Travel time and dietary intake in Latin American cities - A multilevel analysis.

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Rationale

- Latin american cities have a diverse urban profile, which can define the spatial relationships between home and workplaces.

- Longer travel times have been observed due to increased urbanization and vehicle motorization rates, and may affect activities in daily life such as physical activity and dietary intake.

Rationale

- More time spent travelling can translate into less time for buying food and cooking, leading to a greater consumption of lower time cost meals (e.g. pre-prepared foods) and ultra-processed foods.

- There are some studies showing a positive association between active commuting and lower risk of obesity, diabetes, and metabolic syndrome.

- There is limited empirical evidence on how travel time affects diet, and even less is known about it in Latin American cities.

Research questions:

1) Whether travel time at the city-level is associated with individual diet indicators and

2) If this association varies according to the city size?

Methods

Sample

SALURBAL harmonized data - Countries with available data on travel time, diet indicators and covariates (BR, CO, CL, MX, PE)

Exposure (L1_UX – Urban extent metropolitan area, Quistberg, 2018)

Urban average travel time – measures the average automobile travel time during peak hour (in minutes);

Urban travel delay - the average travel time delay due to congestion in the street network (in minutes);

Urban travel delay index - Measures the increase in travel times due to congestion in the street network (Index ranges from zero to infinity)

Outcome (individual)

Vegetable and Sugar-sweetened beverages consumption

(Days per week - Rare: <= 1; Medium: 2-4 and Frequent: 5-7)

Methods

Confoundings

Individual: age, sex, education, car ownership;

City-level:

city size, population density, intersection density;

adjusted gas price, presence of mass transportation options (Subway or BRT);

social environment index.

Methods

- Analytical methods:
- Ordinal multilevel models for each outcome
  - Individuals nested within cities
  - Random effect at the city level

- Model building:

Model 1: exposure + sex + age

Model 2: exposure + sex + age + education

Model 3: exposure + sex + age + education, car ownership

Model 4: $\mathrm{M3} + citysize + popden + intden + gasprice + transport\ option$

Model 5: M4 + socio environment index

Models - 3 tertiles based on the city size (M1-M3 were the same and M4 and M5 without city size)

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Results - Descriptives

Table 1. Number of cities and individuals per country.

Country	**BR**	**CL**	**CO**	**MX**	**PE**
Survey year	2013	2010	2010	2012	2016
Number of cities (n=181)	27	21	35	91	23
Number of individuals*	93,113	3,140	62,230	72,789	11,929

*Note: Surveys complete samples;

Analytic sample: 57,170 (Vegetable consumption) 42,117 (SSB consumption)

Results - Descriptives

Table 2. City-level characteristics by Vegetable consumption groups.

City level characteristics	Vegetable consumption (in Days per week)			
	Frequent (5-7)	Medium (2-4)	Rare (<=1)	p-value
Average travel time in traffic (min)	30.0	28.9	26.1	< 0.001
Average travel delay time in traffic (min)	5.6	6.2	6.2	< 0.001
Travel delay index	0.23	0.27	0.28	< 0.001
City size	46523.3	41039.3	30914.2	< 0.001
Population density	7775.4	8632.8	9839.4	< 0.001
Intersection density (NA=42)	13.0	12.9	12.4	< 0.001
Adjusted gas price (NA=533)	0.03	0.03	0.03	< 0.001
Presence of mass transit, %				
No	44.7	37.0	18.3	< 0.001
Yes	50.7	35.8	13.5	
Social environment index (z-score)*	0.19	0.06	-0.02	< 0.001

Results - Descriptives

Table 3. City-level characteristics by Sugar Sweetened Bevarages consumption groups.

City level characteristics	Sugar Sweetened beverages consumption (in Days per week)			
	Frequent (5-7)	Medium (2-4)	Rare (<=1)	p-value
Average travel time in traffic (min)	30.7	29.6	29.9	< 0.001
Average travel delay time in traffic (min)	5.2	5.1	5.3	< 0.001
Travel delay index	0.22	0.22	0.23	< 0.001
City size	51942.9	47454.9	48567.4	< 0.001
Population density	8292.7	8073.3	8184.4	< 0.001
Intersection density (NA=42)	15.6	14.3	14.8	< 0.001
Adjusted gas price (NA=533)	0.036	0.037	0.038	< 0.001
Presence of mass transit, %				
No	44.2	30.8	25.0	< 0.001
Yes	49.2	26.2	24.5	
Social environment index (z-score)*	0.06	-0.0005	0.02	< 0.001

* Higher score indicates better social environment

Results - models

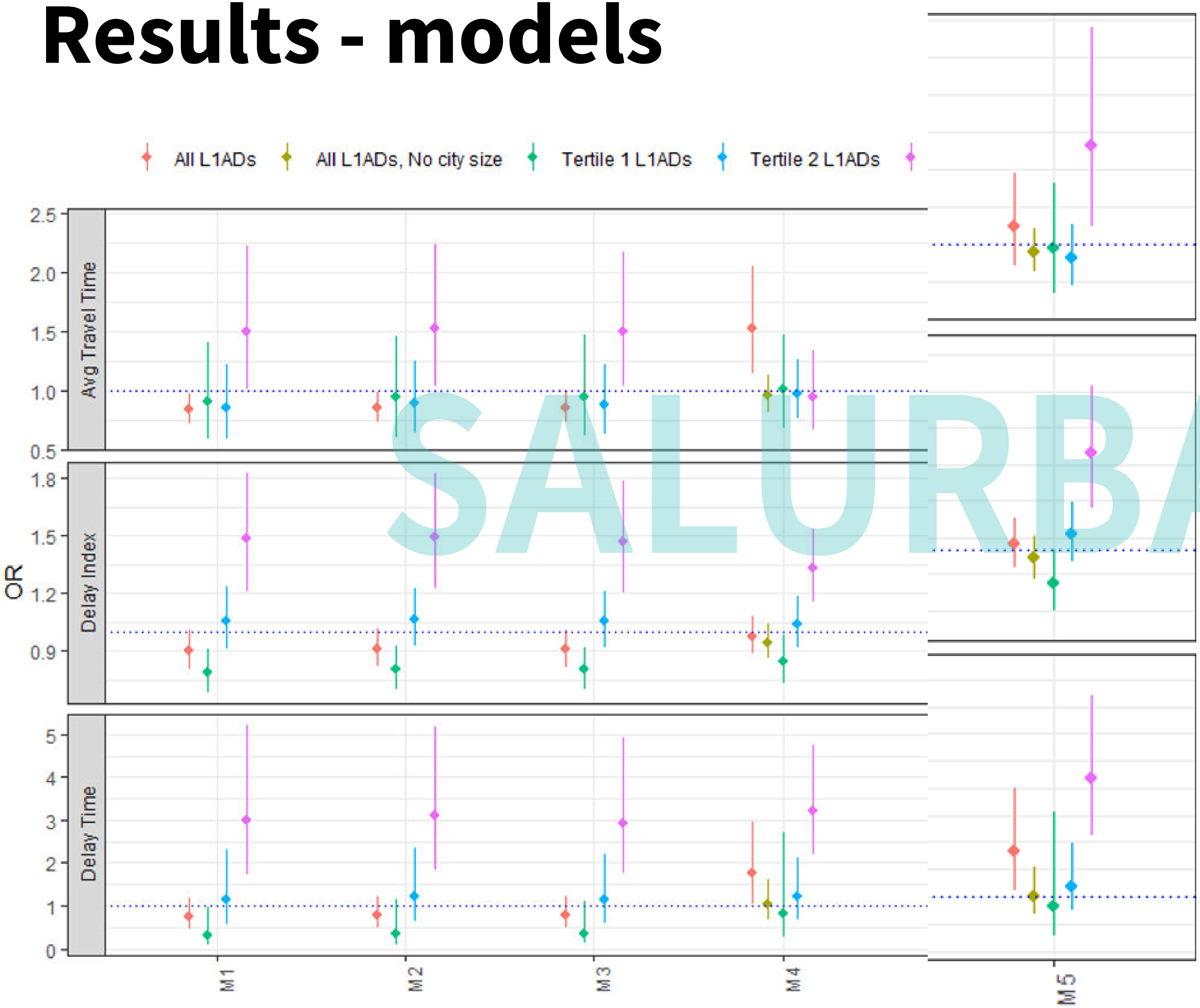

Figure 1: Adjusted association between Avarage travel time, Delay Time and Delay Index and Vegetable consumption in Latinamerican cities. SALURBAL Project.

Notes:
Odds for Rarity of consumption;
Average travel time / delay time variable: 10 min increase.
Delay index: 0.1 increase

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Results - models

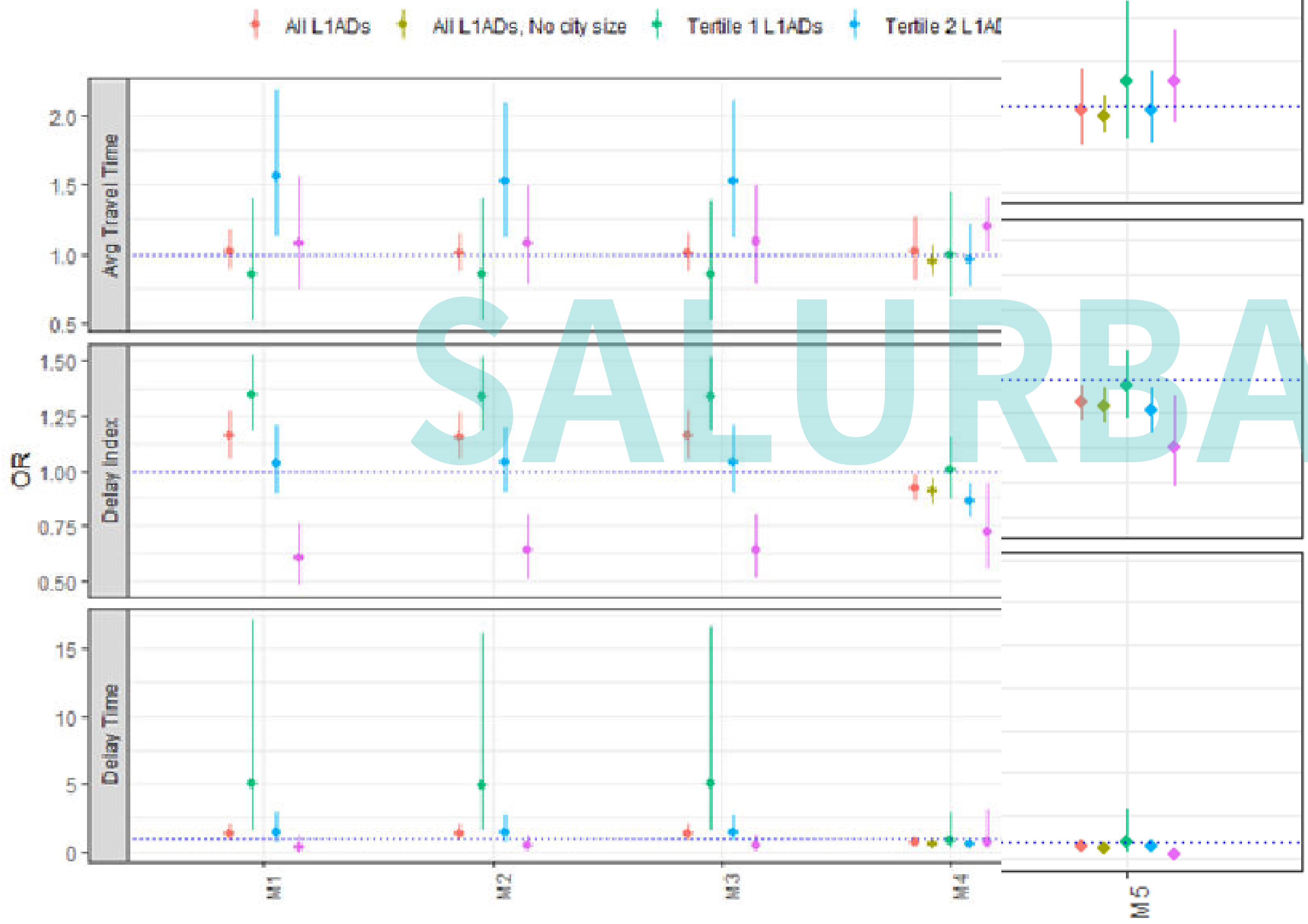

Figure 2: Adjusted association between Avarage travel time, Delay Time and Delay Index and SSB consumption in Latinamerican cities. SALURBAL Project.

Notes:
Odds for Rarity of consumption
Average travel time / delay time variable: 10 min increase. Delay index: 0.1 increase

Summary Results

- Our results suggest there is an inverse association between travel time (avarage travel time, avarage delay time and travel delay index) and the frequency of vegetable consumption and a direct association with the frequency of SSB consumption - specially in bigger cities.
- Relevance of interventions in urban mobility systems for healthy diets.

Strengths

Harmonized data for five countries;

Big sample size;

Possibility to explore a novel hypothesis.

Limitations

Lack of temporality between exposure and outcome measures (travel time data does not precede diet data)

Heterogeneity of exposure across individuals in the same city

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