.7	0.5	Clustered	0.00
	Local markets	2,111	6.4	0.8	Clustered	0.00
Groceries	Supermarkets	372	1.1	0.1	Clustered	0.00
	Hypermarkets	23	0.1	0.009	Dispersed	0.000057
	Fresh food	1,131	3.4	0.5	Clustered	0.00

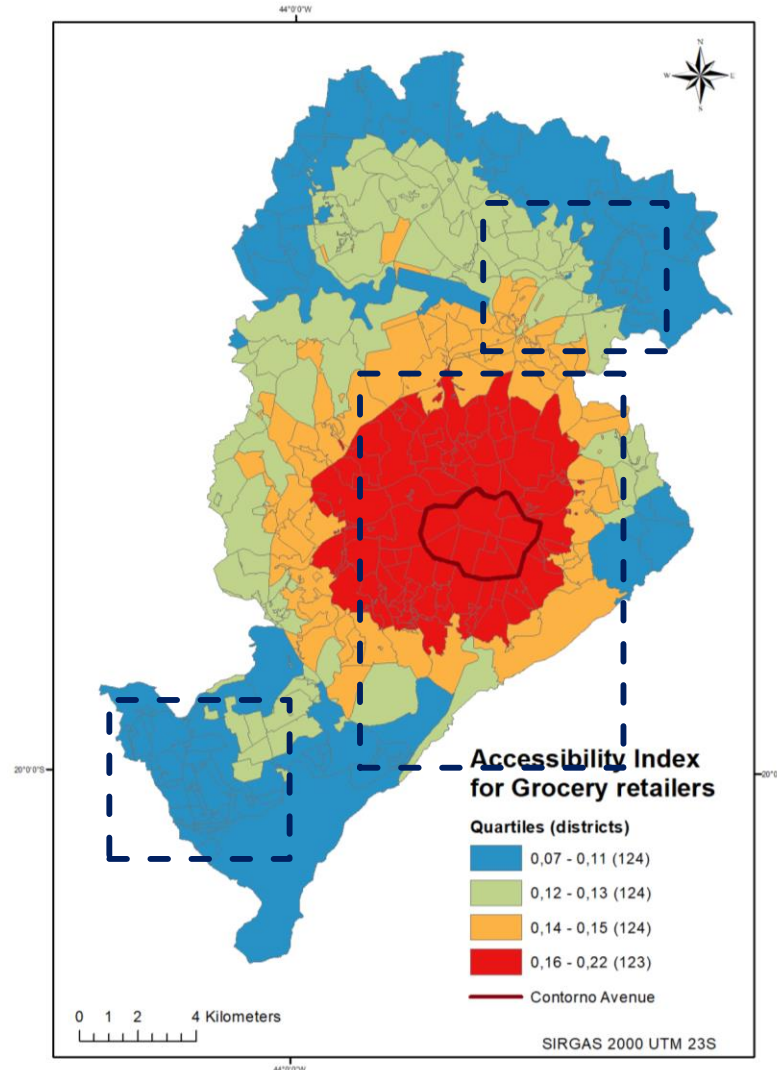
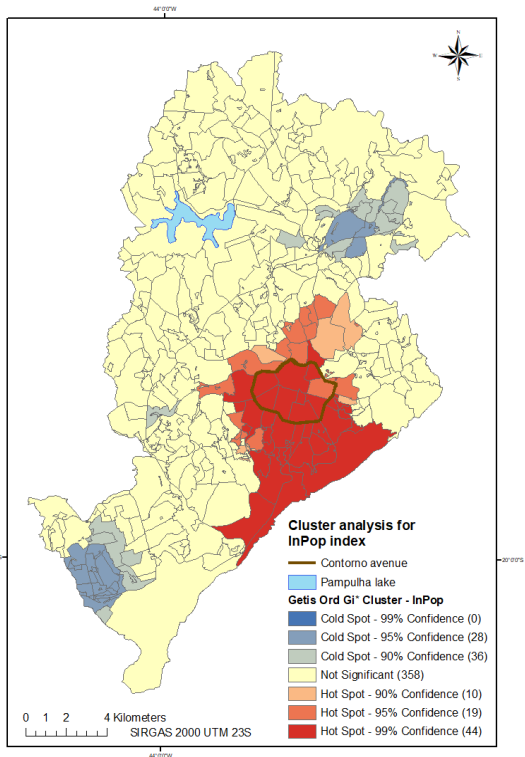
CLUSTER ANALYSIS – POPULATION AND INCOME



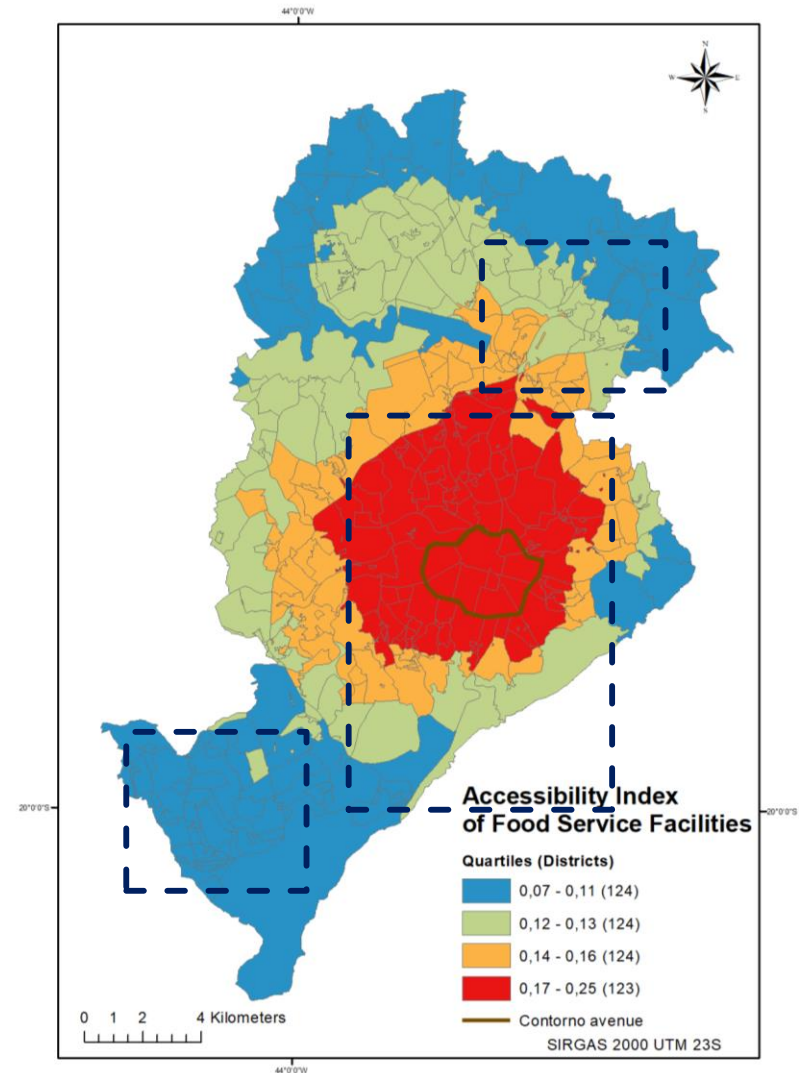
INPOP CLUSTER ANALYSIS (90% CONF.)



POTENTIAL ACCESSIBILITY

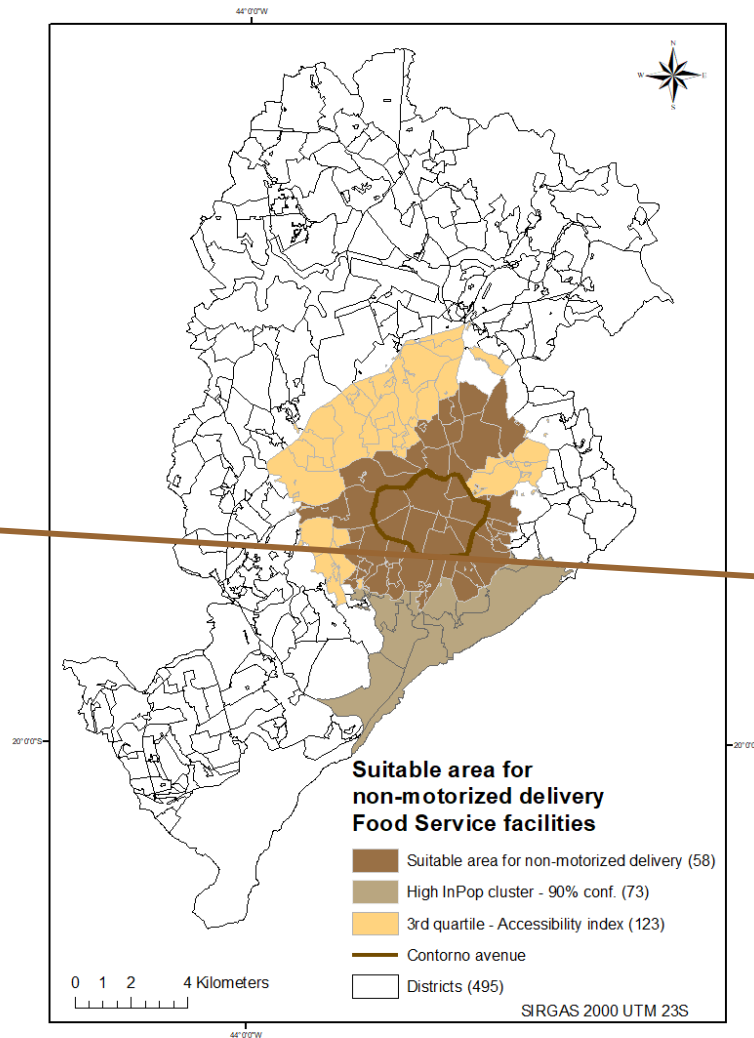
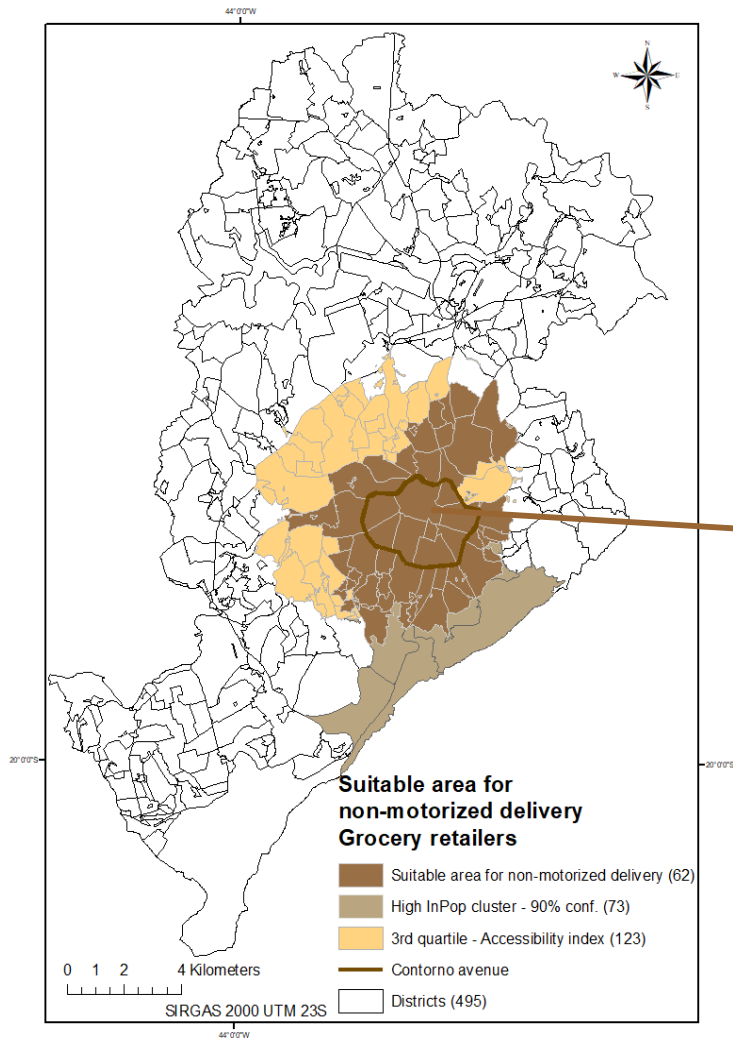


GROCERY STORES



FOOD SERVICE

HIGH INPOP CLUSTER (90% CONF.) X 3RD QUARTILE ACCESSIBILITY INDEX



Area where active delivery, collaborative delivery initiatives or crowd deliveries can succeed, regarding the spatial match between origin and destination of freight

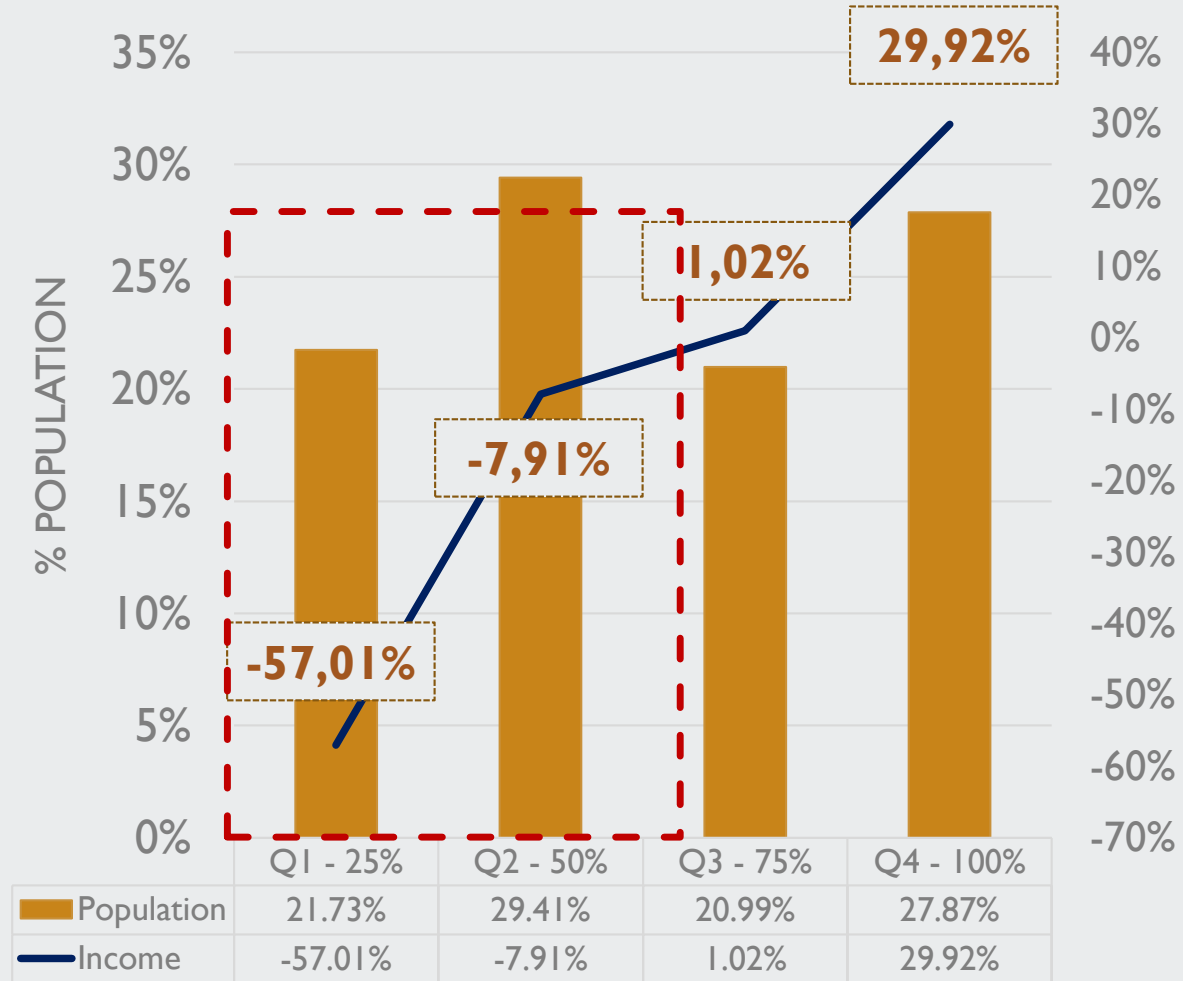
OPERATIONAL CHARACTERISTICS

Attributes to analyze suitable area for non-motorized deliveries from Food Retailers in Belo Horizonte

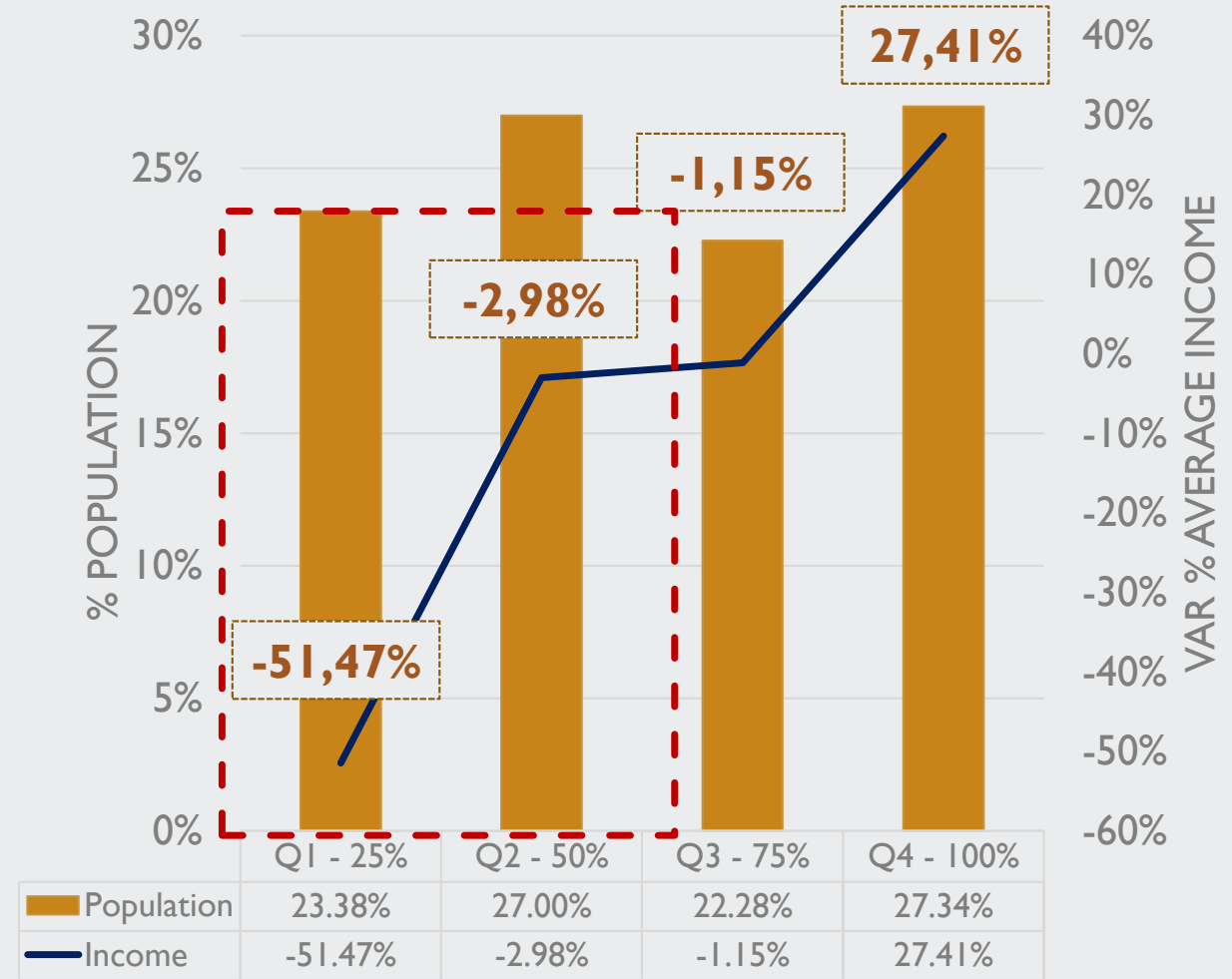
Attribute	Groceries retailers	Food service facilities
Population (% out of municipality)	428,592 (17.8%)	392,176 (16.3%)
Average distance to the closest facility	678 m	699 m
Maximum distance to the closest facility	2.2 km	2.3 km

ACCESSIBILITY x INCOME AND POPULATION

GROCERY STORES



FOOD SERVICE



MAIN FINDINGS

- Deliveries within the **CBD** are more likely to be performed by **non-motorized modes**.
- The **peripheral areas** in the north, southwest, and east of Belo Horizonte are areas where **motorized home delivery or purchase/pickup** should be, at least in a short-term period, the most likely way to provide food access to the households.
- **Spatial concentration of food retailers in Belo Horizonte**
- There are **great spatial differentiation and economic inequality** regarding the **access to food retailers**.
- The **locational decision for food retailers** should have considered **profitability issues** with market approach towards **higher income population**.

MAIN FINDINGS

With the **growth in the e-commerce as a food channel**, **the distance to consumers** must be considered as an impedance for retailers to perform their activity.

Accessibility as a planning approach to jointly consider urban planning and transportation efficiency

POLICY AND PRACTICAL IMPLICATIONS

- i. Public policy can be directed to **land use regulation** in order to stimulate more equity regarding the access to food retailers, especially groceries and fresh food.
- ii. **Economies of scale and economies of agglomeration (efficiency/surplus) can be developed concerning social impact projects.**
 - **Pickup points**
 - **Joint delivery Systems**
- iii. **ATTENTION:** small freight vehicles x restrictive public policy
- iv. Local production and consumption for fresh food: i.e. **urban agriculture**

FURTHER RESEARCH

- Investigate **food deserts**, regarding the **quality of food** available.
- Other retail models and more detailed impedance function - $\text{km} \gg \text{time}$ and discuss different modes
- Inclusion of local consumption habits in the analysis
- **New business models** – “Rappi Compras”
- Consider the **work conditions** for the deliverers – sprawled cities

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THANK YOU!

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