

Associations between spatial access to bicycle-specific infrastructure, sociodemographic characteristics, and city-wide safety perceptions of bicycling: a cross-sectional survey of bicyclists in 6 Canadian and U.S. cities

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Background

- Cycling as active transport provides personal and environmental health benefits
- Safety is major concern for bicyclists
- Safety influenced by personal and road environment characteristics



Infrastructure is key to perceived safety of bicycling





Is there an association between spatial access to bicycle specific infrastructure and overall perceived safety?

Data: International Bikeshare Impacts of Cycling and Collisions Study (IBICCS)

6 cities with available geospatial data on bicycle infrastructure were sampled using three repeated cross-sectional surveys in 2012, 2013 and 2014

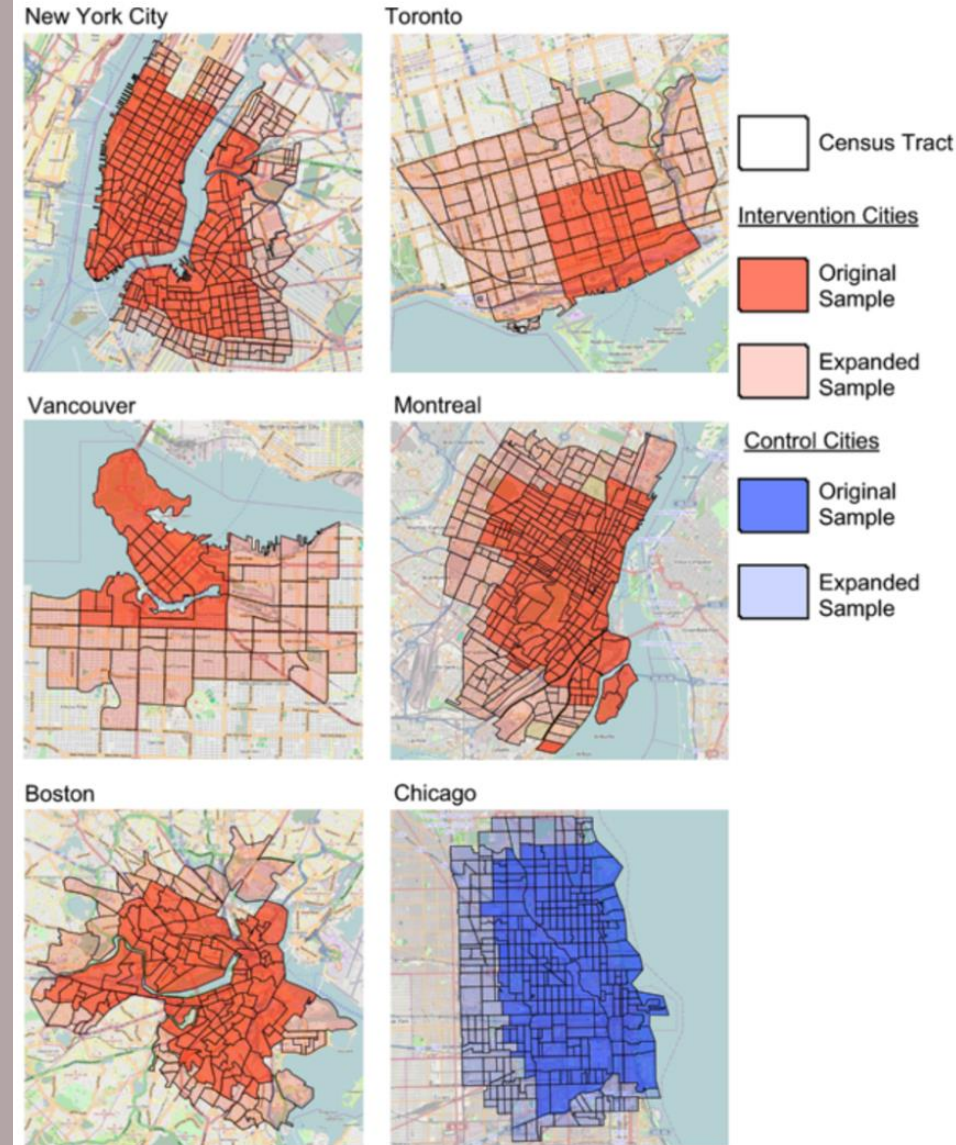
- Montreal, Toronto, Vancouver, New York, Boston, Chicago

Non-probabilistic online panel survey

Collected information on socio-demographic characteristics, traffic behaviour and transportation safety

Participants geo-located by 6 digit postal code of residence

Post stratification weights by age and sex



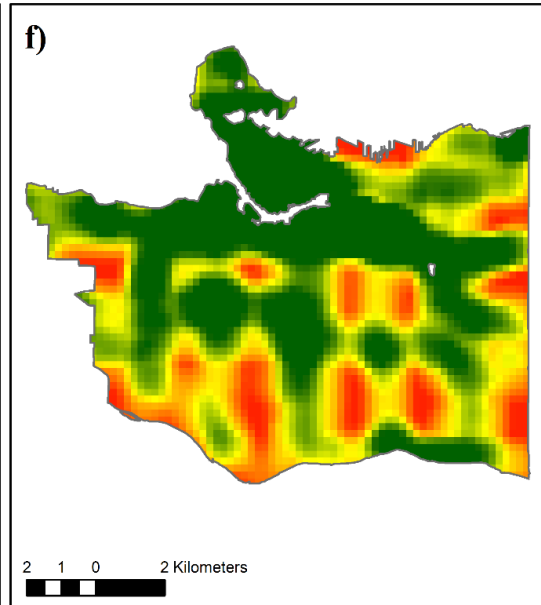
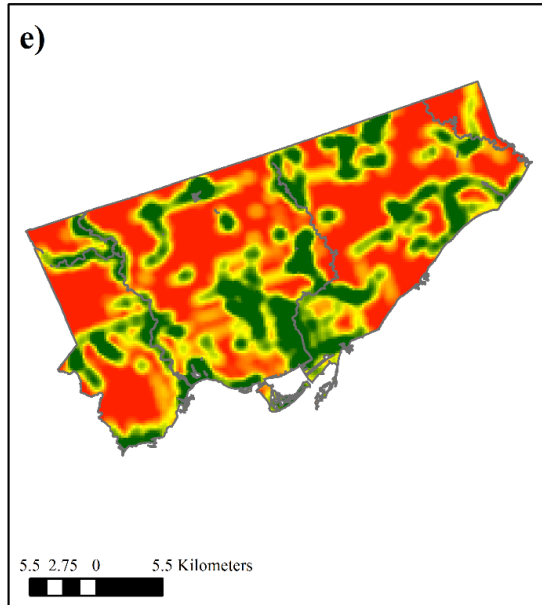
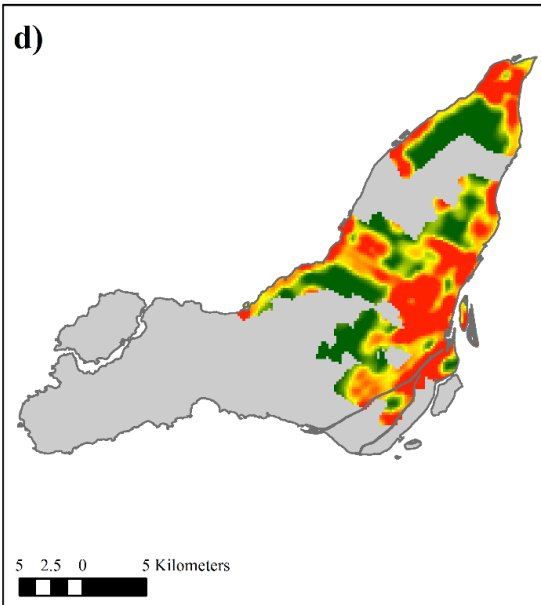
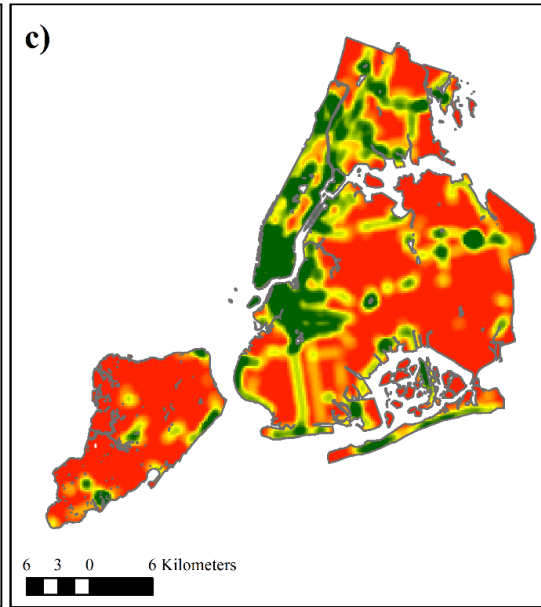
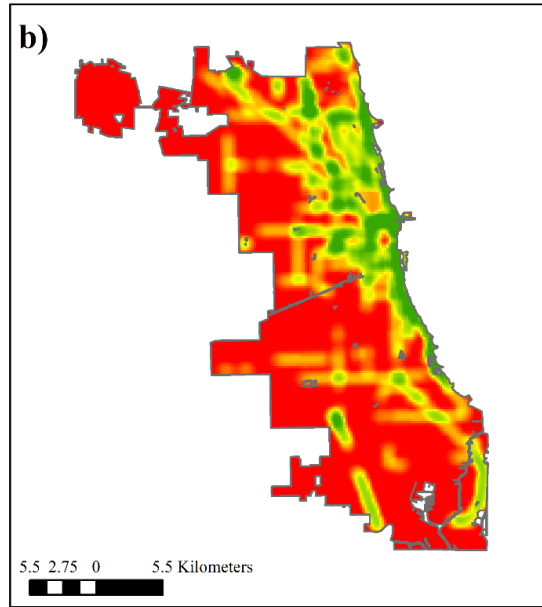
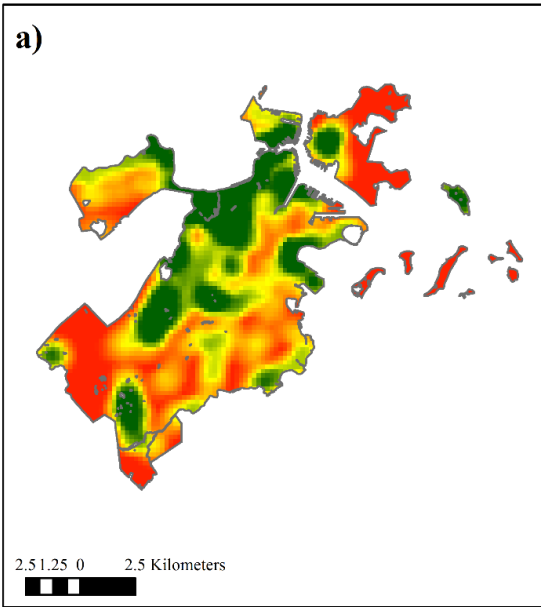
Measuring Perceived Safety

“Overall, how safe do you think bicycling is in your city?”

Safe

**Neither Safe or Unsafe
(Neutral)**

Dangerous



Bike Lane Score 0  100  NA

Measuring Spatial Access to Bicycle Infrastructure: Bike Lane Score

Statistical Analysis

- Weighted descriptive statistics of individuals
- Weighted **baseline category logit** model for multinomial outcomes (3 or more categories)

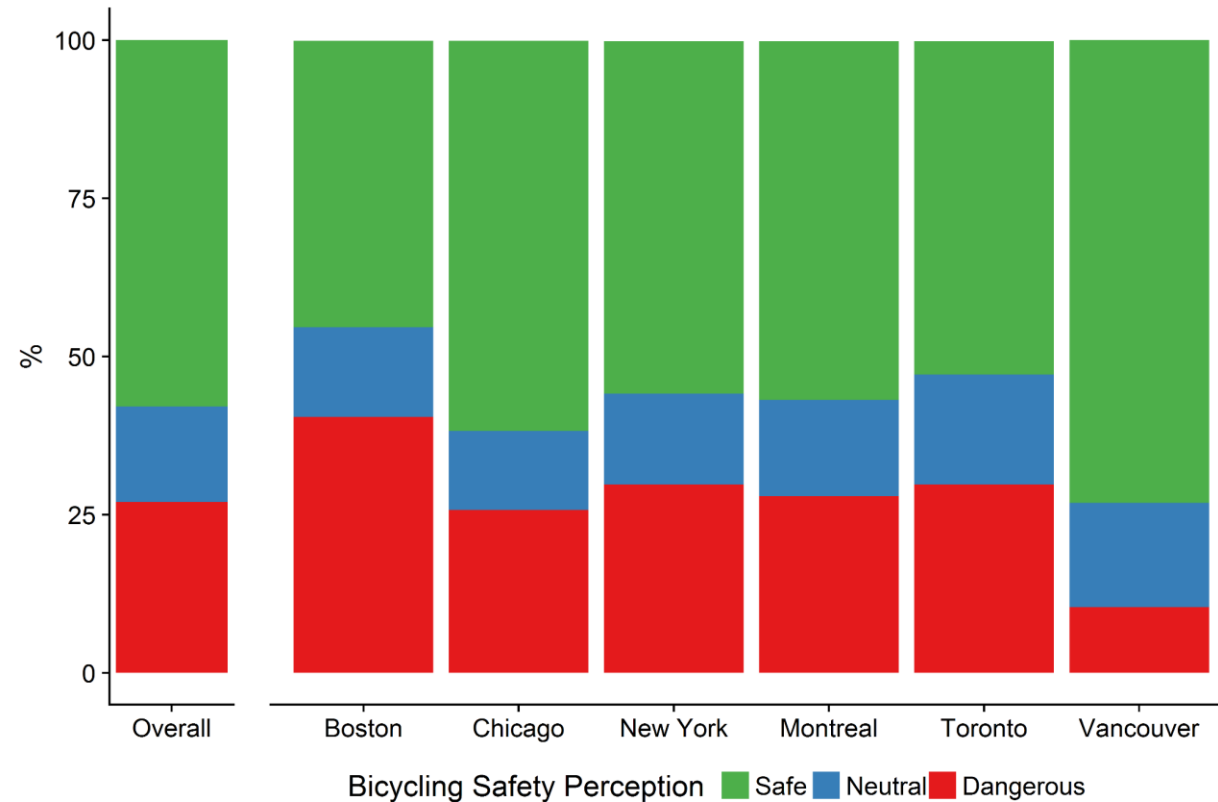
Perceived Safety ~ Bike Lane Score, Sociodemographic factors, City

$$\ln\left(\frac{P_h}{P_j}\right) = \beta_{0h} + \beta_{1h}X_1 + \dots + \beta_{kh}X_k \text{ for } h = 1 \text{ to } j - 1$$

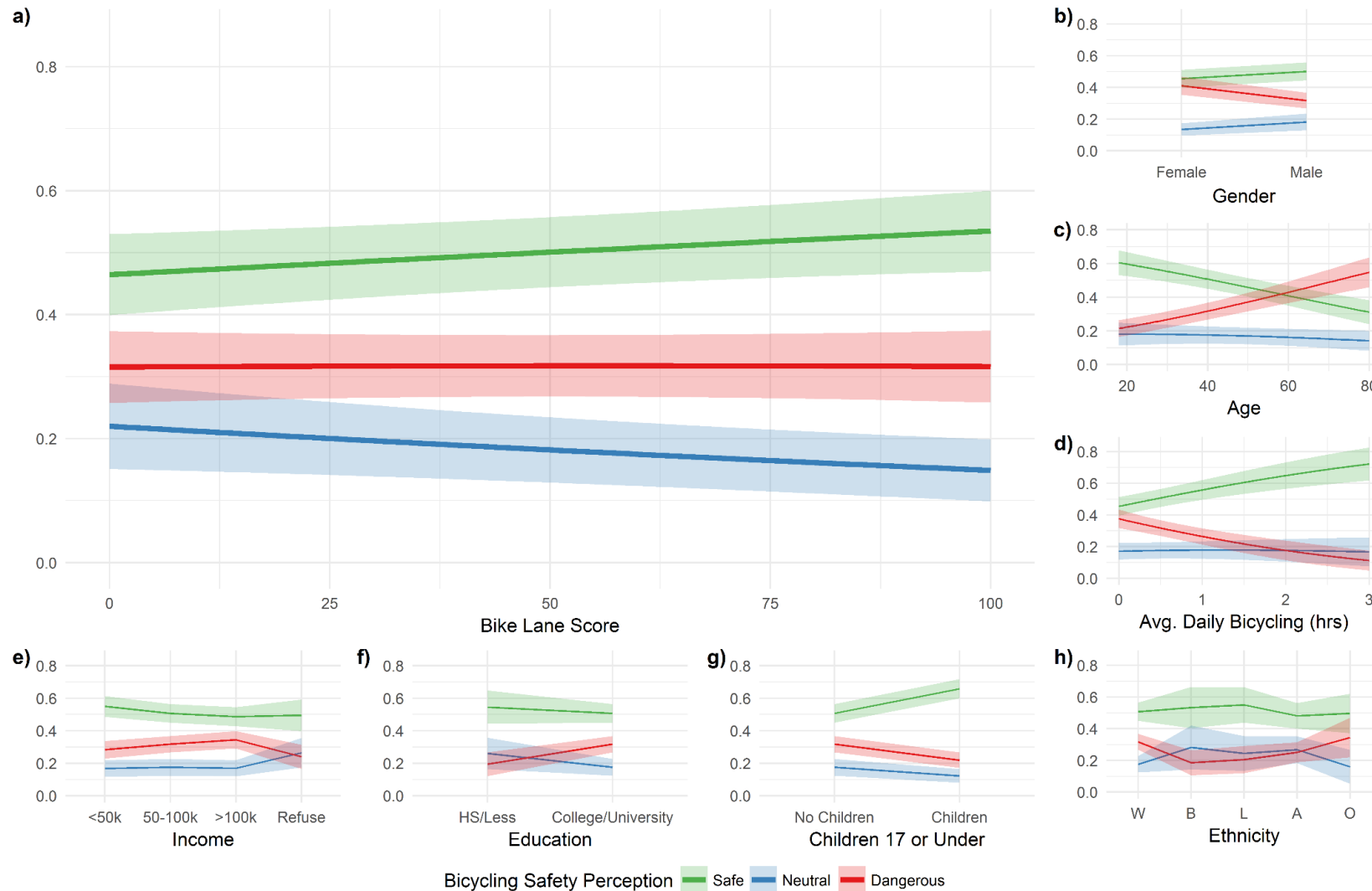
- We included a fixed effect for city to adjust for between city differences
- Results were visualised through plots of predicted probabilities of safe, neutral or dangerous when other variables are held to their mean or mode

Bicyclist Sample Characteristics

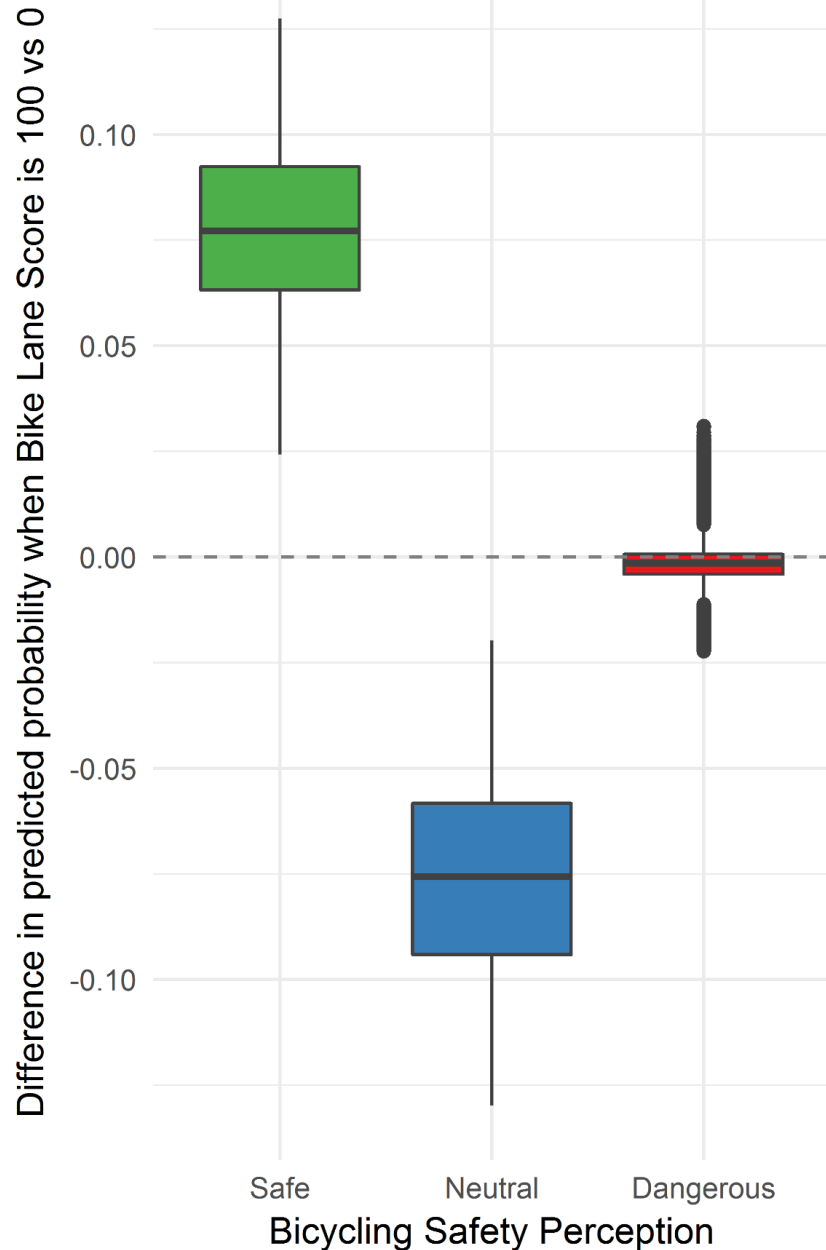
- N = 3,439
- Male (61.1%)
- Employed full-time (57.7%)
- Post-secondary education (90.9%)
- Did not have any children aged 17 years or under (74.4%)
- Driver's license (87.8%)
- Had access to a motor vehicle (69.4%).
- Most had cycled 1-2 days per week in the previous month (56.6%)
- Many bicyclists (41.2%) had a Bike Lane Score lower than 50
- **Most bicyclists perceived bicycling in their city to be safe**
 - Varied by city



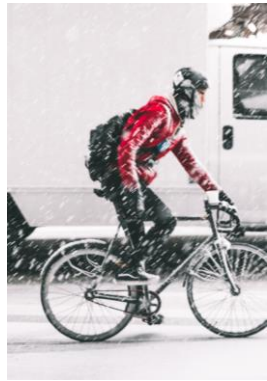
Associations between Bike Lane Score of Residence, Sociodemographic characteristics and Perceived Bicycling Safety: Predicted Probabilities



Predicted effect of Bike Lane Score on perceived safety, adjusting for individual exposure and sociodemographic characteristics

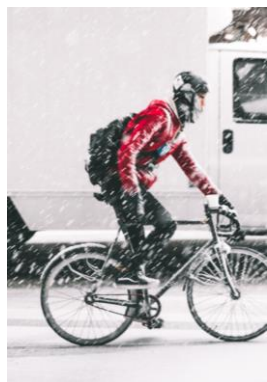
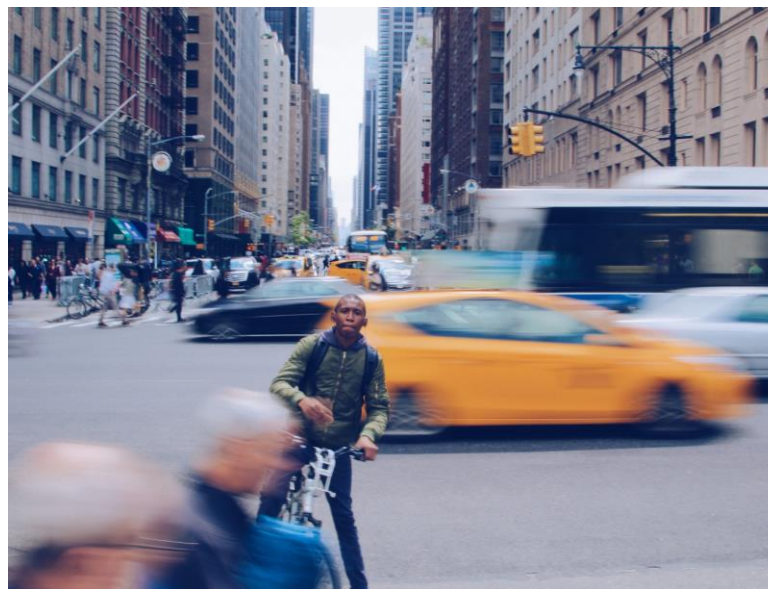


- More likely to perceive bicycling as safe
- Less likely to perceive bicycling as neutral



Caveats

- We were not able to assess observed safety (e.g. a measure of injuries or crashes per unit of exposure), as spatially and temporally resolved crash data are not readily available across municipalities.
- Motor vehicle traffic volumes may also play a role in safety perceptions but standardized, spatially resolved data on traffic volumes was not available
- Cross-sectional data – causality not defined



Conclusions

The built environment can shape perceptions of safety

- Findings support the hypothesis that bicycling infrastructure availability around one's residence is associated with more favourable perceptions of bicycling safety.
- On average, bicyclists living in an area with a Bike Lane Score of 100 are 7.8% more likely to perceive bicycling as safe in their city, compared to bicyclists living in an area with a Bike Lane Score of 0 (range 2.4% to 12.7% depending on the profile).
- Significant differences in perceptions of bicycling safety between males and females who already bicycle
- Older bicyclists tend to perceive bicycling to be less safe than younger bicyclists.

