Impacts of Bicycle Infrastructure in Mid-sized Canadian Cities

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Impacts of Bicycle Infrastructure in Mid-sized Canadian Cities (IBIMS) designed in partnership with local government and public health

How does investment in a bicycling 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?
## 3 Mid-sized Canadian Cities

<table>
<thead>
<tr>
<th>Study City</th>
<th>Population</th>
<th>Bicycling Mode Share</th>
<th>Bicycling infrastructure **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>140,000</td>
<td>11.5%</td>
<td>~ 190 km</td>
</tr>
<tr>
<td>(including Esquimalt, Oak Bay, Saanich)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kelowna</td>
<td>197,600</td>
<td>3.5%</td>
<td>~ 240 km</td>
</tr>
<tr>
<td>Halifax</td>
<td>198,000</td>
<td>3.9%</td>
<td>~ 80 km</td>
</tr>
<tr>
<td>(including the Peninsula, Mainland, Dartmouth)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:

**We defined km of infrastructure based on previous work. We included 4 categories: painted lanes (excluding shoulders with no markings for cyclists); residential bikeways; off-street multi-use or bike only paths; cycle tracks. Based in 2016**
Objectives & Methods

1. To estimate the impact of the intervention on changes in the use of active travel, perceived safety, and cycling incidents

2. To analyze the impact on spatial inequities of access to cycling infrastructure and safety incidents

3. To assess the health-related economic benefits, and the cost-benefit ratio for the intervention
Population Survey

- Survey 1 (Baseline) October 19-31, 2016
- Recruited 3000 residents (1000 from each study city)
- Conducted by Leger, age and sex quotas
- Analyzed responses for those who live or work in study boundaries (n=2433 total)
2016 Baseline Population Survey Results
We drive a lot in Canada ... but active modes of transportation are gaining popularity

Primary mode of transportation

<table>
<thead>
<tr>
<th>Mode</th>
<th>Victoria</th>
<th>Kelowna</th>
<th>Halifax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car/truck</td>
<td>68%</td>
<td>87%</td>
<td>73%</td>
</tr>
<tr>
<td>Transit/bus</td>
<td>15%</td>
<td>5%</td>
<td>17%</td>
</tr>
<tr>
<td>Bicycle</td>
<td>8%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Walk</td>
<td>8%</td>
<td>4%</td>
<td>6%</td>
</tr>
</tbody>
</table>

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 Q1. Overall, which mode of transportation do you use most often to get around?
Cycling Rates in 3 Mid-sized Cities

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

- Victoria: 51%
- Kelowna: 50%
- Halifax: 34%

Number of adult bikes/household:
- Victoria: 1.7
- Kelowna: 1.8
- Halifax: 1.1

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 Q12a. In the previous 12 months, have you used a bicycle?
Amongst cyclists, frequency of cycling varies city to city

How often do you typically travel by bicycle?

<table>
<thead>
<tr>
<th></th>
<th>Victoria</th>
<th>Kelowna</th>
<th>Halifax</th>
</tr>
</thead>
<tbody>
<tr>
<td>4+ days/week</td>
<td>28%</td>
<td>34%</td>
<td>48%</td>
</tr>
<tr>
<td>1-3 days/week</td>
<td>20%</td>
<td>22%</td>
<td>18%</td>
</tr>
<tr>
<td>1-3 days/month</td>
<td>29%</td>
<td>27%</td>
<td>20%</td>
</tr>
<tr>
<td>&lt;1 day/month</td>
<td>23%</td>
<td>15%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Phone Survey October 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. Results weighted by age and sex for region Q7b. How often do you typically travel by bicycle?
Who cycles? – age and gender

Gender: In Halifax, 40% of men cycled in the past year, but only 28% of women.

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

Active Modes*

Phone Survey October 2016, Halifax respondents only (n=766), 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 some walking to and from stations.
Who cycles? Income considerations...

Although those with higher income have picked up a bicycle at least once in the past year, reliance on active modes (including bicycling) decline with higher income.

Household income category by bicycle use

Income category by primary mode

Phone Survey October 2016; n=766, Halifax, Results weighted by age and sex for region

Based on question 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?”
Residents in Halifax felt their city was less safe for cycling, relative to those from other cities.

How safe do you think cycling is in your city?

<table>
<thead>
<tr>
<th>City</th>
<th>Very Safe</th>
<th>Somewhat Safe</th>
<th>Neither Safe nor Unsafe</th>
<th>Somewhat Dangerous</th>
<th>Very Dangerous</th>
<th>Don’t Know/Refuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>13%</td>
<td>33%</td>
<td>28%</td>
<td>18%</td>
<td>6%2%</td>
<td></td>
</tr>
<tr>
<td>Kelowna</td>
<td>7%</td>
<td>29%</td>
<td>32%</td>
<td>21%</td>
<td>9%3%</td>
<td></td>
</tr>
<tr>
<td>Halifax</td>
<td>7%</td>
<td>19%</td>
<td>32%</td>
<td>27%</td>
<td>12%2%</td>
<td></td>
</tr>
</tbody>
</table>

Women had greater concerns than men.
Planning for all ages and abilities? 
Cyclist typologies

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

<table>
<thead>
<tr>
<th></th>
<th>Strong and Fearless</th>
<th>Enthused and Confident</th>
<th>Interested but Concerned</th>
<th>No Way No How</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halifax</td>
<td>5%</td>
<td>58%</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>Kelowna</td>
<td>4%</td>
<td>67%</td>
<td>27%</td>
<td></td>
</tr>
<tr>
<td>Victoria</td>
<td>7%</td>
<td>63%</td>
<td>26%</td>
<td></td>
</tr>
</tbody>
</table>

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
Cyclist type generated based on Jennifer Dills cyclist typologies using Q7c (Comfort on different types of road and pathway infrastructure) and Q9 (desire to cycle more)
## Top factors in deciding to bicycle (or not)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Somewhat important</th>
<th>Very important</th>
</tr>
</thead>
<tbody>
<tr>
<td>The fear of traffic or collisions with vehicles</td>
<td>16%</td>
<td>49%</td>
</tr>
<tr>
<td>Rain and adverse weather</td>
<td>26%</td>
<td>34%</td>
</tr>
<tr>
<td>The presence of separated bicycle lanes along your route</td>
<td>19%</td>
<td>40%</td>
</tr>
<tr>
<td>The presence of a connected network of bicycle routes through the city</td>
<td>22%</td>
<td>38%</td>
</tr>
<tr>
<td>The fear of injury from crashes or falls</td>
<td>21%</td>
<td>35%</td>
</tr>
<tr>
<td>Having to transport items or passengers including children</td>
<td>13%</td>
<td>37%</td>
</tr>
<tr>
<td>Steep hills along your route</td>
<td>23%</td>
<td>23%</td>
</tr>
<tr>
<td>Heat and humidity</td>
<td>23%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Phone Survey October 2016, n=766 Halifax respondents, 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.
## Comfort riding on various road types

<table>
<thead>
<tr>
<th>Description</th>
<th>Very Comfortable</th>
<th>Somewhat Comfortable</th>
<th>Somewhat uncomfortable</th>
<th>Very uncomfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>A major urban or suburban street* with no bike lane?</td>
<td>5%</td>
<td>16%</td>
<td>26%</td>
<td>53%</td>
</tr>
<tr>
<td>A major urban or suburban street*, with a striped bike lane added?</td>
<td>17%</td>
<td>37%</td>
<td>30%</td>
<td>15%</td>
</tr>
<tr>
<td>A major urban or suburban street*, with a wide bike lane physically separated from traffic by a raised curb, planters, or parked cars?</td>
<td>62%</td>
<td>24%</td>
<td>11%</td>
<td>2%</td>
</tr>
<tr>
<td>A quiet, residential street with traffic speeds of 30-40 km per hour?</td>
<td>64%</td>
<td>23%</td>
<td>8%</td>
<td>5%</td>
</tr>
<tr>
<td>A path or trail separate from the street.</td>
<td>84%</td>
<td>5%</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>A quiet residential street, with a 30 km per hour speed limit, bicycle route markings, wide speed bumps, and other things that slow down and discourage car traffic?</td>
<td>73%</td>
<td>17%</td>
<td>7%</td>
<td>3%</td>
</tr>
</tbody>
</table>

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

*Region

**Phone Survey October 2016, Halifax respondents only (n=766), Results weighted by age and sex for region**

**Q7c. How comfortable would you feel biking in the following places?**
Widespread support for cycling infrastructure amongst both cyclists and non-cyclists

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

<table>
<thead>
<tr>
<th>Area</th>
<th>Very good idea</th>
<th>Somewhat good idea</th>
<th>Somewhat bad idea</th>
<th>Very bad idea</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>61%</td>
<td>24%</td>
<td>13%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Kelowna</td>
<td>81%</td>
<td>13%</td>
<td>2%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>Halifax</td>
<td>62%</td>
<td>24%</td>
<td>13%</td>
<td>2%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Cycling infrastructure makes a difference for folks who cycle...and those who don’t... yet.

Phone Survey October 2016, N=766 Halifax respondents, Cyclists, n=258, Non-cyclists, n=508 Results weighted by age and sex for region Q7a. Have you used a bicycle in the past

Impacts of Cycling Infrastructure in Mid-sized Canadian Cities

Population Survey Findings
Equity in Spatial Access to Infrastructure - 2016
Does investment happen in both high and low income communities?

Halifax
Median household income & cycling facilities per DA area

<table>
<thead>
<tr>
<th>Total cycling facilities per DA area (quantiles, m/km²)</th>
<th>Median household income by quintile</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-565</td>
<td>Q1 (low deprivation)</td>
</tr>
<tr>
<td>566-1426</td>
<td>Q2</td>
</tr>
<tr>
<td>1427-2607</td>
<td>Q3</td>
</tr>
<tr>
<td>2059-2609</td>
<td>Q4</td>
</tr>
<tr>
<td>2990-10434</td>
<td>Q5</td>
</tr>
<tr>
<td>Cyclist interview</td>
<td></td>
</tr>
<tr>
<td>No income data</td>
<td></td>
</tr>
</tbody>
</table>

Legend
- Cycle track
- Mult-use path
- Painted bicycle lane
- Residential bikeway

GIS MAPPING
Impacts of Cycling Infrastructure in Mid-Sized Canadian Cities
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
Access to Bicycling Infrastructure, by Income

VICTORIA

KELOWNA

HALIFAX

Facilities per DA area and median household income quintiles

Low income

High Income

Low income

High Income

Low income

High Income

GIS MAPPING
Spatial Analysis

Halifax: Infrastructure vs. Income

- High income areas with poor investment: quiet streets that may not need infrastructure?
- Low income areas with poor investment: intervention opportunities

Not significant
- High infrastructure-high income
- Low infrastructure-high income
- High infrastructure-low income
- Low infrastructure-low income
Population Density
A driver for mid-sized cities

Halifax
- High infrastructure-low income
- Low infrastructure-high income

Income
low
- light gray
- cream
- beige

Density
- dark gray
- dark brown
- brown
Impacts of Bicycle Infrastructure in Mid-sized Canadian Cities

What's next?
Impacts of Cycling Infrastructure in Mid-sized Canadian Cities

Collaborative project aiming to fill an evidence gap for mid-sized cities

Activities over the next 5 years:
• Additional population surveys (2018, 2021)
• GIS mapping of changes in infrastructure and safety incidents
• Economic analysis
• Sharing evidence with study cities, and larger group of stakeholders

Many opportunities to partner
Research Team

Investigator Team

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Vancouver Island Health

Research Personnel

Suzanne Therrien
Research Coordinator

Michael Branimation-Calles
PhD Candidate

Jaimy Fischer
Spatial Analysis, Mapping & Equity

Calvin Thigpen
Post-doctoral Fellow

Danielle DeVries
Economic Assessment

www.sfu.ca/ibims
To close, a point you can all take home with you – huge latent demand!

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

In Halifax, 50% said they would like to travel by bicycle more than they 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.”