



How the physical and social environment shape commuters' choices to bike or walk to work

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Project advisors

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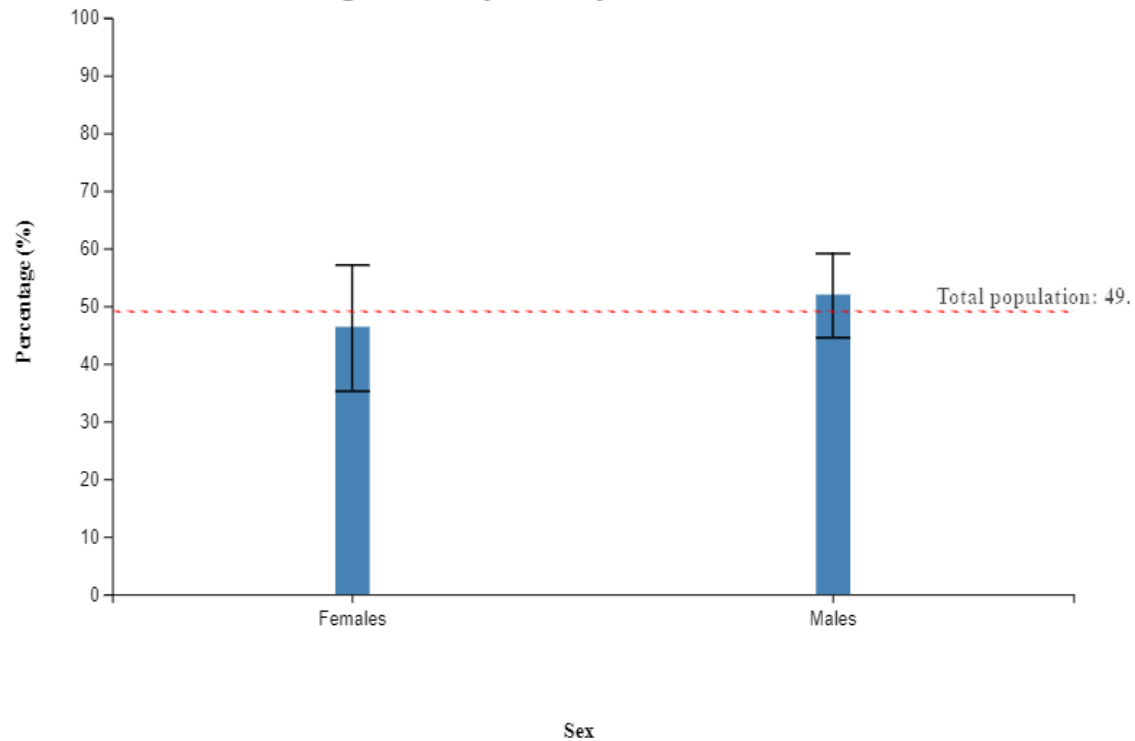
Public Health Agency of Canada (PHAC)

Takeaway messages

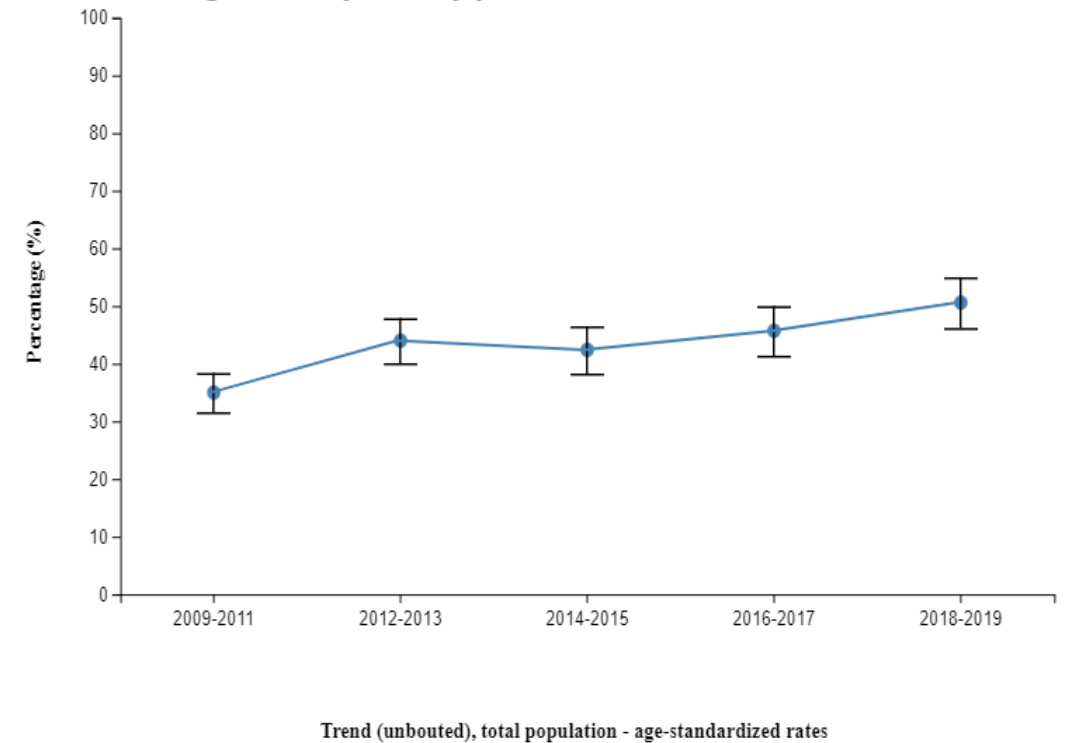
- Supportive physical environments (including good air quality, greater walkability, cycling infrastructure, and greenness) can promote active commuting, particularly in areas with greater instability and deprivation
- Both home and work neighbourhood environments contribute together to support active commuting

Physical inactivity is prevalent among Canadian adults

^aPercentage (%) of adults who meet physical activity recommendations by accumulating at least 150 minutes of moderate to vigorous physical activity each week, aged 18-79 years, by sex, Canada, 2018-2019

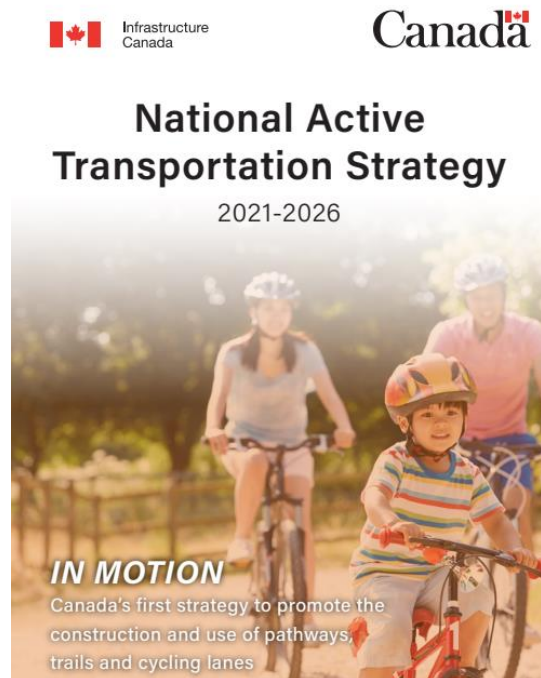


^aPercentage (%) of adults who meet physical activity recommendations by accumulating at least 150 minutes of moderate to vigorous physical activity each week, aged 18-79 years, by year (ASR), Canada, 2009-2011 to 2018-2019



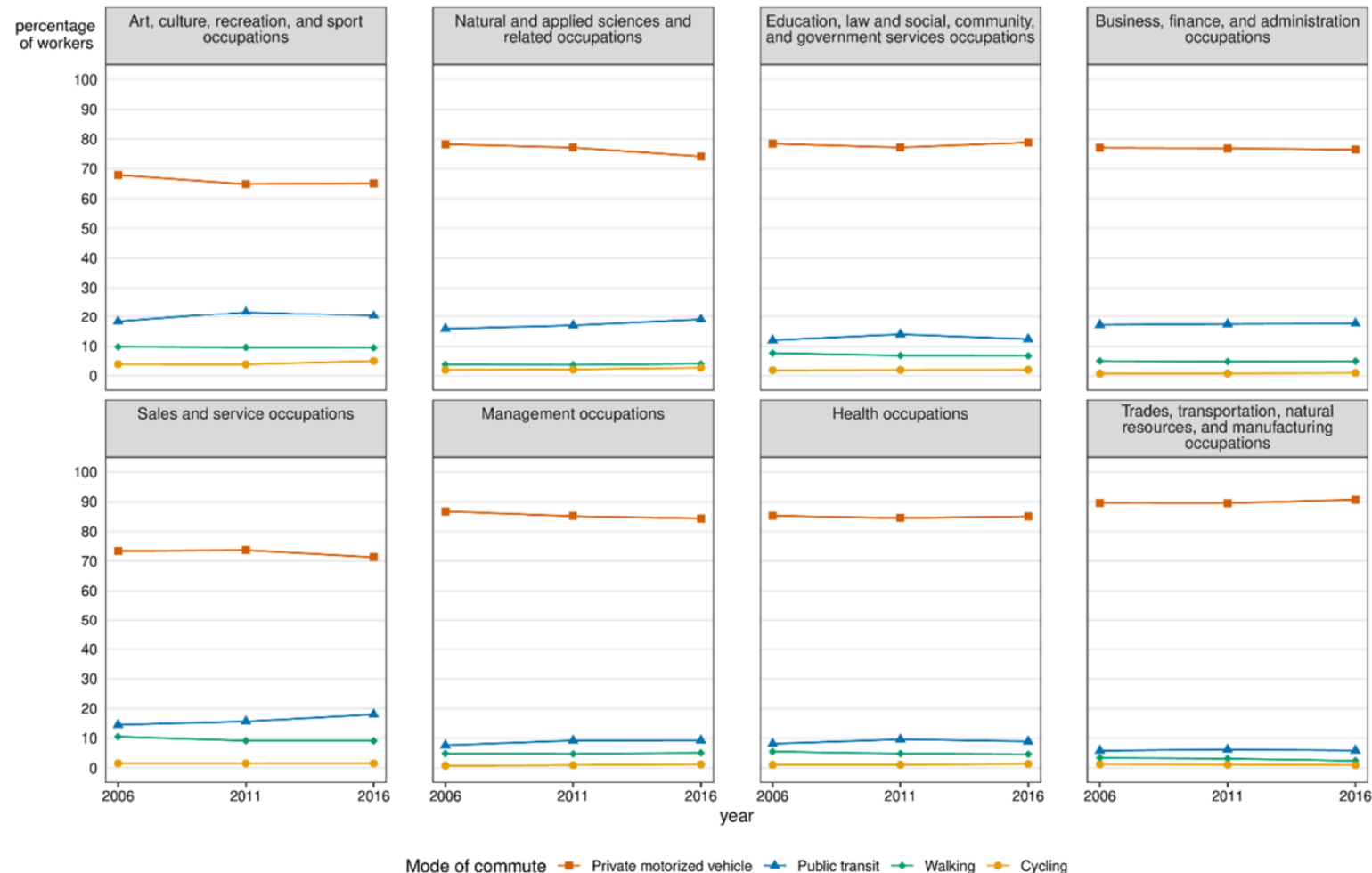
Why promote active commuting?

- A practical way for workers to increase their daily physical activity
- Environmental and health benefits

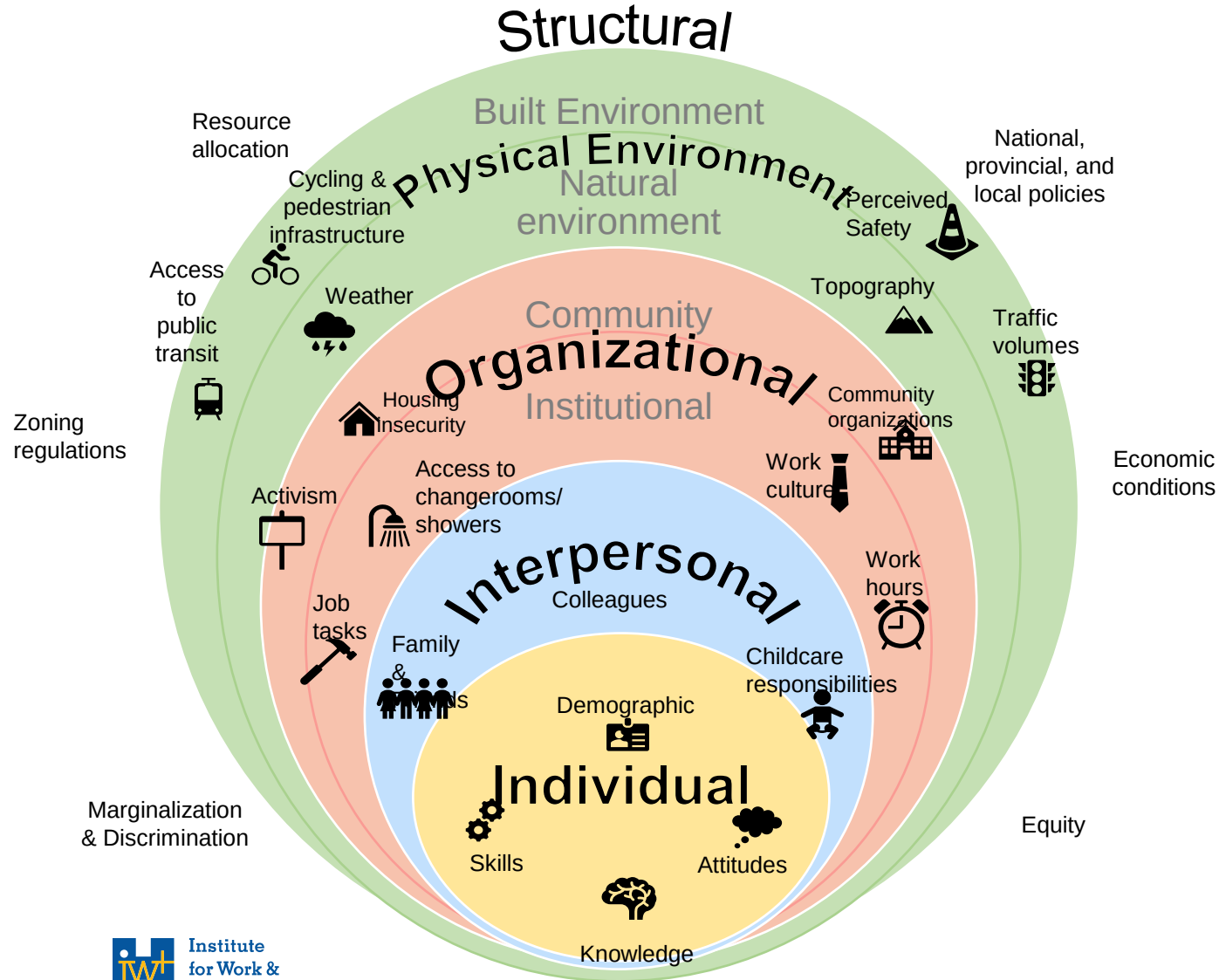


Occupational trends by main mode of commute

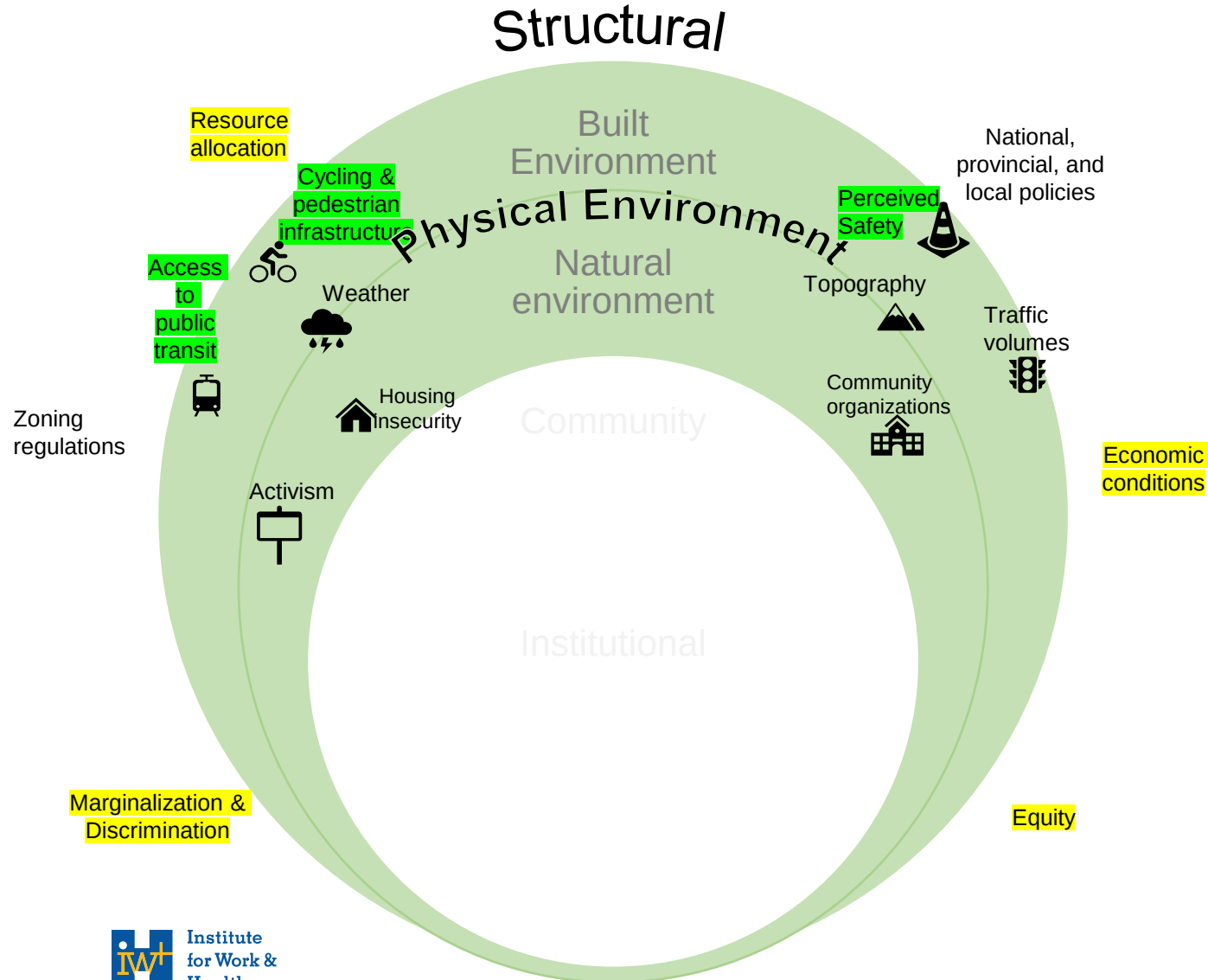
Percentage of workers commuting by each mode from 2006 to 2016, stratified by occupation



Built and social environments and active transportation



Built and social environments and active transportation



Built environment:

Human-made or human modified elements of the physical environment

Social environment:

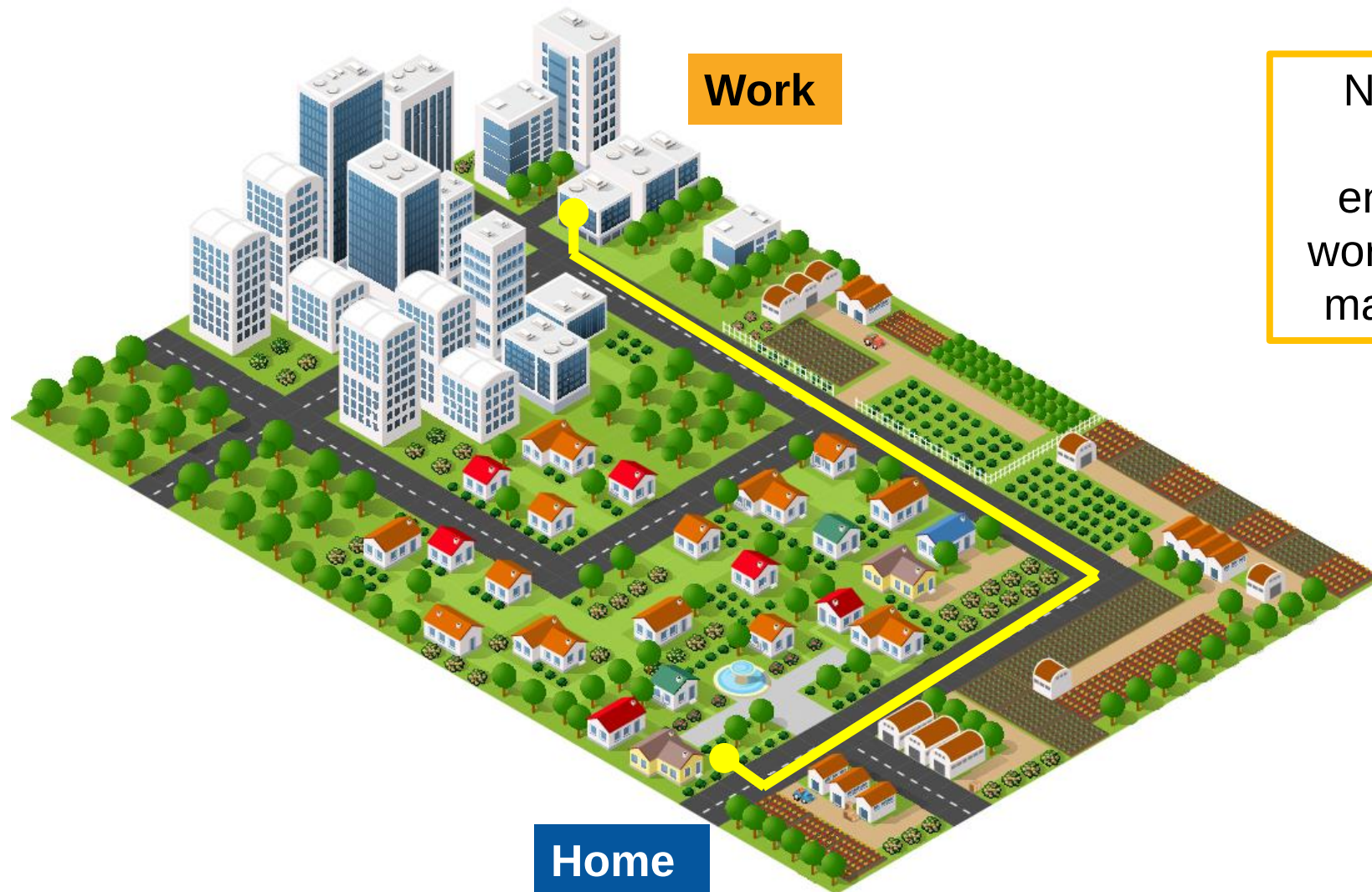
Sociodemographic makeup of areas, community relationships, and social dynamics within them

Environment characteristics can support active commuting

Studies suggest active commuting linked to:

- Distance to work
- Density of street intersections around the home
- Pedestrian and cyclist-friendly infrastructure around home or workplace
- Access to points of interest (facilities, shops, schools) close to work
- High monthly car parking costs at work
- Worksite supports/facilities (bike racks, showers)

Existing knowledge gaps

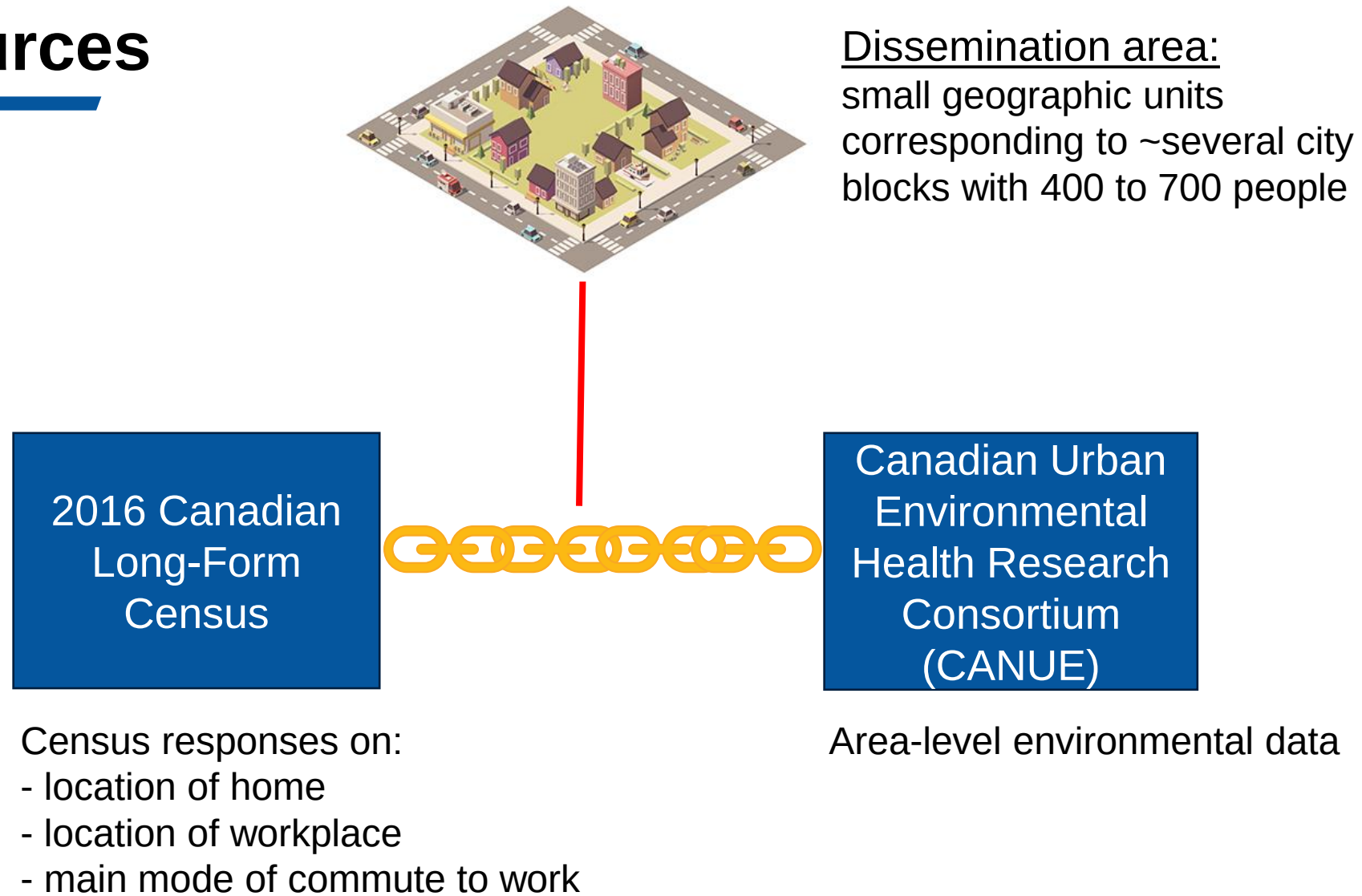


Need to explore connections between social and built environments on the home to workplace journey and how they may support active commuting

Objectives

1. Characterize the different interrelated physical environments (built environments, natural environments (e.g., greenness) and air quality) and social environments around the homes and workplaces of urban Canadian workers
2. Examine how the different types of physical and social environments are associated with active commuting (walking and cycling to work)

Data sources



Environmental data

Canadian Urban Environmental Health Research Consortium (canue.ca)



Active living environments (walkability)



Cycling infrastructure



Bus stops



Green roads & Greenness



Annual average Nitrogen Dioxide (NO₂) concentration



Annual average fine particulate matter concentration (PM_{2.5})



Annual average Ozone (O₃) concentration



Canadian Index of Multiple Deprivation (area-level social inequities)

Sample

- 2,077,405 respondents of the 2016 Canadian Long-Form Census

Sample:

- Ages between 18 to 90 years
- Living in urban areas with corresponding environmental data
- Working outside the home within 15km
- No long-term daily activity limitations

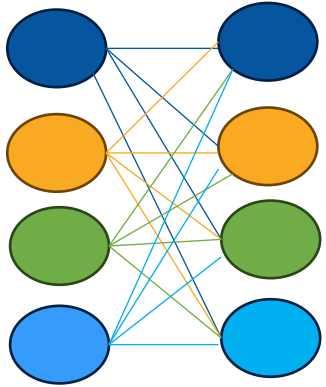
Analysis

- Cluster analysis was used to identify similar built environment, air quality, and social environment features across urban neighbourhoods
- The clusters (types of similar environments) we identified were assigned Census respondents' home location and workplace location



Analysis

Home Work



Combinations of clusters (similar environments) around home and workplace

analytical technique:

multivariate multinomial
logistic regression



Mode of
commute to
work



Explored differences by:

- Age
- Sex (males/females)
- Sex & having a child at home
- Straight-line distance from home to work

4 distinct physical and social environments

	Cluster 1 “Low active living, high greenness & medium social environments”	Cluster 2 “Medium physical & High social environments”	Cluster 3 “Medium physical & Low social environments”	Cluster 4 “High active living & Medium-low social environments”
Physical environment (built environment, greenness, air quality)				
Walkability	Low score	Medium score		High score
Cycling infrastructure				
Bus stops				
Green roads				
Greenness				
NO ₂				
O ₃				
PM _{2.5}				
Social environment				
Instability				
Deprivation				
Dependency				
Ethnic concentration				

Legend

Low walkability, cycling infrastructure, bus stops, green roads, greenness, high air pollution

High walkability, cycling infrastructure, bus stops, green roads, greenness, low air pollution

Most unstable, deprived, dependent, least ethnically diverse

Least unstable, deprived, dependent, ethnically diverse

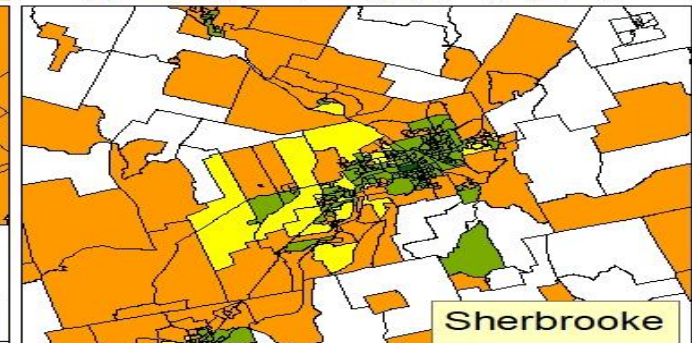
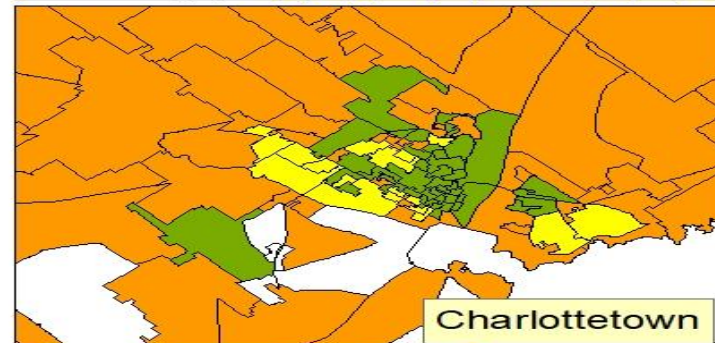
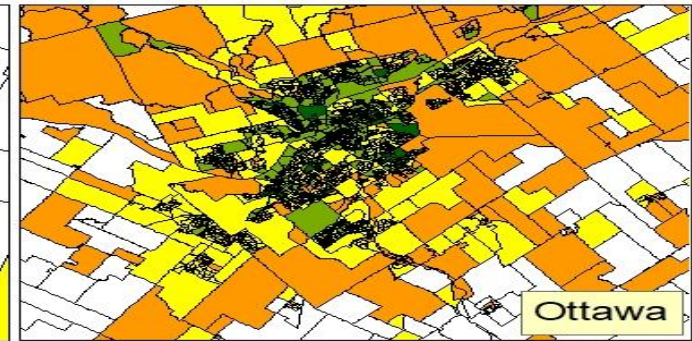
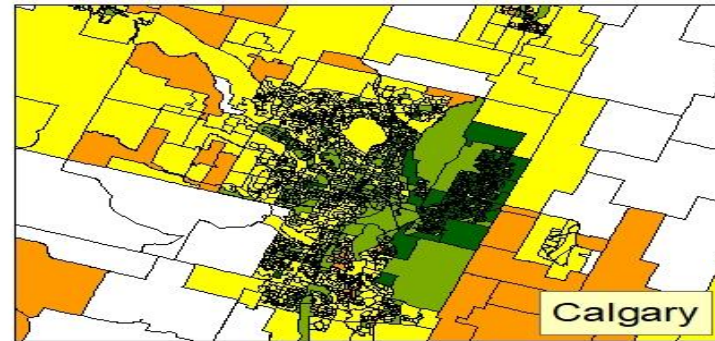
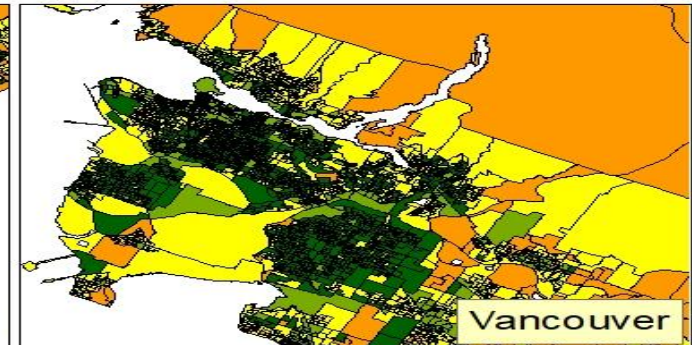
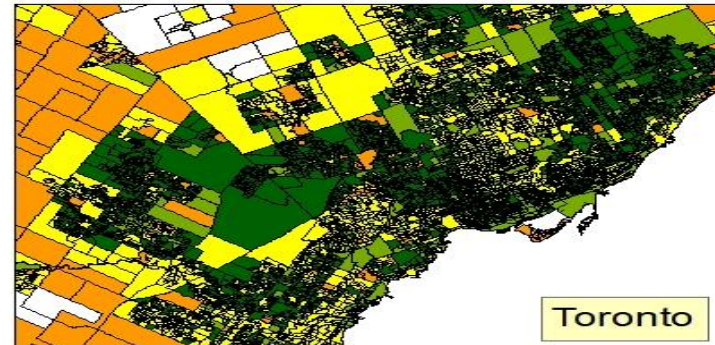
Worker characteristics at home location

	Cluster 1 “Low active living, high greenness, & medium social environments” (12% of sample)	Cluster 2 “Medium physical & High social environments” (24% of sample)	Cluster 3 “Medium physical & Low social environments” (43% of sample)	Cluster 4 “High active living & Medium – low social environments” (21% of sample)
Sex	55% Males	54% Males	53% Males	53% Males
Education	41% HS diploma	39% Bachelors of above	34% HS diploma	36% HS diploma
Family composition	39% Married with child	46% Married with child	26% Married no child	37% Married with child
Cultural/ racial background	87% White	76% White	77% White	44% White
Immigrants	12%	26%	24%	53%
Income Quintile (Q1-Q5)	23% Q4	34% Q5	31% Q1	29% Q1
Type of dwelling	87% House	90% House	56% Apartment	51% Apartment
Occupation	28% Sales & Services	24% Sales & Services	29% Sales & Services	32% Sales & Services

Locations of physical and social environments

	Cluster 1 "Low active living, high greenness & medium social environments"	Cluster 2 "Medium physical & High social environments"	Cluster 3 "Medium physical & Low social environments"	Cluster 4 "High active living & Medium-low social environments"
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Physical environment (built environment, greenness, air quality)				
Walkability	Low score	Medium score		High score
Cycling infrastructure				
Bus stops				
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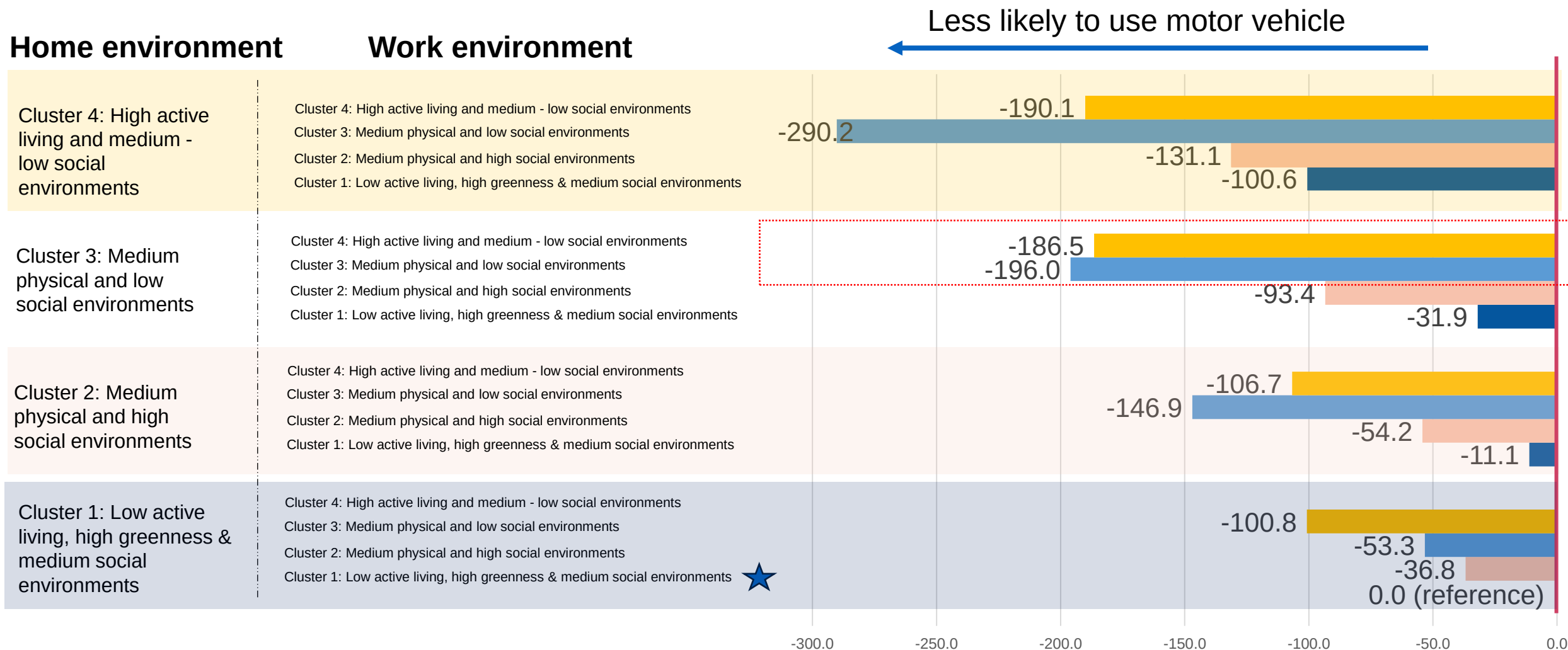


Neighbourhood clusters

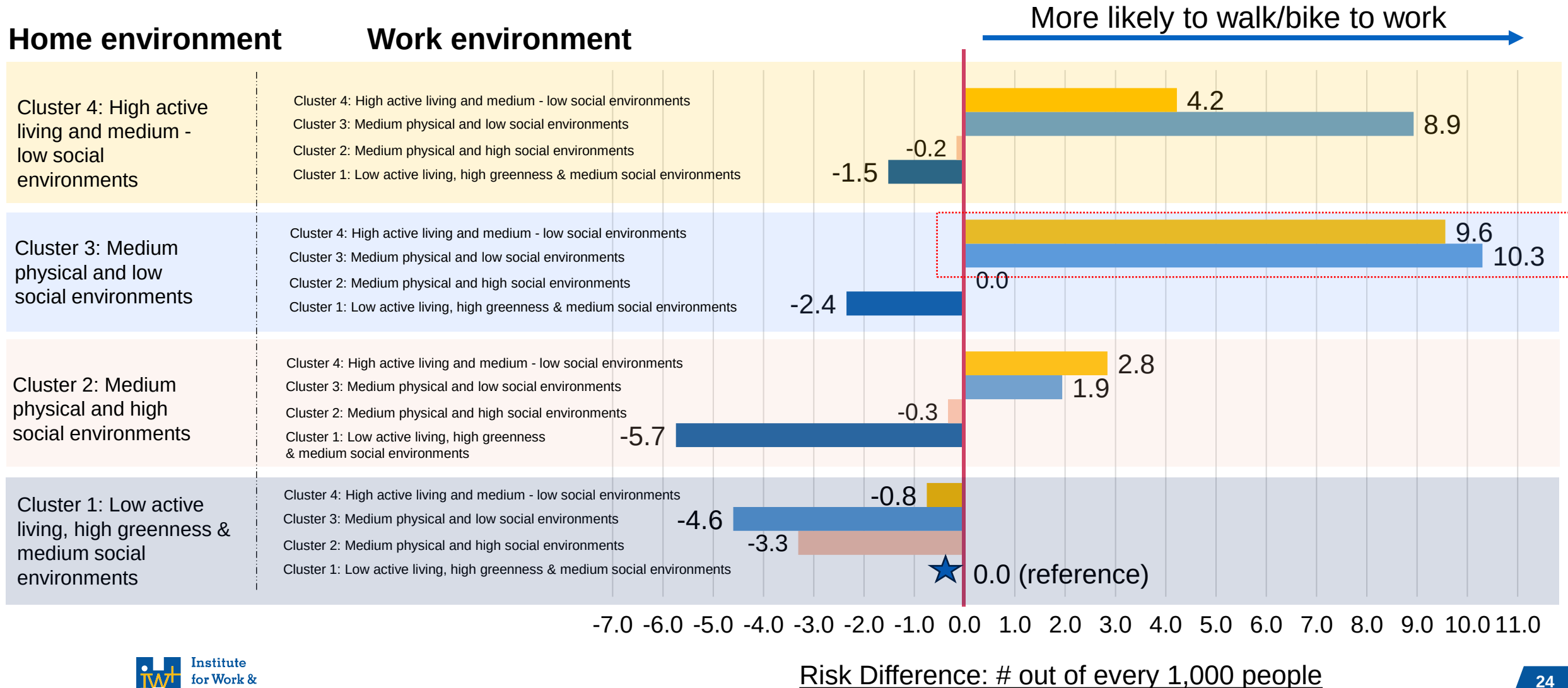
Missing 1 2 3 4



Motor vehicle to work



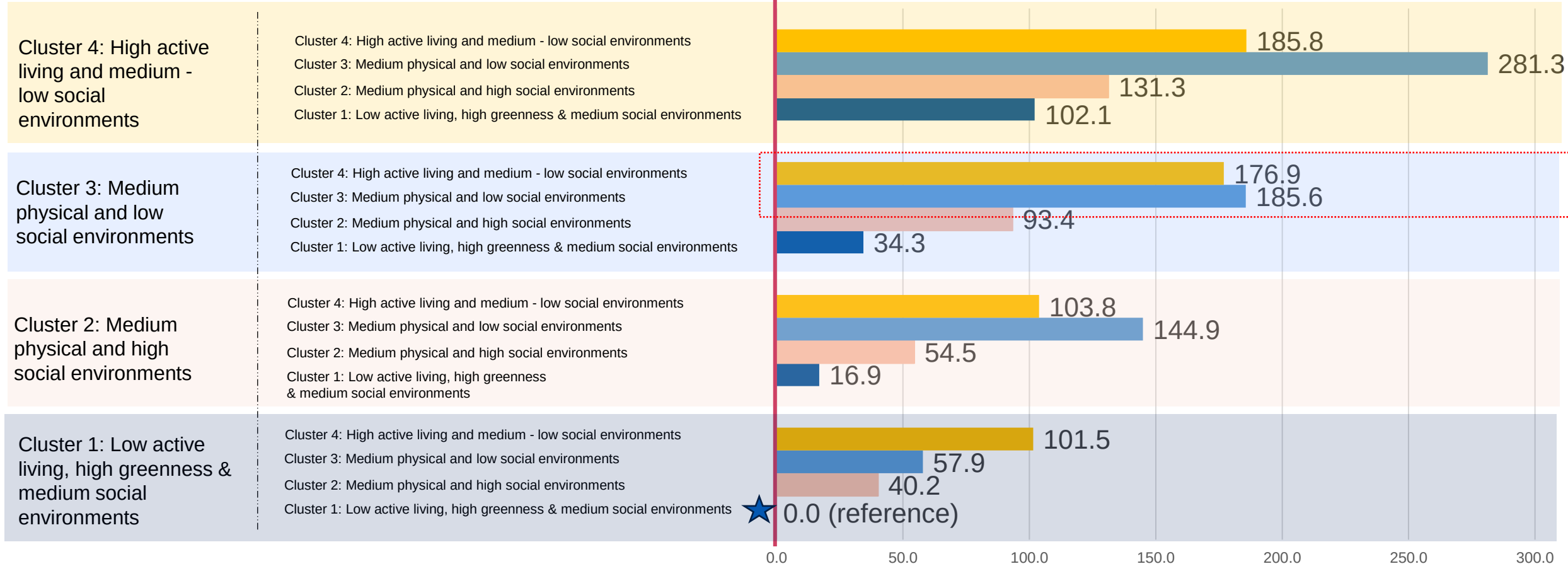
Walking or biking to work



Public transit to work

Home environment

Work environment



Trends for different worker groups

- Results consistent for different groups, with some notable highlights:
 - Males walked, biked, and used motor vehicles more than females
 - Younger (18-34 years) and middle-aged workers (35-49 years) were more likely to use public transit than older workers
 - Those with longer commutes were more likely to use public transit

Key messages

- Policies and interventions supporting walking/biking infrastructure, good air quality, and greenness can promote active commuting, particularly for areas experiencing greater instability and deprivation
 - These areas also represent socially disadvantaged communities with greater levels of physical inactivity and chronic disease
- Supportive environments around homes and workplaces can contribute together to supporting active commuting

Strengths & Limitations

Strengths

- Large sample size of over 2 million Census respondents
- Examined both home & workplace neighbourhood environments
- Multiple air quality measures, built- and social environments analysed together

Limitations

- Data provides information from one point in time – we cannot tell what happens if environments were modified or if people relocate
- We accounted for key environmental and social factors, but not all of them
- Multimodal commuting information missing. Available in 2021 Census

Thank you

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