



If we build it ... who will come?

Equity in Spatial Access to Bicycling Infrastructure in Mid-Sized Cities



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CITE & PIBC Joint Mini Conference

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**“First we shape the cities –then they shape us”
~Jan Gehl**

**“If you plan cities for cars and traffic, you get cars
and traffic. If you plan for people and places, you get
people and places” ~Fred Kent**





**Not just
painted lines**



Who will come?

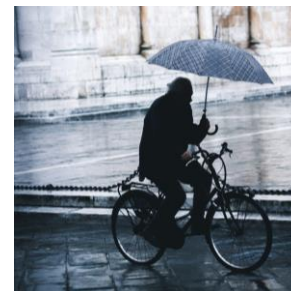
All Ages and Abilities & Equity

All Ages & Abilities

- Babies in trailers to elderly
- School-aged children including youth
- Parents with young children
- Expecting mothers
- Working professionals
- People with physical and mental disabilities who need adaptive bicycles
- Riding solitary but also riding in groups

Further equity considerations

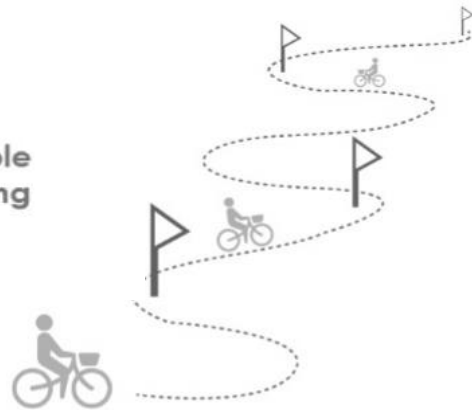
- Sex and gender
- Income and other socio-economic indicators
- Ethnic or cultural backgrounds
- Social isolation



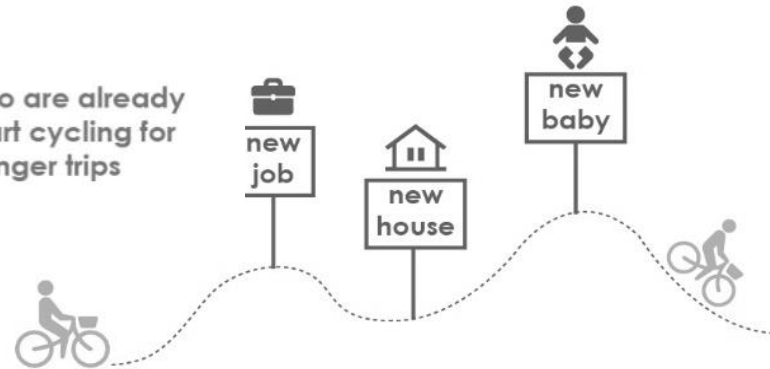
Increasing cycling: Diverse approaches



1 New people start cycling



2 People who are already cycling start cycling for more or longer trips



3 People who are already cycling continue to cycle throughout life's transitions.

Study Context & Opportunity

- **Equity** increasing priority for local governments (“Who will benefit?”)
- **Big cities have** typically been the **focus of investment/research**
- 1 in 4 Canadians live in mid-sized cities
- Opportunity for mid-sized cities:
 - ✓ Shorter travel distances
 - ✓ Less investment to date -> opportunity for strategic and bold efforts
 - ✓ In some instances can be very nimble

Huge need for data in these cities!

RESEARCH PROJECT: Impacts of Bicycle Infrastructure in Mid-Sized Cities (IBIMS)



- Canadian
- Coastal
- Mid-sized pop: 100,000 -200, 000
- “Sister Cities”



Study Questions

How does investment in a cycling network impact:

1. people of “all ages and abilities” riding a bike?
2. different populations groups and neighbourhoods?
3. safety & injury rates?
4. health-related economic benefits of cycling?



CIHR IRSC



Canadian Institutes of Health Research
Institut de recherche en santé du Canada

Funded 2016-2022

CHATR

IBIMS Methods



Population Survey

GIS Mapping

Health Economic Assessment

Q6
On a scale of 1 to 5 (1 being very safe and 5 being very dangerous), overall, how safe do you think cycling is in your city?

DO NOT READ OPTIONS BUT PROMPT IF NEEDED. E.G. IF SOMEONE SAYS "Oh I think it is safe", PROMPT WITH: "Do you think it is 'Very safe' or 'somewhat safe'?"

Choices	
Very safe	01
Somewhat safe	02
Neither safe nor unsafe	03
Somewhat dangerous	04
Very dangerous	05
DO NOT READ: Don't know	77
DO NOT READ: Refused	99

Q7A1
In the previous 12 months, have you used a bicycle?

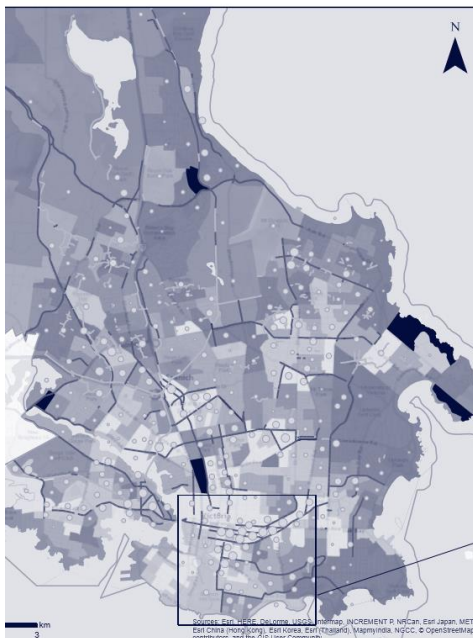
Choices	
Yes	01
No	02
DO NOT READ: Don't know	77
DO NOT READ: Refused	99

Q7A11
Compared to 3 years ago (Fall 2016) what best describes your overall bicycling behaviour? Do you bicycle: [Read response options]

Choices	
less	01
about the same	02
more	03
DO NOT READ: Don't know	77
DO NOT READ: Refused	99

Q7F
In terms of your attitudes toward cycling, what would you describe yourself as from the following categories: [Read response options]

Choices	
Strong and fearless	01
Enthusied and confident	02
Interested but concerned	03
No way, no how	04
DO NOT READ: Don't know	77
DO NOT READ: Refused	99



Health economic assessment tools (HEAT) for walking and for cycling



ECONOMIC ASSESSMENT OF TRANSPORT INFRASTRUCTURE AND POLICIES

IBIMS Baseline (2016) Population Survey Results



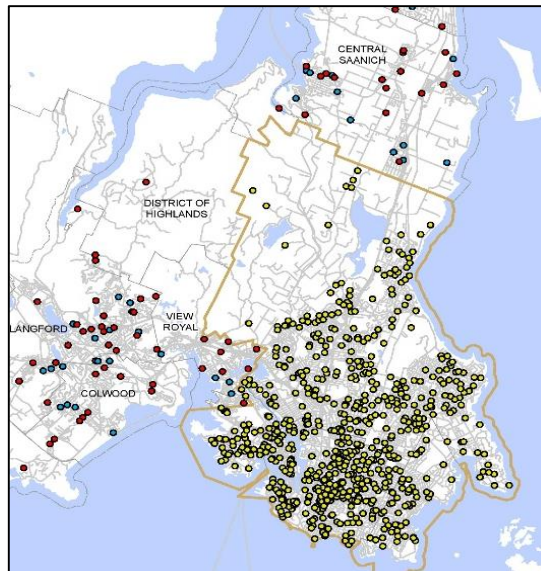
Survey participants by home location

Map Legend

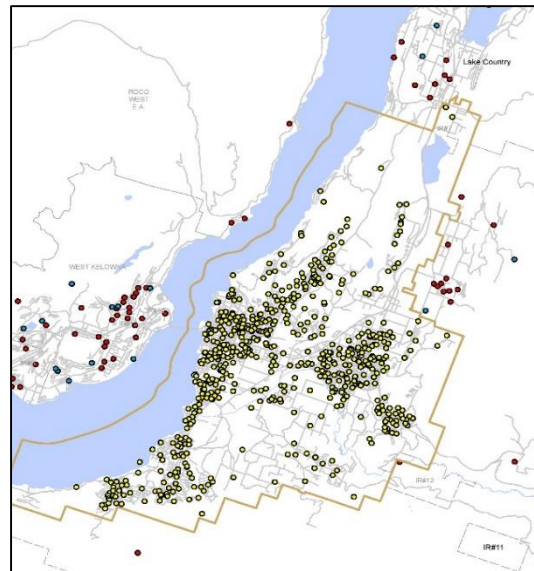
- Study area boundary
- Municipal/administrative boundary
- Roads
- Survey participant address location**
 - Home inside study area boundary
 - Home outside study area boundary
 - Home outside study area boundary, work address inside study area boundary



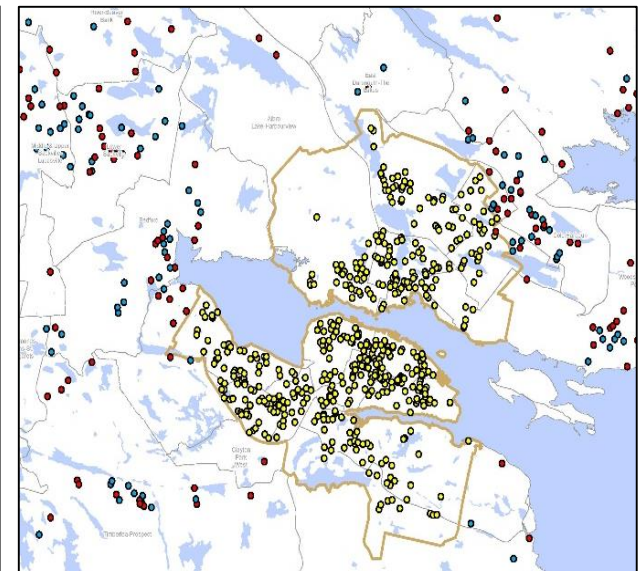
Victoria



Kelowna



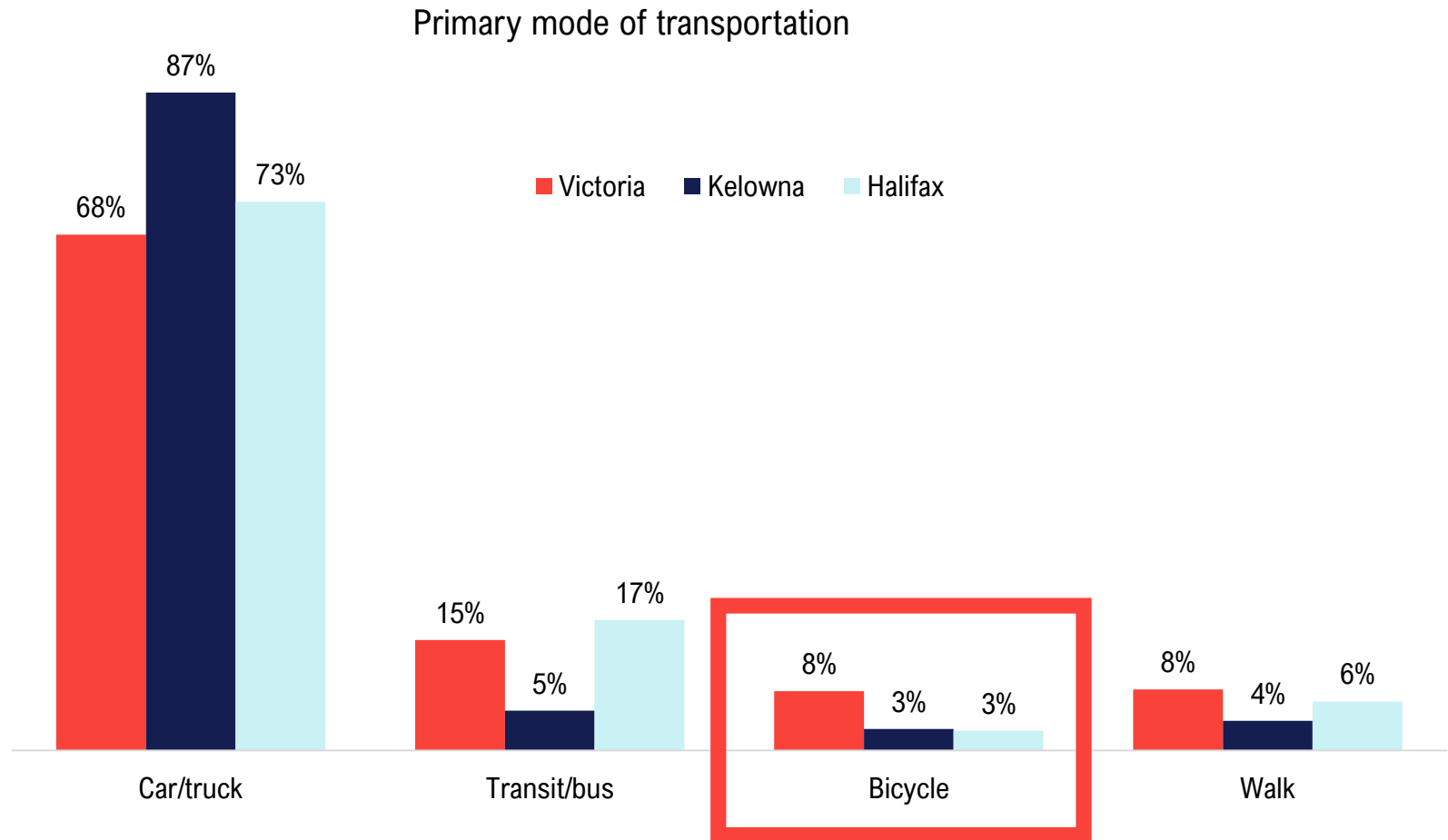
Halifax



IBIMS Phone Survey Sept-Oct 2016, N=843: City of Victoria, n=294; Saanich, n=357; Esquimalt, n=79; Oak Bay, n=58; Lives outside these municipalities but works inside one, n=55
Results weighted by age and sex for region

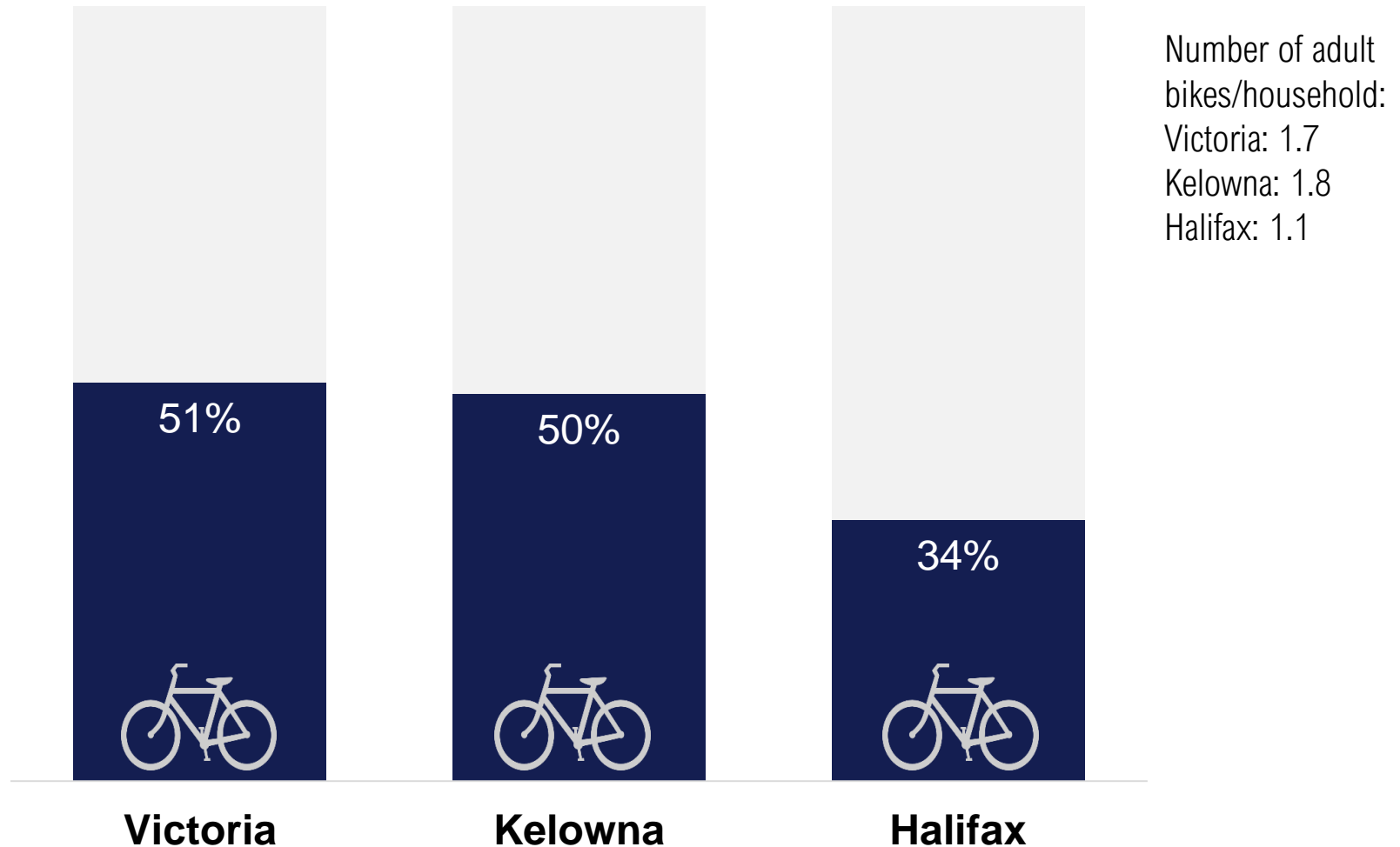
Survey Question: **Q18. What is your postal code of your home? OR Instead of the postal code, would you be able to give the address, or nearby cross-streets of your home?**

We drive a lot in Canada ... but active modes of transportation are gaining popularity



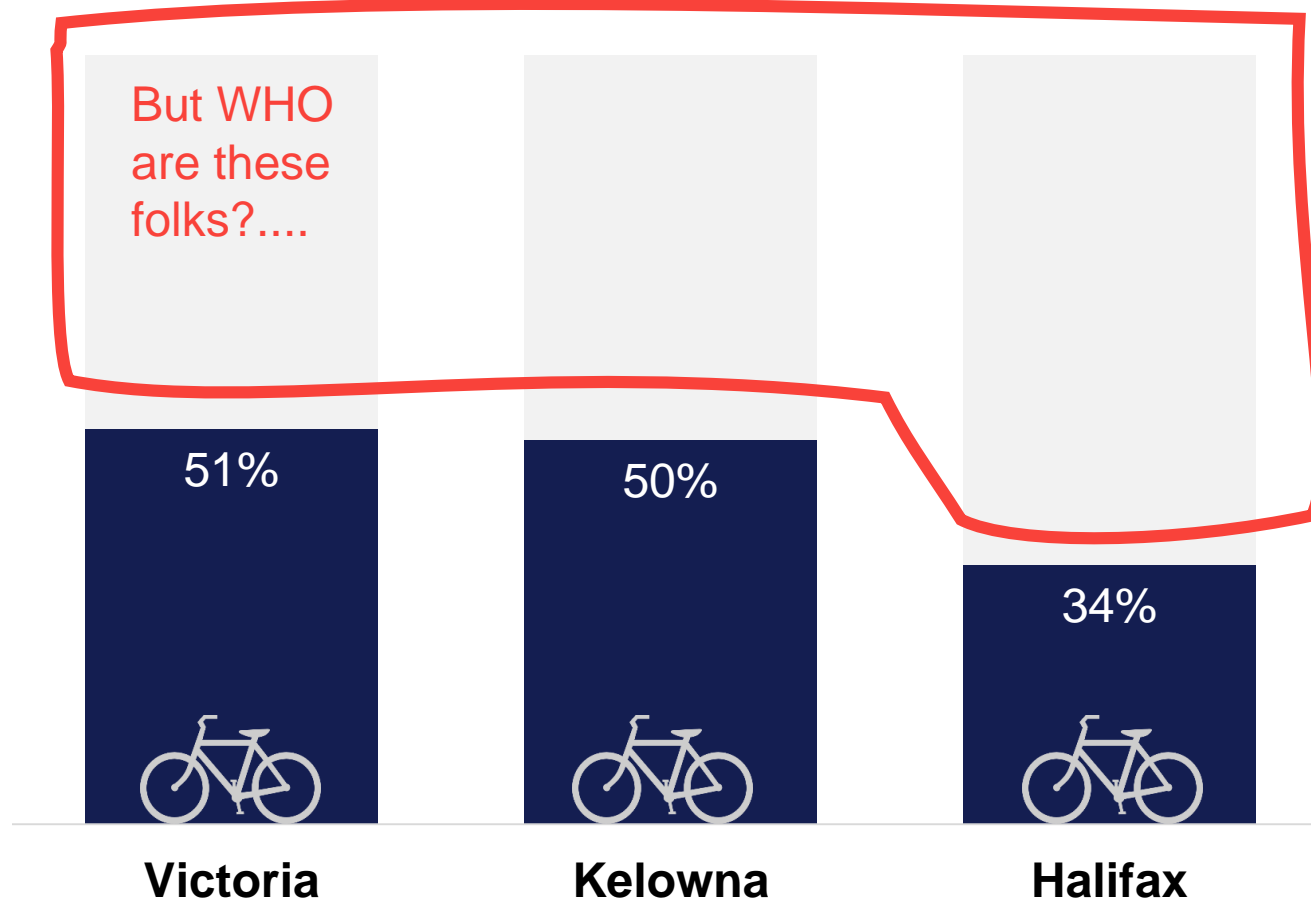
IBIMS Phone Survey Sept-Oct 2016, N=2433 total respondents: n=843, Victoria; n=824, Kelowna; n=766, Halifax, Results weighted by age and sex for region
Q1. Overall, which mode of transportation do you use most often to get around?

Half or fewer have used a bicycle in the past year



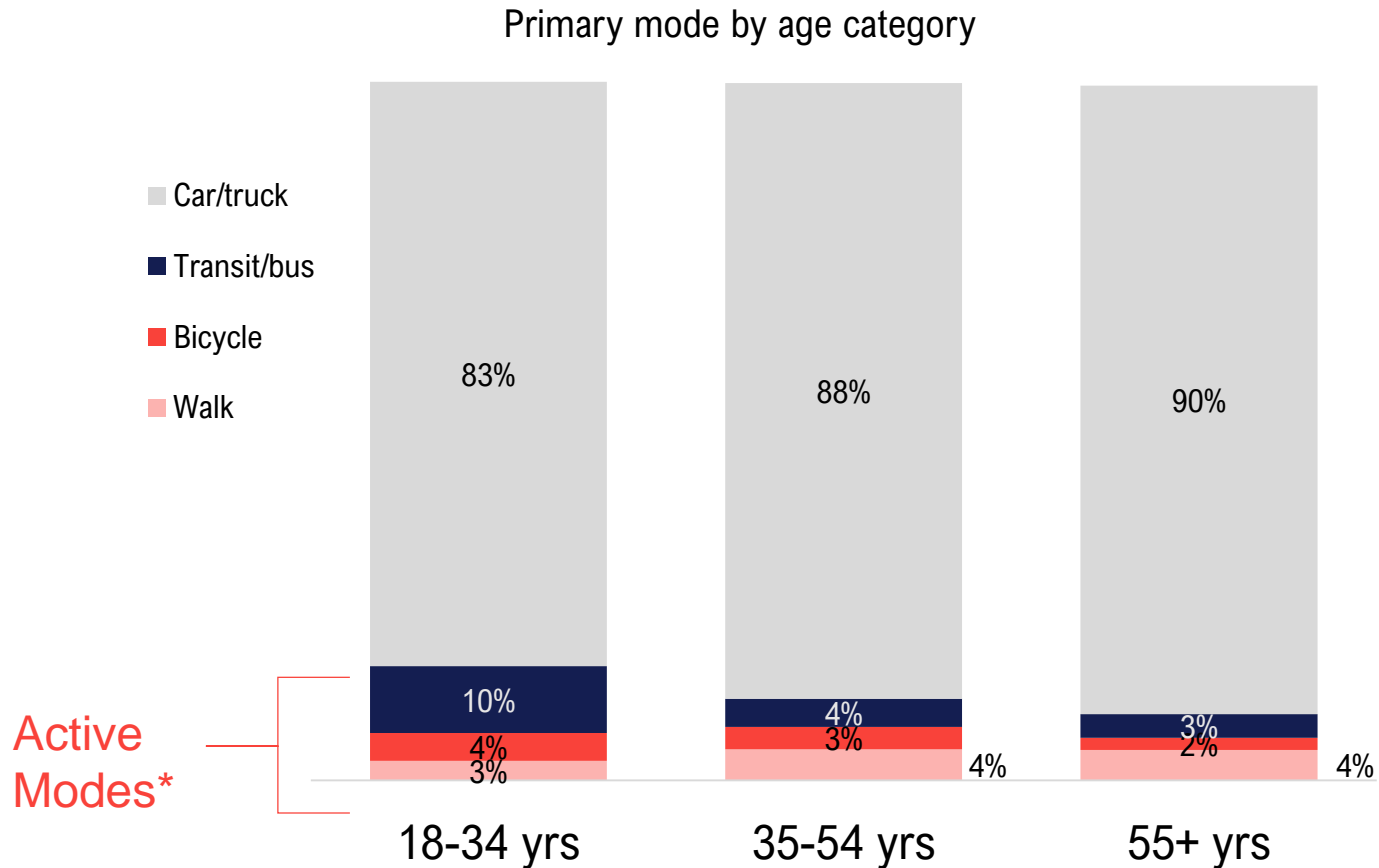
IBIMS Phone Survey Sept-Oct 2016, N=2433 total respondents: n=843, Victoria; n=824, Kelowna; n=766, Halifax, Results weighted by age and sex for region
Q12a. In the previous 12 months, have you used a bicycle?

Equity considerations exercise: “flip” the graph



IBIMS Phone Survey Sept-Oct 2016, N=2433 total respondents: n=843, Victoria; n=824, Kelowna; n=766, Halifax, Results weighted by age and sex for region
Q12a. *In the previous 12 months, have you used a bicycle?*

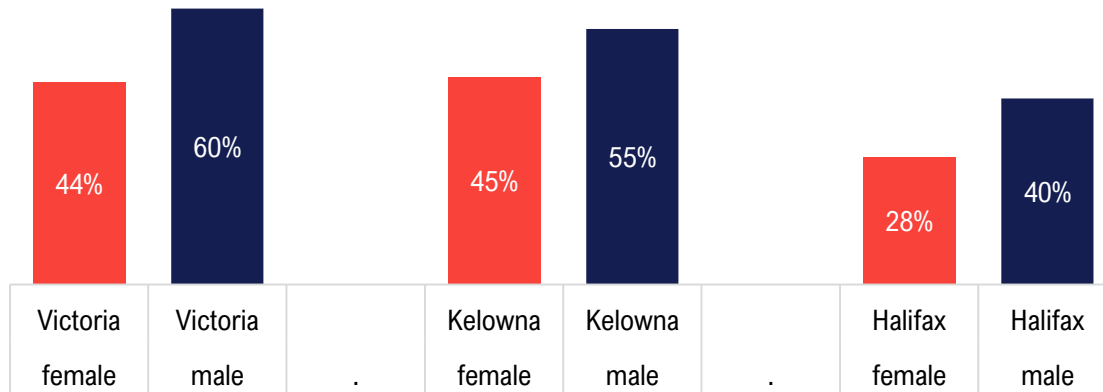
Younger people are more likely to rely on active modes, including cycling



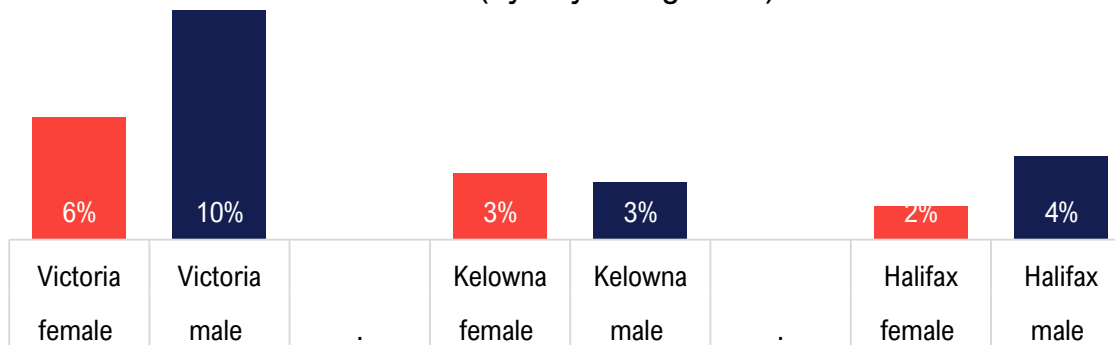
IBIMIS Phone Survey Sept-Oct 2016, Kelowna respondents only (n=824), Results weighted by age and sex for region
 Survey Questions: **Q7a. In the previous 12 months, have you used a bicycle?** and **Q1. Overall, which mode of transportation do you use most often to get around?** *We include transit in "active modes" as this mode nearly always requires walking to and from stations.

Who cycles? Gender differences

Used a bicycle in the past 12 months
(by city and gender)



Bicycle as primary mode of transportation
(by city and gender)

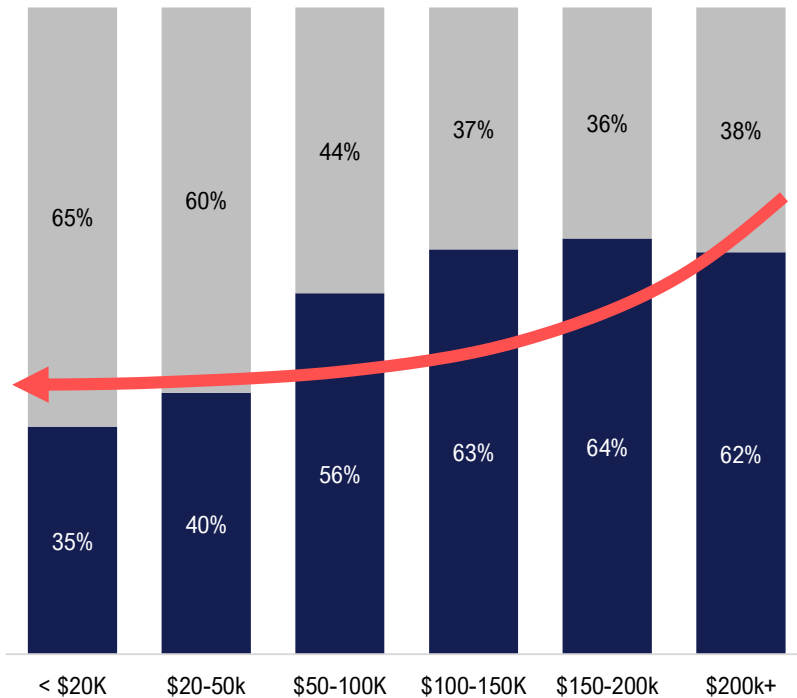


Who cycles? Income considerations...

Although those with higher income have picked up a bicycle at least once in the past year, using active modes decline as the primary mode with higher income

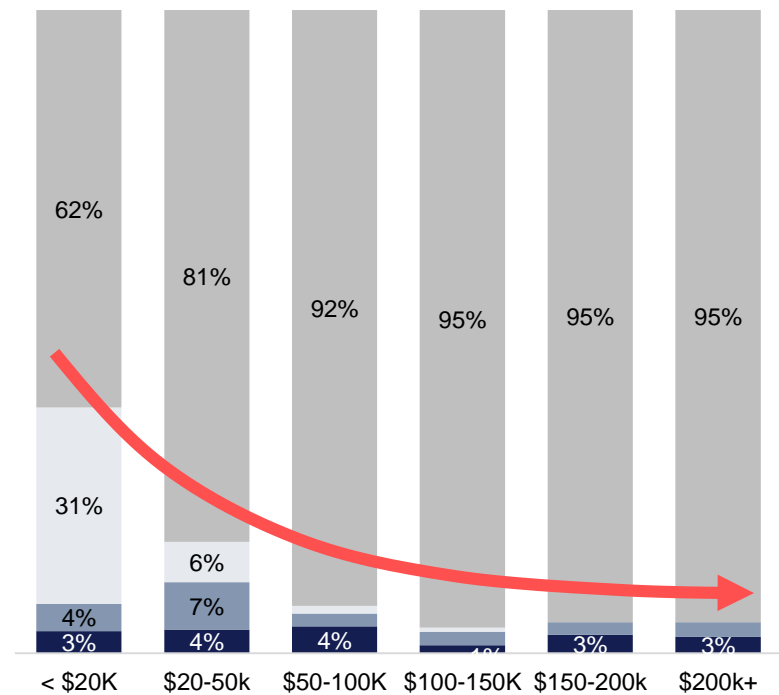
Household income category by bicycle use
Kelowna, 2016

■ Has not used bicycle in past 12 months ■ Used bicycle in past 12 months



Household income category by primary mode, Kelowna, 2016

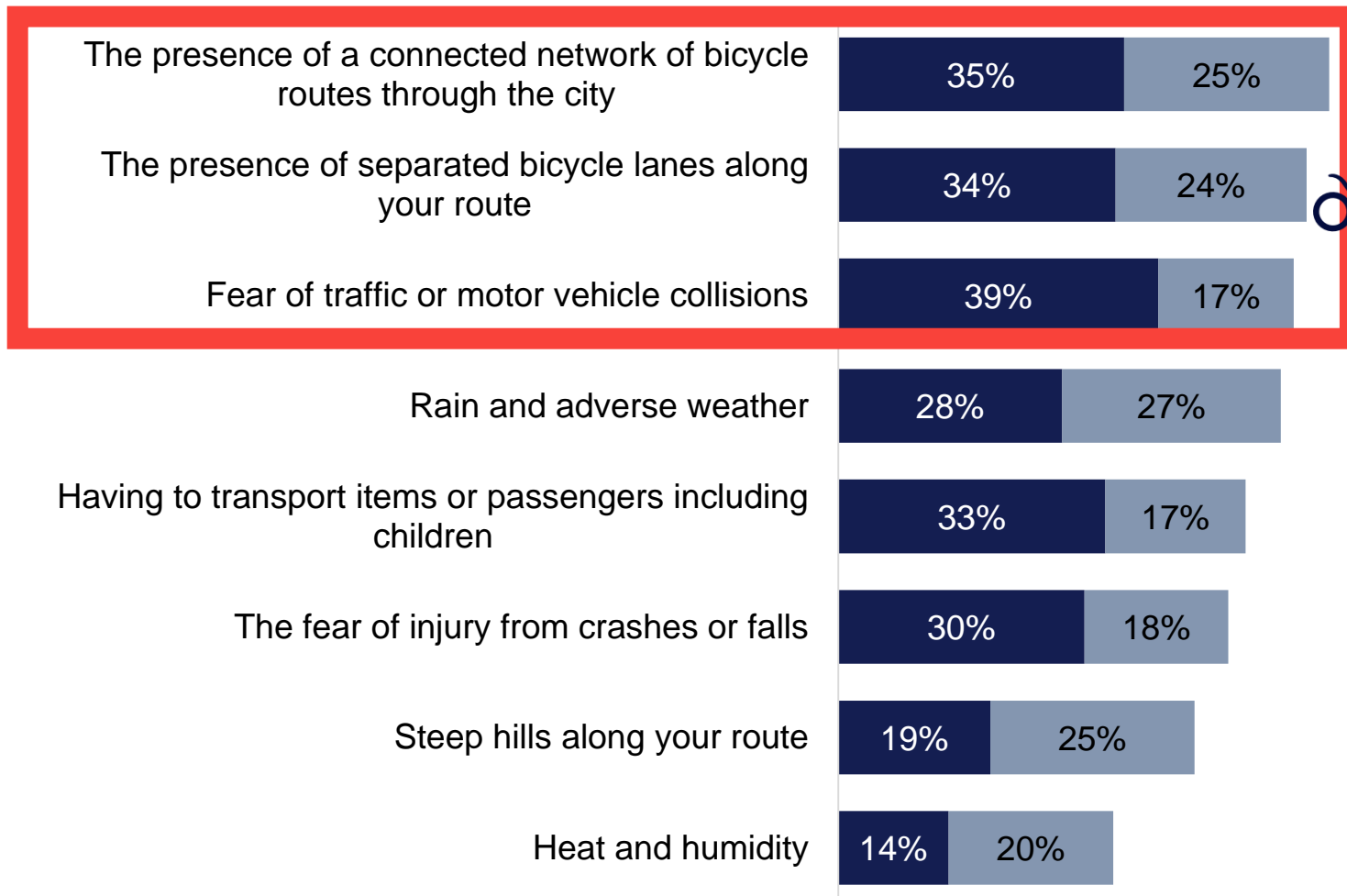
■ Bicycle ■ Walk ■ Transit/bus ■ Car/truck



IBIMS Phone Survey Sept-Oct 2016; Kelowna respondents only (n=824), Results weighted by age and sex for region
Based on questions Q1. Overall, which mode of transportation do you use most often to get around?, Q7a. In the previous 12 months, have you used a bicycle? and Q26. "Which of the following best describes your total annual household income before taxes?"

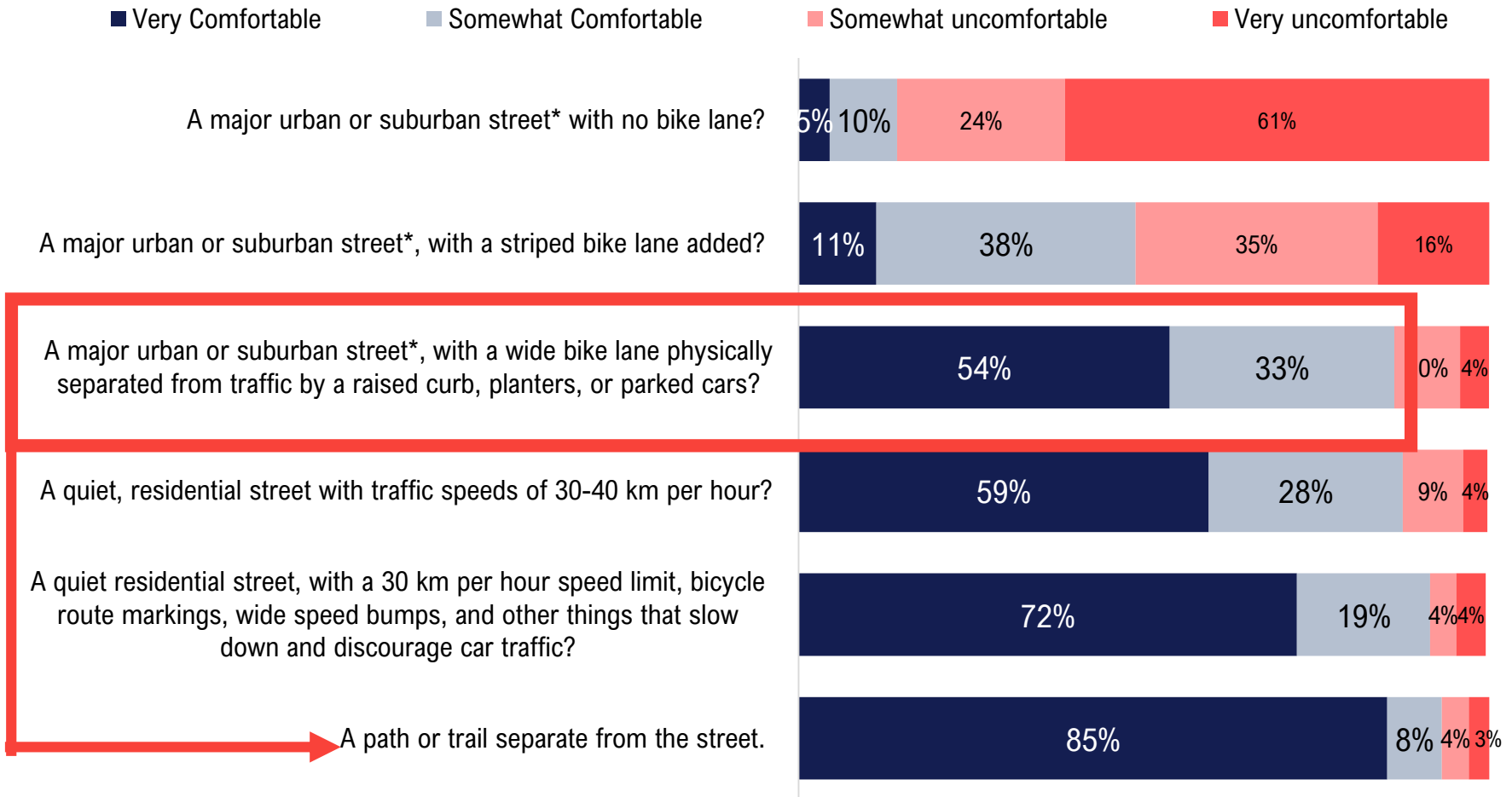
Presence of connected and separated bicycle routes were top factors in deciding to cycle

■ Very important ■ Somewhat important



IBIMS Phone Survey Sept-Oct 2016, Kelowna respondents only (n=824), Results weighted by age and sex for region
 Survey Question: **Q8:How important are the following factors to your decision to cycle/not cycle?**
 Each factor rated independently. Combined proportions of very/somewhat important shown here in figure

With the right infrastructure, folks are nearly as comfortable riding on a major road as on a quiet path!



IBIMS Phone Survey Sept-Oct 2016, Kelowna respondents only (n=824), Results weighted by age and sex for region

Survey Question: **Q7c. How comfortable would you feel biking in the following places?**

Notes: *With 4-lanes, on-street parking and traffic speeds of 50-60 km/hr

Cyclist Types- Kelowna

Strong and Fearless, 2%

would be “*very comfortable*” on a major urban street with no bike lane

Enthusied and Confident, 4%

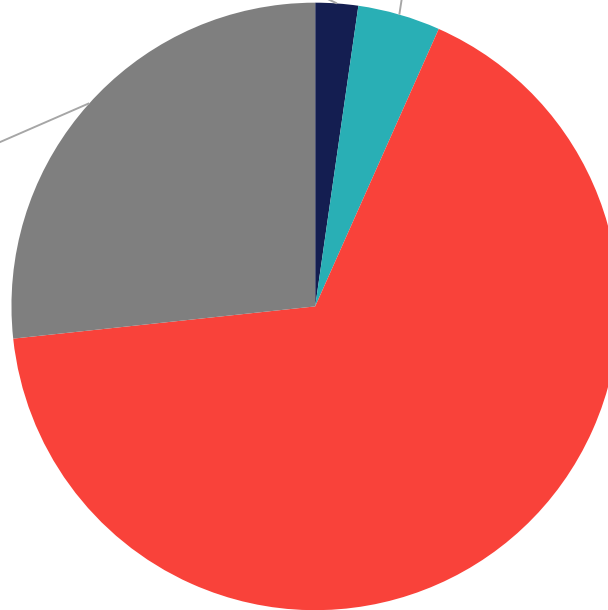
would be “*very comfortable*” on the major street but with a striped bike lane

No Way No How, 27%

those “*very uncomfortable*” on a path or trail separate from the street
 + physically unable to ride a bicycle
 + those who “*strongly disagree*” to “...like to travel by bicycle more than I do now”.

Interested but Concerned, 67%

feel “*uncomfortable (very or somewhat)*” or only “*somewhat comfortable*” biking on a major street without or with a bike lane

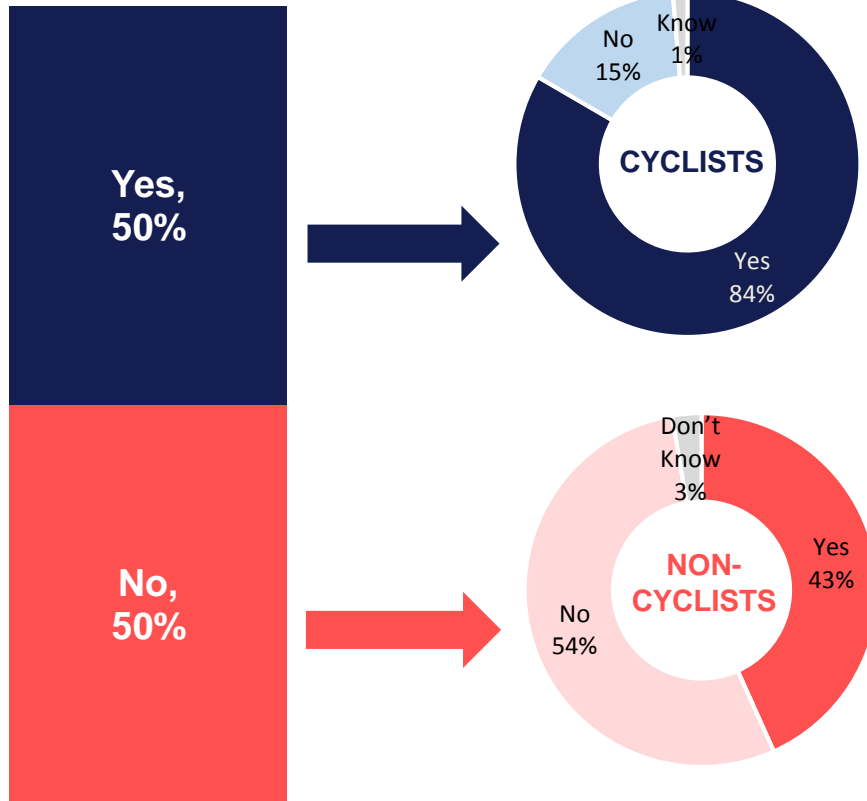


The majority of the population is interested - but concerned...

IBIMS Phone Survey Sept-Oct 2016, n=824, Kelowna; Results weighted by age and sex for region
Cyclist type generated using Q7c (Comfort on different types of road and pathway infrastructure) and Q9 (desire to cycle more)
 Based on typology assignment in Dill, J., & McNeil, N. (2016). Revisiting the four types of cyclists: findings from a national survey. *Transportation Research Record: Journal of the Transportation Research Board*, (2587), 90-99.

Cycling infrastructure makes a difference for folks who cycle...and those who don't... yet.

In the previous 12 months, have you used a bicycle?



Will you be **likely to cycle more** in the future if more cycling infrastructure (e.g. separated bike lanes) is built in Kelowna?

Will you be **more likely to cycle** in the future if more cycling infrastructure (e.g. separated bike lanes) is built in Kelowna?

IBIMS Phone Survey Sept-Oct 2016, Kelowna respondents only (n=824), Cyclists, n=412, Non-cyclists, n=412 Results weighted by age and sex for region

Q7a. Have you used a bicycle in the past 12 months?

Q12a-K. Will you be more likely to cycle (non-cyclists)/ likely to cycle more (cyclists) in the future if more cycling infrastructure is built in Kelowna? (e.g. separated bike lanes)



Equity in Spatial Access to Infrastructure - 2016

Bicycling Facilities- Infrastructure included



Cycle Track: a paved path next to a city street, separated by a curb or barrier



On -Street Painted Bike Lanes: a marked bike lane on the street, with or without parked cars

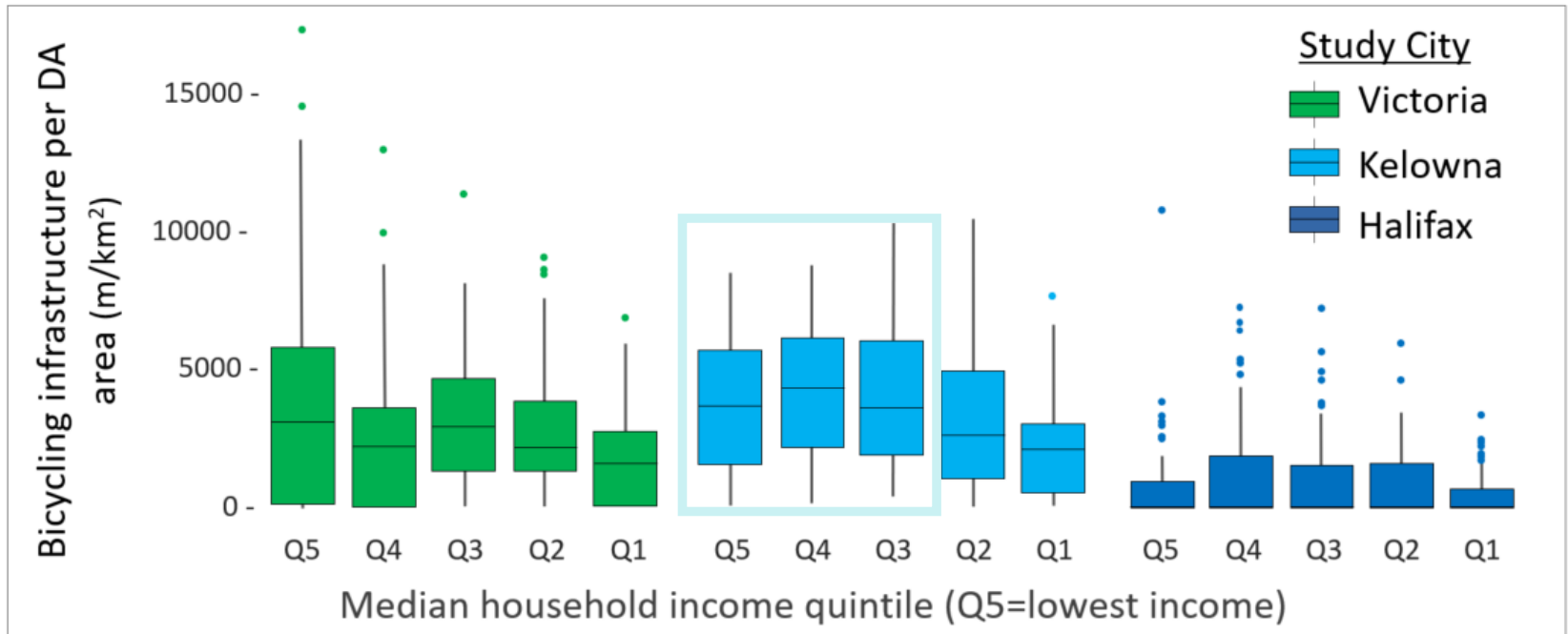


Off-Street Paths: an off-street paved path, either bike only or shared with pedestrians



Residential Bikeway: designated bicycle route with signs, cyclist activated traffic signals/traffic calming

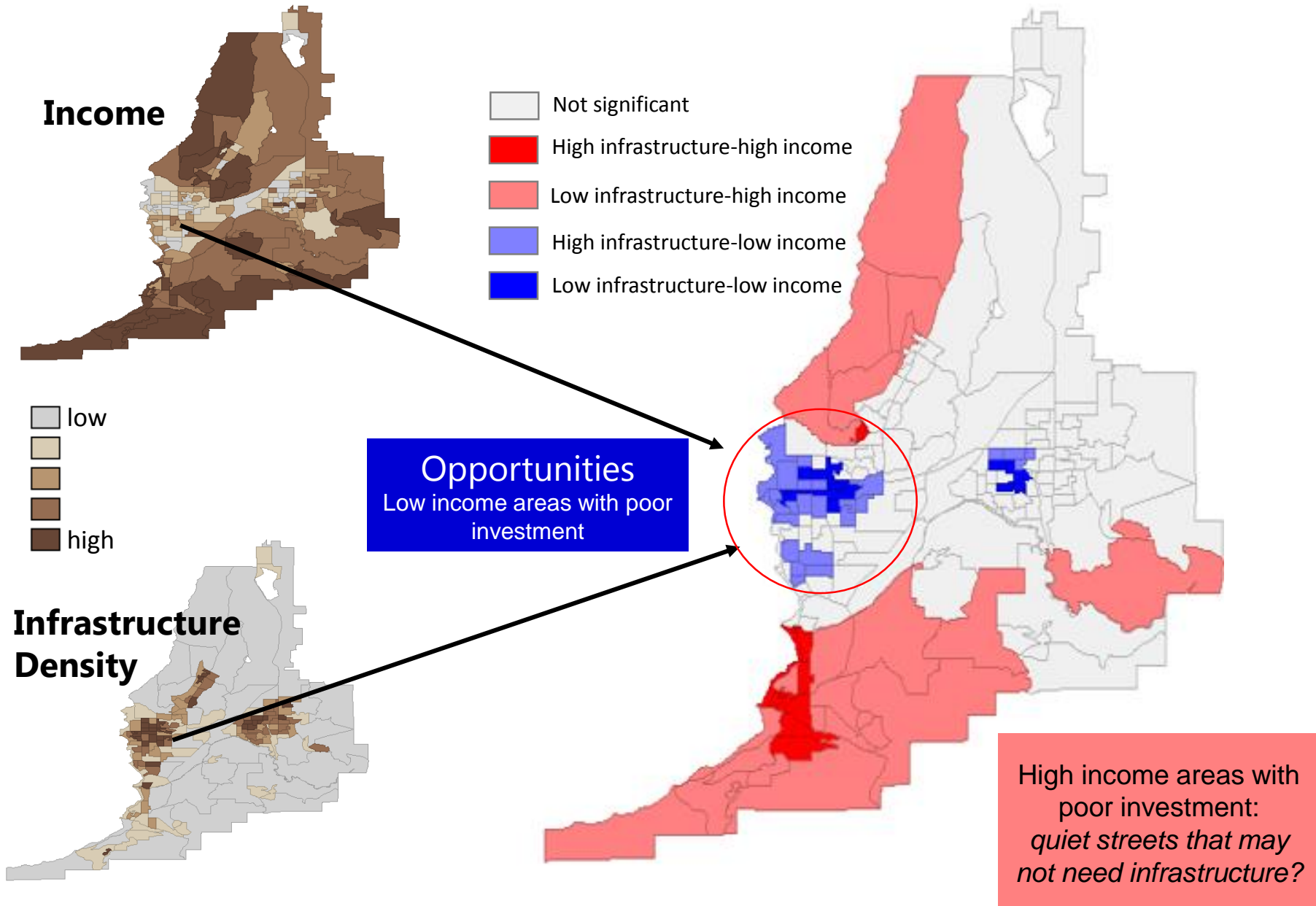
In Kelowna, the best access to bicycle infrastructure is in lower income neighborhoods



Access to bicycle infrastructure by quintiles of area-level income.

- In Victoria and Kelowna, greater access to bicycle infrastructure in lower income quintiles.
- In Halifax, low access to infrastructure across all income quintiles.

Spatial Analysis: Infrastructure vs. Income





HEALTH ECONOMIC ASSESSMENT

BASELINE (2017) RESULTS

- WHO Health Economic Assessment Tool www.heatwalkingcycling.org
- 2016-2020 city budgets used to estimate infrastructure investment
- based on a scenario of moderate increase in bicycling mode share (2%) in 10 years

10-YEAR PREDICTION:

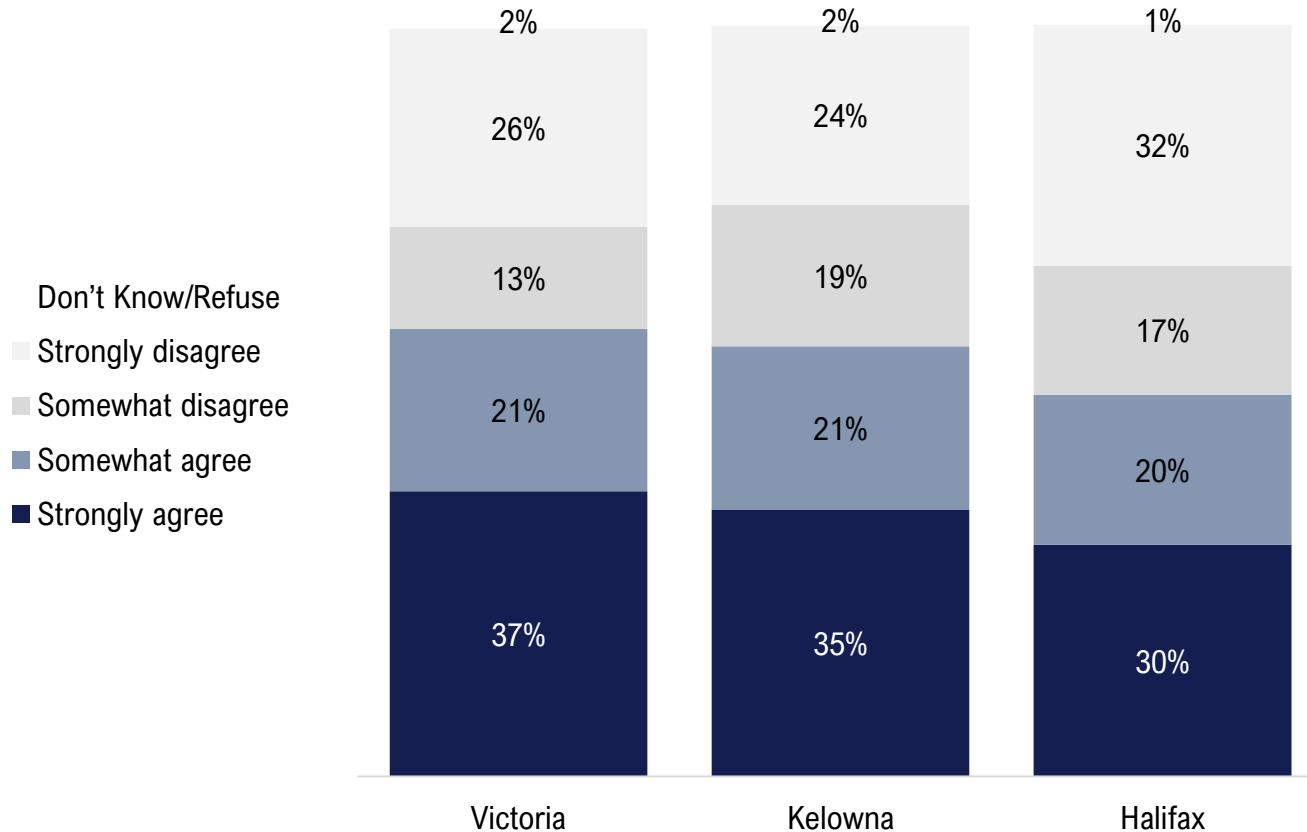
	Victoria	Kelowna	Halifax	APPROXIMATE HEALTH IMPACT PER CITY
Cost/investment (million \$)	68.7	27.9	28.7	
New physical activity/person (mins/day)	1.2	1.0	0.7	~1 min ↑ bicycling/person/day
Carbon saved (tonnes)	32.0	133.0	318.0	32-318 carbon tonnes reduced
Premature deaths prevented (total #)	22.4	9.7	10.6	10-22 premature deaths prevented
<i># due to physical activity</i>	23.0	10.0	11.0	<i>Average 1-2 premature deaths/year, mainly from physical activity benefits</i>
<i># due to air pollution exposure</i>	-0.3	-0.2	-0.2	
<i># due to crashes</i>	-0.3	-0.1	-0.2	
Health economic benefit (million \$)	132.8	58.8	64.2	2:1 benefit-cost ratio
Benefit to Cost ratio (million \$)	1.9	2.1	2.2	ratio

\$1
infrastructure investment
=
\$2 health & environmental benefits

Huge latent demand for bicycling

In Kelowna,
55%
said they would like to travel by bicycle more than they do now

“I would like to travel by bicycle more than I do now.”



Phone Survey October 2016, N=843: City of Victoria, n=294; Saanich, n=357; Esquimalt, n=79; Oak Bay, n=58; Lives outside these municipalities but works inside one, n=55

Results weighted by age and sex for region

Based on Q9. On a 4 point scale, with 1 being strongly disagree and 4 being strongly agree, how much would you agree with the following statement: “I would like to travel by bicycle more than I do now.”

Funding & Partners



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Impacts of Bicycle Infrastructure in Mid-sized Cities

Investigator Team



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Thank-you!

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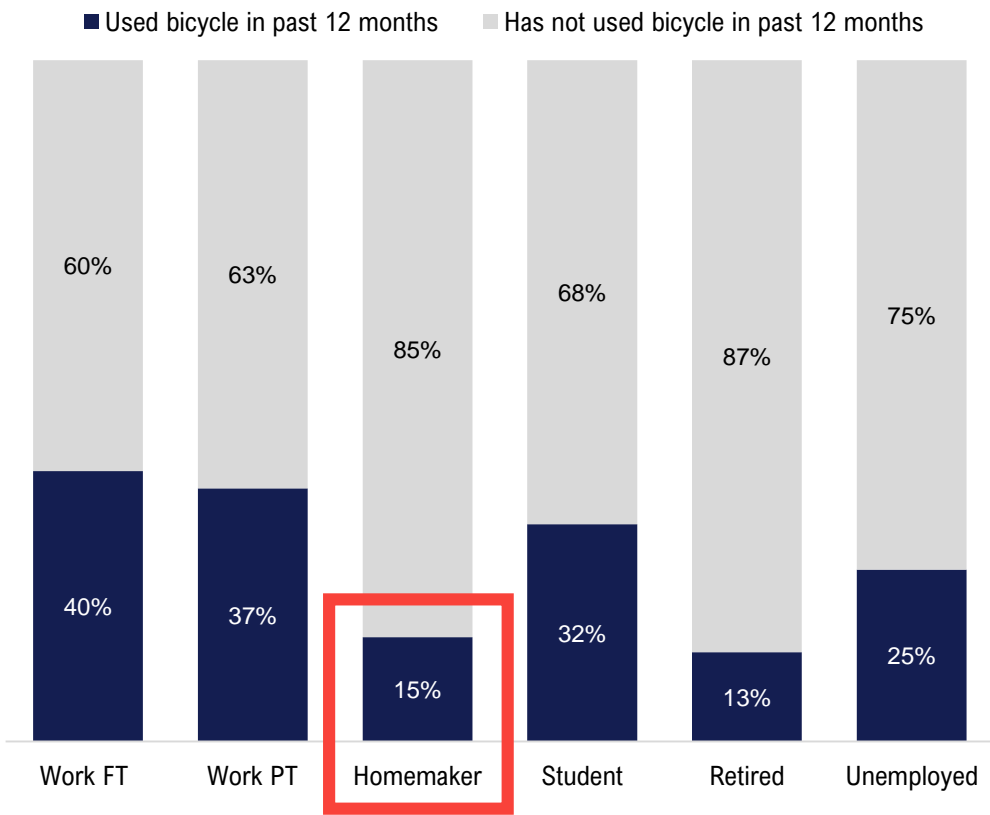
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Supplemental slides

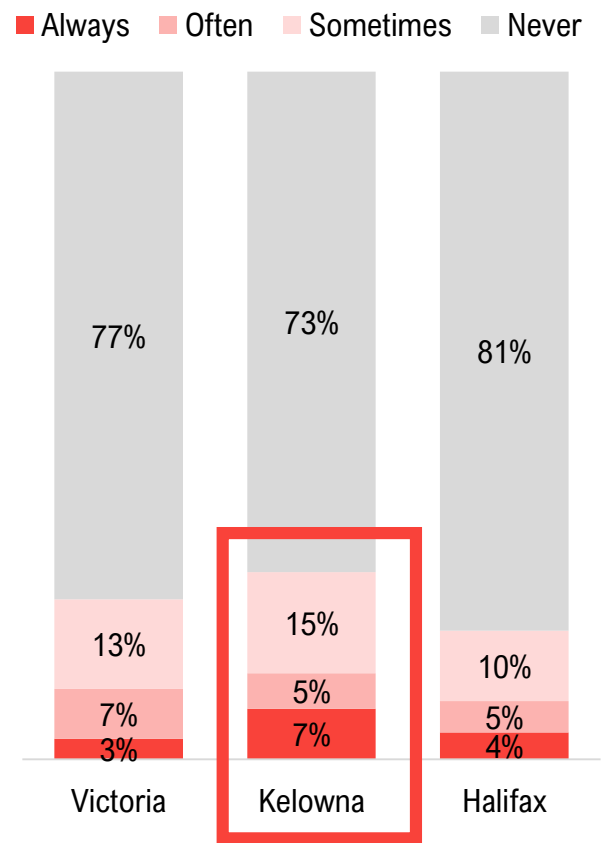
The impact of children...

50%
said transporting
items including
passengers/children
impacts their
decision to cycle

Bicycle use by occupation



How often are your cycling trips made with children?



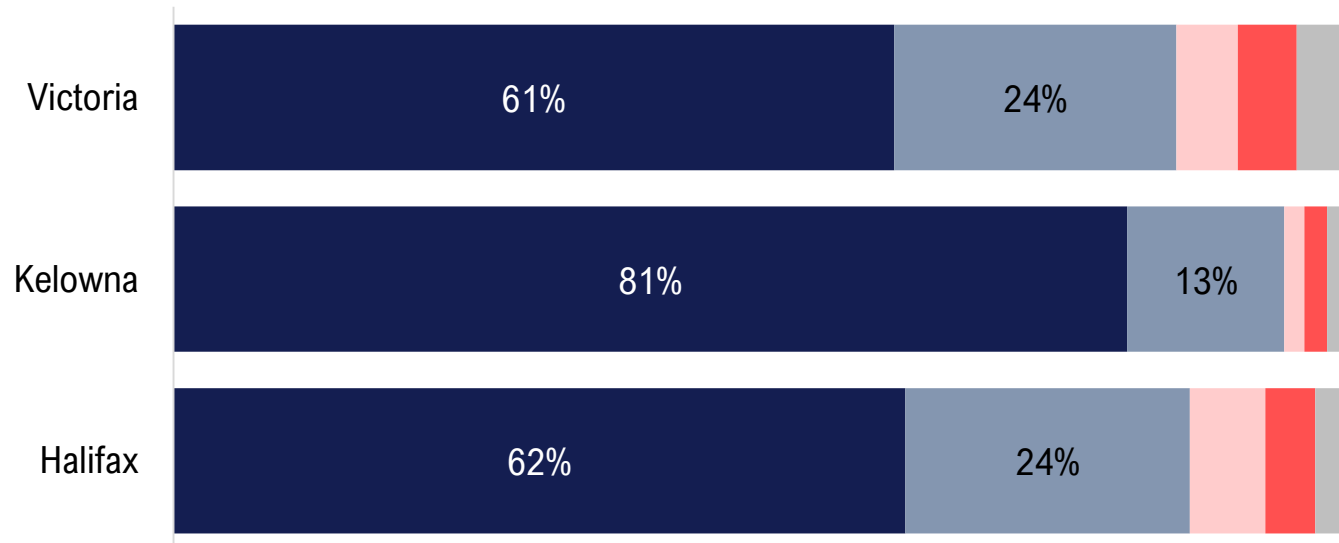
Notes: IBIMS Phone Survey Sept-Oct 2016, N=2433 total respondents: n=843, Victoria; n=824, Kelowna; n=766, Halifax, Results weighted by age and sex for region

Notes: IBIMS Phone Survey Sept-Oct 2016, Question only asked of those N=1104 respondents who had bicycled in past year including n=434, Victoria; n=412, Kelowna; n=258, Halifax, weighted by age and gender population data

Strongest support for cycling infrastructure (amongst both cyclists and non-cyclists) in KELOWNA!

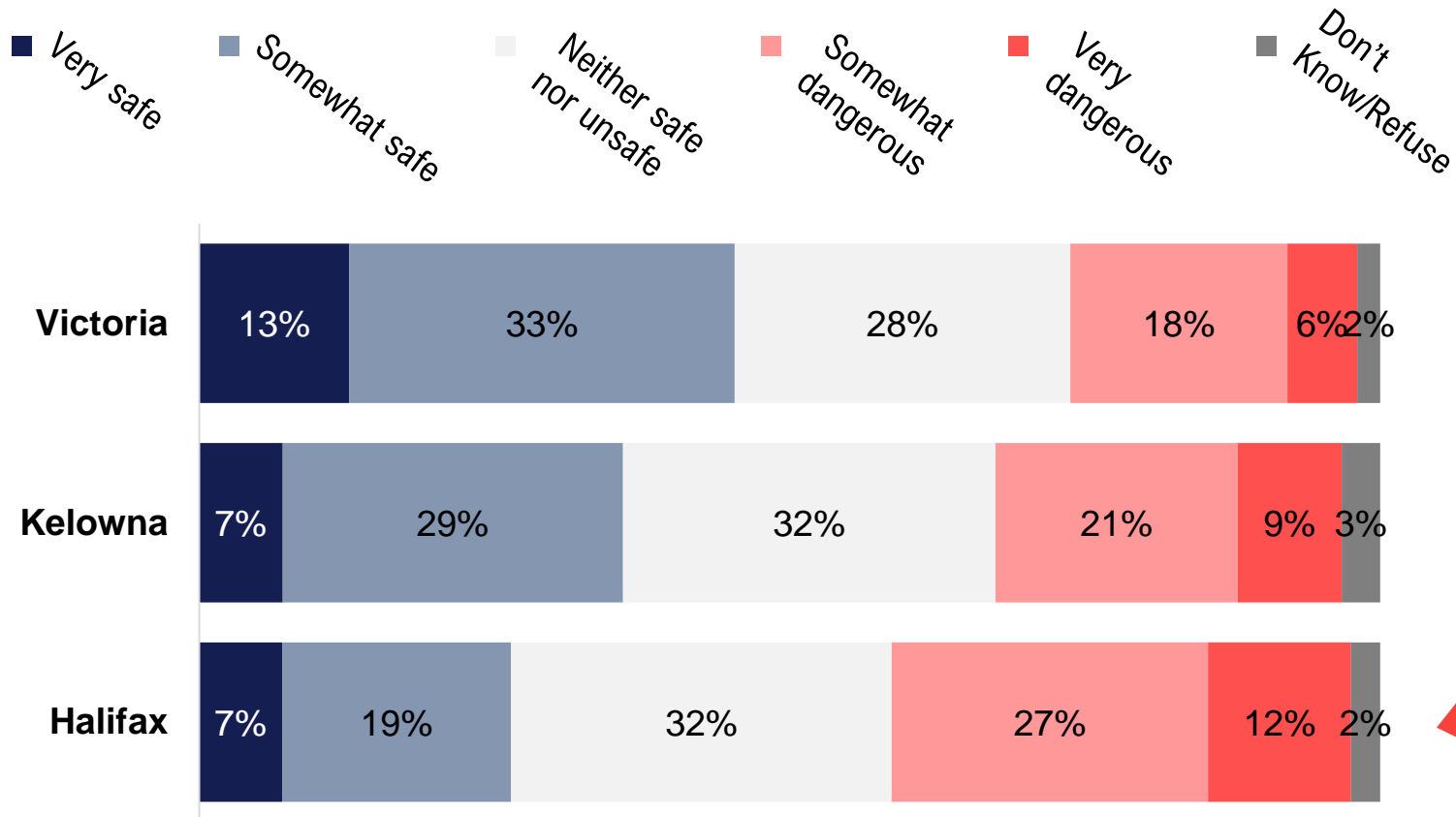
Do you think that building more cycling infrastructure is a good or bad idea for your area?

■ Very good idea ■ Somewhat good idea ■ Somewhat bad idea ■ Very bad idea ■ Don't Know



There was variation in perceptions of safety across cities: Victoria residents felt safest

How safe do you think cycling is in your city?



Women had greater concern than men

Phone Survey October 2016, N=2433 total respondents: n=843, Victoria; n=824, Kelowna; n=766, Halifax, Results weighted by age and sex for region
Q6. Overall, how safe do you think cycling is in your city?