

An aerial photograph of Vancouver, British Columbia, Canada. The image shows the city's skyline, including the Vancouver Convention Centre and the Vancouver SkyTrain. In the background, the rugged, snow-capped mountains of the Coast Range are visible under a clear blue sky. The foreground shows a mix of urban development, including residential areas and commercial buildings, interspersed with green spaces and water bodies.

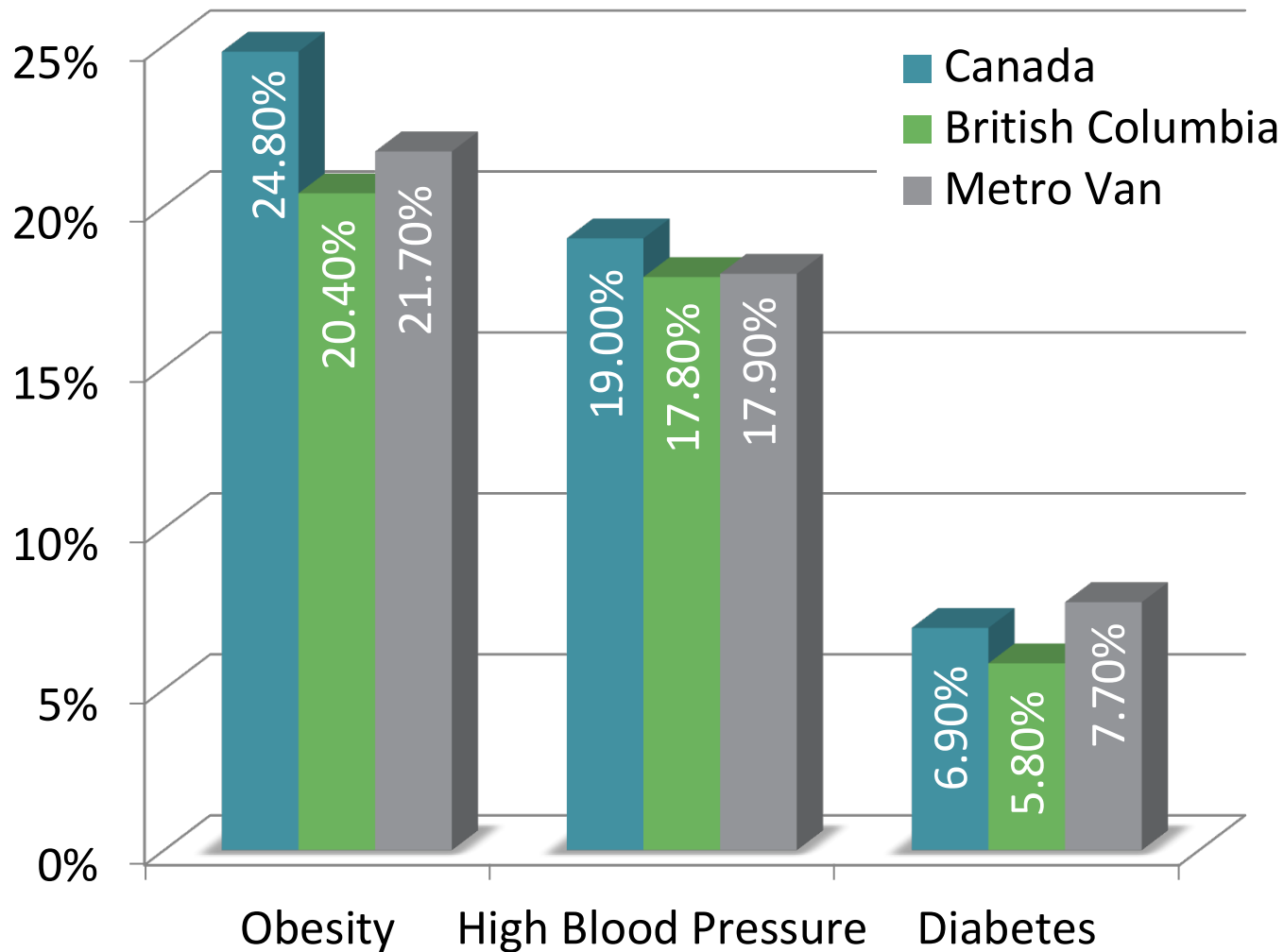
BUILT, NATURAL, AND SOCIAL ENVIRONMENT IMPACTS ON HEALTH AND WELL BEING

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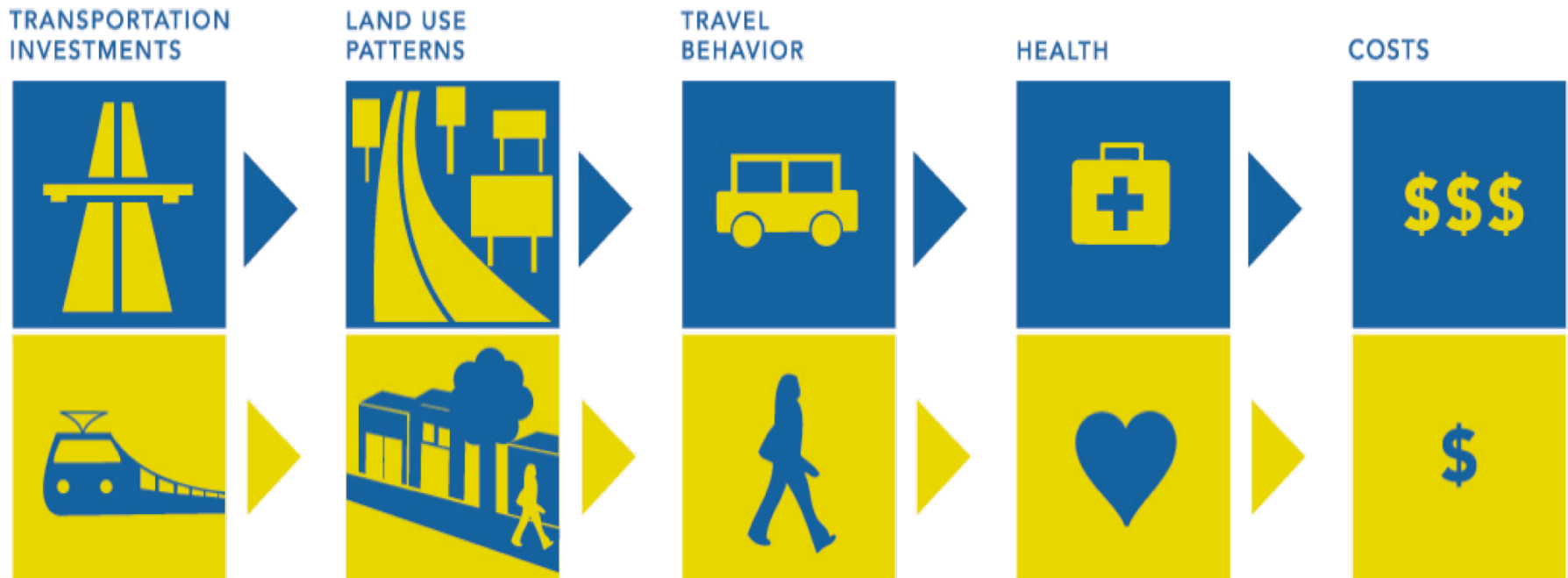
Director - Health and Community Design Lab @ UBC

Health Context



APPROACH OVERVIEW: DECISION-MAKING

HOW TRANSPORTATION IMPACTS HEALTH COSTS



Source: "The Hidden Health Costs of Transportation" APHA
Written by UD4H, Inc. 2010.

3 Policy Levels

Regional Accessibility



Walkable, Complete
Neighborhoods



Pedestrian Environment
(Micro-scale)





West End
Boundary

Burrard Inlet

Stanley Park

Coal Harbour

West Georgia Street

Triangle West

Central Business
District

Gastown

Comox-Helmcken Greenway

West End

Burrard Street

Downtown South

Northeast False Creek

Yaletown

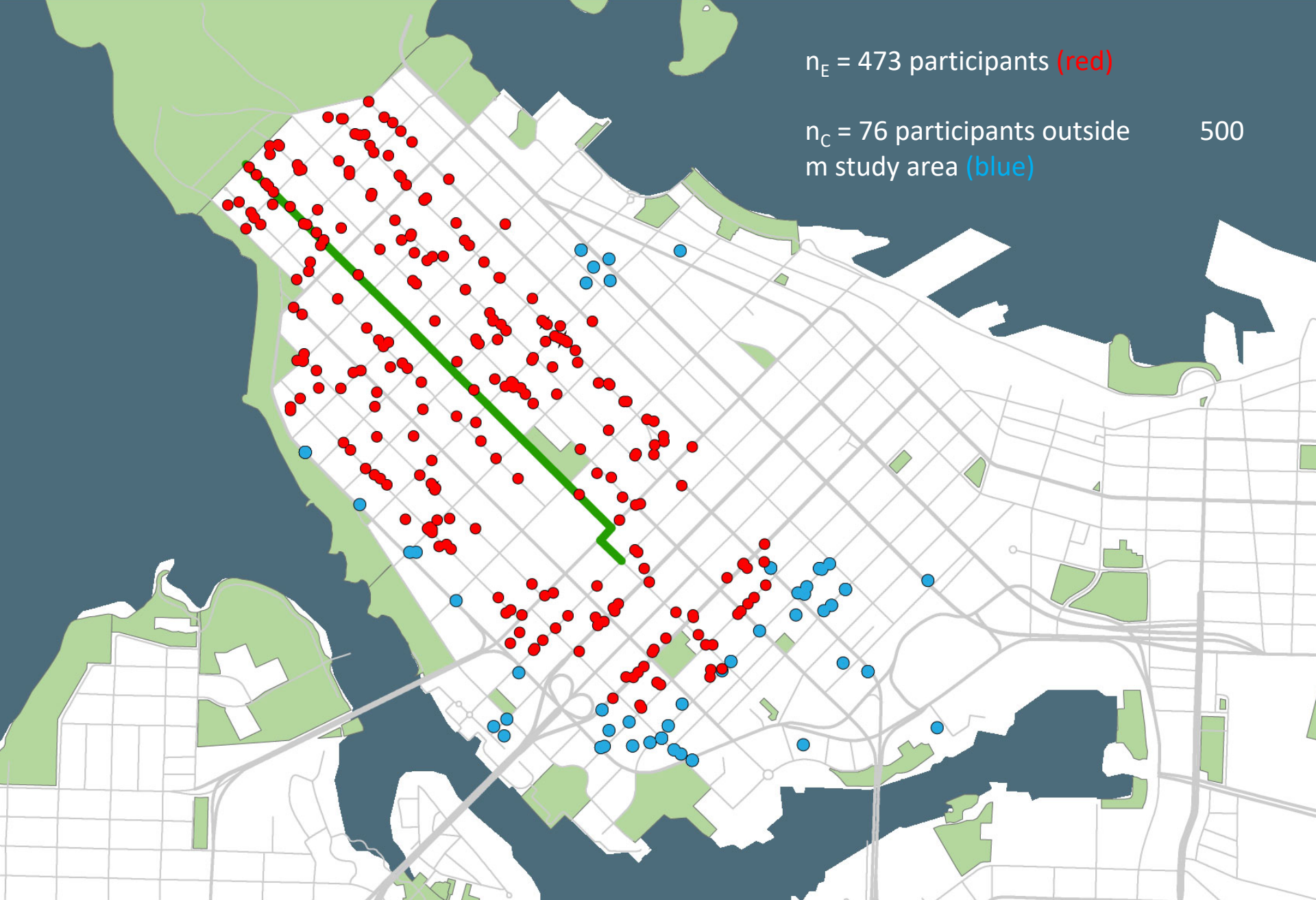
Burrard Bridge

Cambridge Bridge

False Creek North

Comox Corridor Greenway Vancouver, BC





Before



After (Counterflow Lanes)



GHG Reductions

- Among the first longitudinal study evaluating changes in GHG emissions from an pedestrian/cyclist greenway.
- - Tracked a cohort of 524 residents over a period of three years from 2012 to 2015.
- - Residents living near the greenway reduced their transport GHG emissions by 21%
 - Those further away actually increased driving and GHG emissions likely due to emergence of car sharing
- - Building infrastructure for pedestrians and cyclists can contribute to municipal climate change policy.

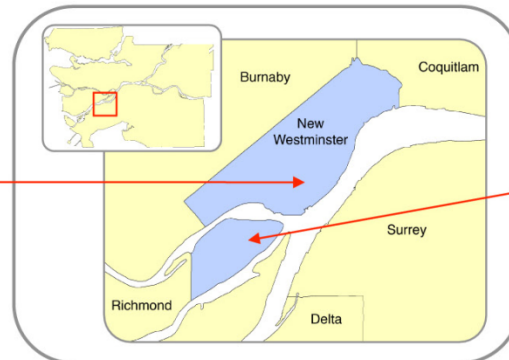
Ngo, VD, Frank, L.D., Bigazzi, A.Y. Effects of new urban greenways on transportation energy use and greenhouse gas emissions: A longitudinal study from Vancouver, Canada. Transportation Research Part D.

Health Related Results

- Study Participants After the Greenway Was Constructed Showed these Changes:
 - 32 % increase in bike trips
 - 23 % decrease in automobile trips
 - 33 % decrease in time spent in cars after the greenways
 - 16 % increase in the number of days engaged in moderate physical activity.
 - 10 % decrease in the number of days in poor physical or mental health
 - 8 % decrease in sedentary time

Walkability Components

***Includes
Sidewalk
Continuity
In 2016***



**Uptown
Moody Park**

Queensborough

Net Residential Density
(dwelling units/acre)

40.29

7.73

Mixed Use Index
(range 0 – 1)

0.58

0.09

Intersection Density
(per square km)

70.12

27.91

Retail Floor
Area Ratio

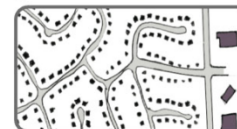
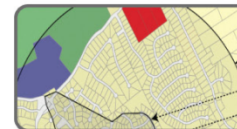
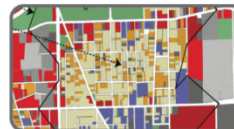
0.64

0.30

Overall Walkability

4.26

-3.74



WALKABILITY

- Building on Past Research
 - Ours and Others
- Validated by 100s of studies
- Consistent methods in 3 time points
 - comparability
- Built environment that support **walking** and **biking**:
 - Local walkability data
 - Regional accessibility data

2006



2011

- New data
- Improved indicators
- New built environment variables



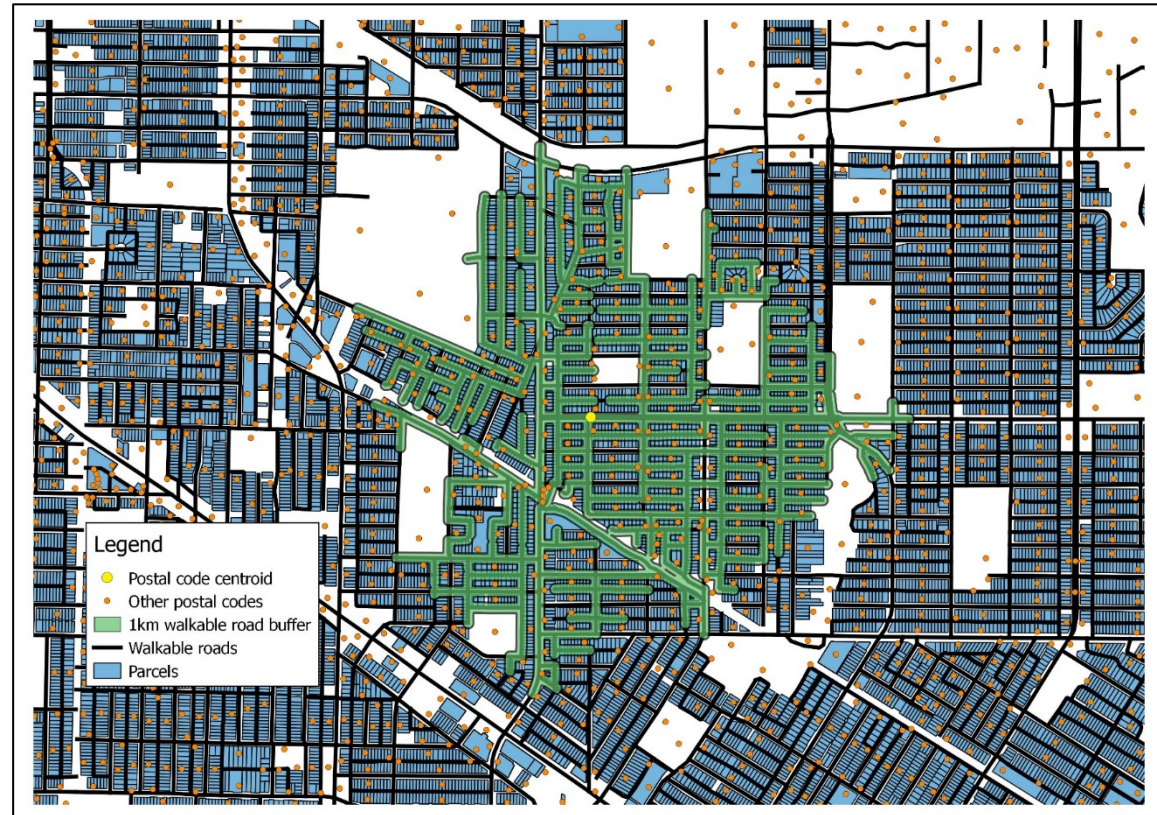
2016

- New data
- Improved indicators
- New built environment variables
- Alternative buffer sizes
- Transit accessibility

Walkability index methodology

For each postal code:

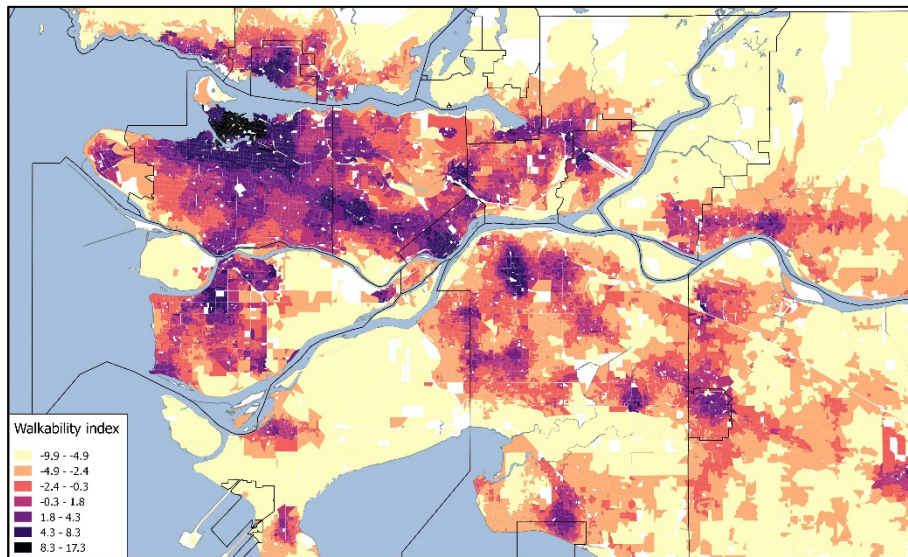
- Compute indexes based on surrounding
 - reachable parcel's attributes
 - Intersections
- Buffer along road network
 - 1000 m
 - 800 m
 - 400 m



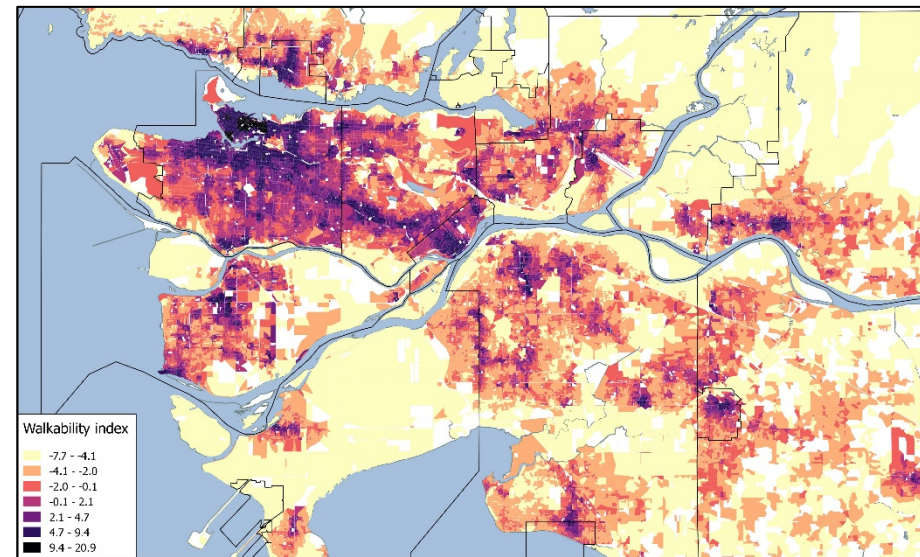
Frank, L.D., Fox, E.H., Ulmer, J.M., Chapman, J.E., Kershaw, S.E., Sallis, J.F., Conway, T.L., Cerin, E., Cain, K.L. Adams, M.A., Smith, G.R., Hinckson, E., Mavoa, S., Christiansen, L.B., Hino, A.A.F, Lopes, A.A.S., Schipperijn, J. 2017. International comparison of observation-specific spatial buffers: maximizing the ability to estimate physical activity. International Journal of Health Geographics, 16(4): 1-13.

Final index

1000 m

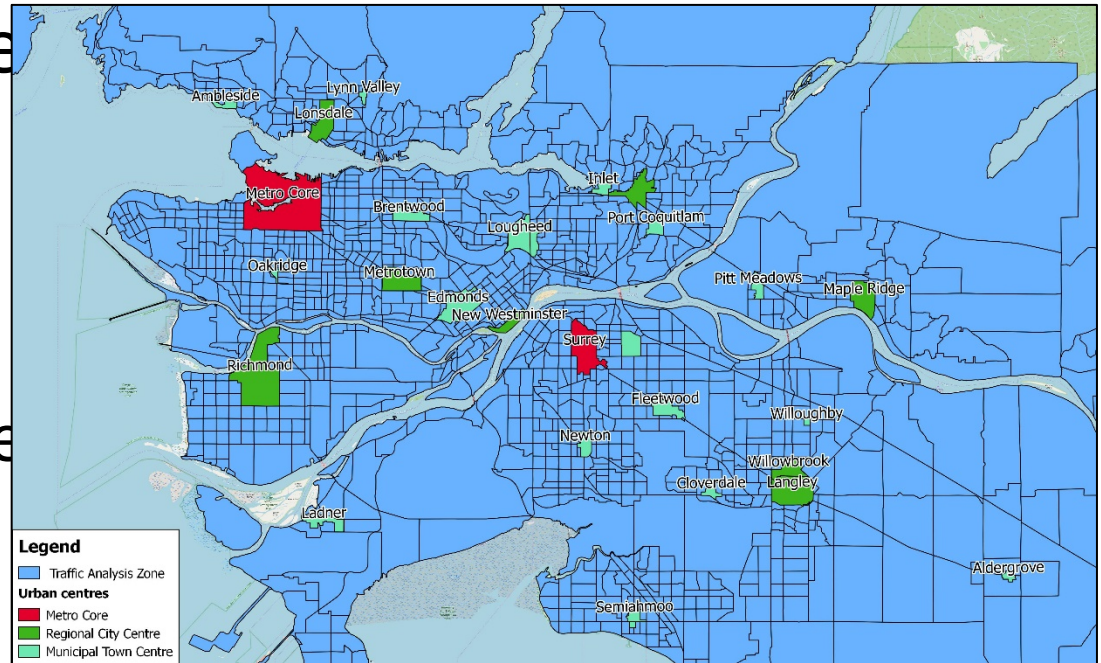


400 m

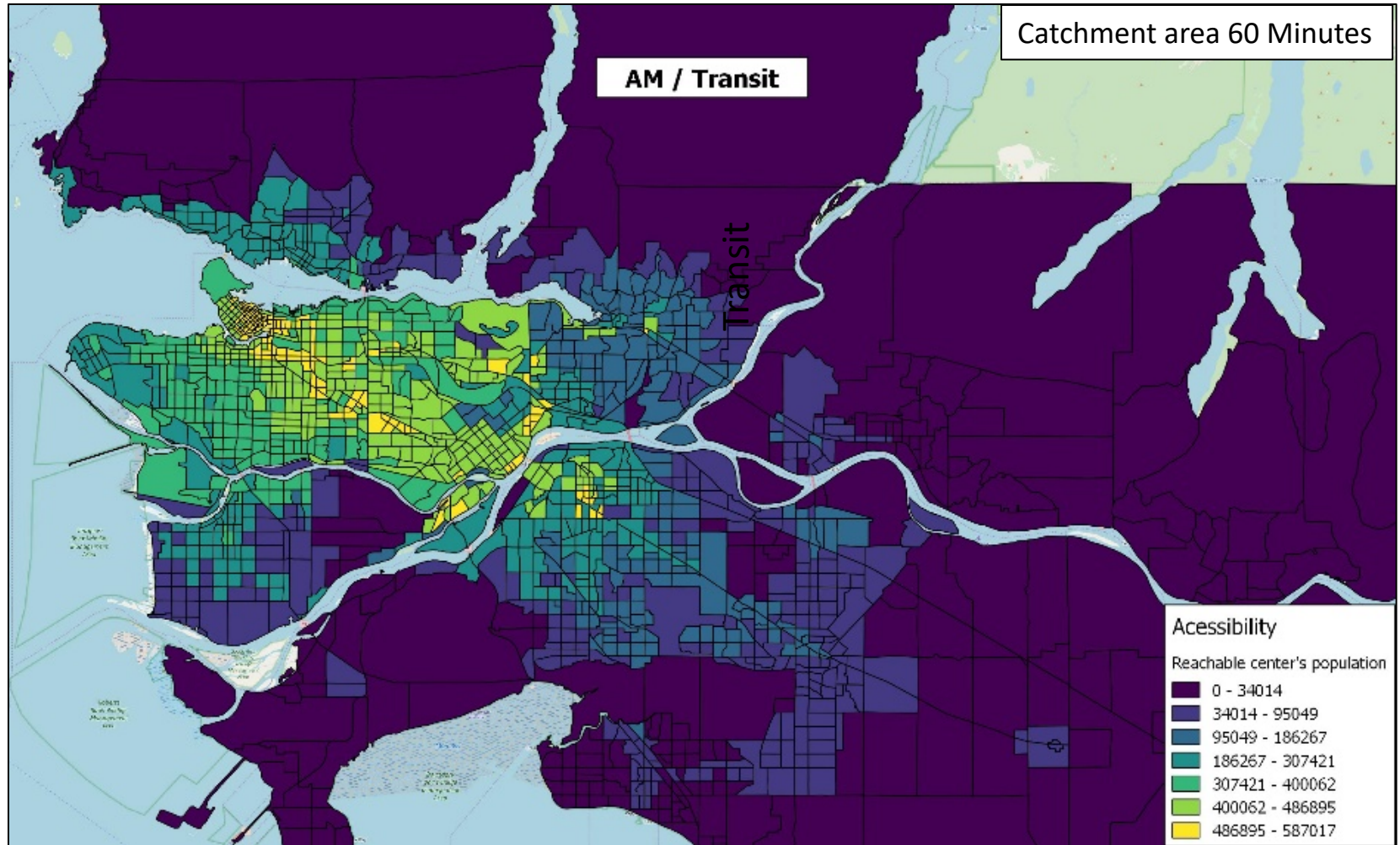


Regional Accessibility

- The time it takes to reach a wide array of regional activities from any given location (Bureau of Transportation Statistics, 1997).
- Metro Vancouver
 - AM / off peak
 - Transit / Auto
 - Translink's Travel Model Data



Regional Accessibility



AM PEAK - TRANSIT

*Buffer #2 –
Pedestrian
Network
Including Off-
Street Linkages*

*Buffer #1 –
Street Network*



Results – Street Connectivity

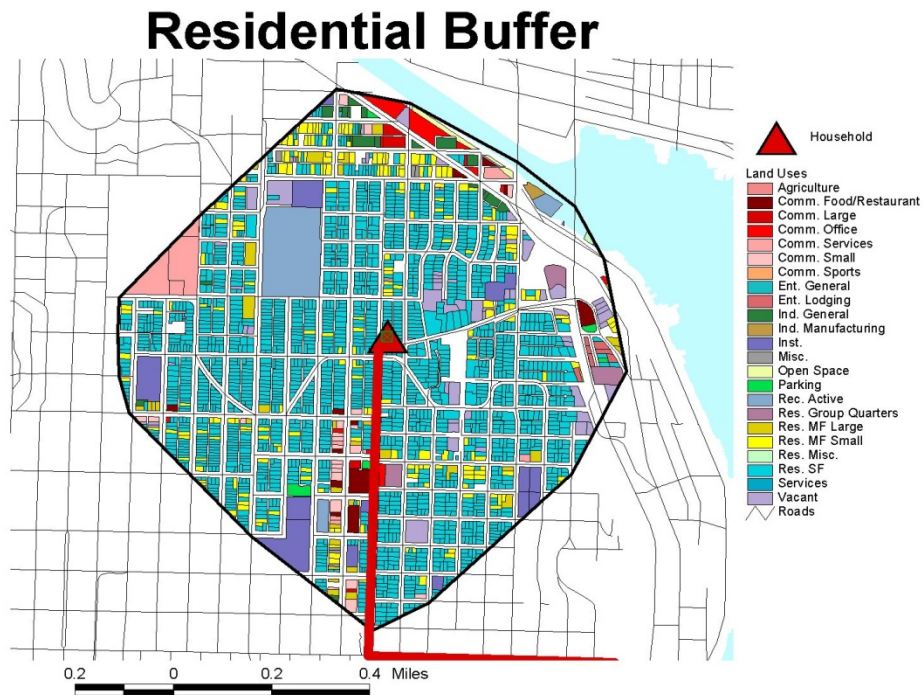
Inclusion of off-street pedestrian linkages increases intersection density on average by:

- **23%** across the study area

These increases vary across walkability:

- **19%** in high walkability (i.e. town centre) areas
- **24%** in low walkability (i.e. suburban) areas

Residential Buffer



	Square Footage	# of Land Uses	Land Area
Residential	4,306,770	2243	232.95 acres
Retail	18,849	33	0.27 acres
Entertainment	94,374	14	17.96 acres
Office	194,336	17	5.17 acres
Institutional	390,092	17	48.10 acres

Walkability Methods Compared

1998 Results

Correlations Between Land Use and % Household Walk Trips

(Controlling for Household Size and Income, Street Connectivity and Sidewalk Density)

Land Use Type	Number of Attractions	Rentable Building Area	Total Parcel Area
Civic	0.2073 (P=0.000)	0.1683 (P=0.000)	0.0806 (P=0.000)
Educational	0.2594 (P=0.000)	0.1427 (P=0.000)	0.1421 (P=0.000)
Retail - Neighborhood	0.2965 (P=0.000)	0.2920 (P=0.000)	0.1456 (P=0.000)
Restuarants and Taverns	0.2757 (P=0.000)	0.2432 (P=0.000)	0.1423(P=0.000)
Office Buildings	0.2557 (P=0.000)	0.2280 (P=0.000)	0.1615 (P=0.000)
Grocery Stores	0.2174 (P=0.000)	0.1717 (P=0.000)	0.1194 (P=0.000)

Assessed at Place of Residence

Where Matters:

Health, Environmental, & Economic Impacts of Transportation and Land Use Actions

September 21, 2018

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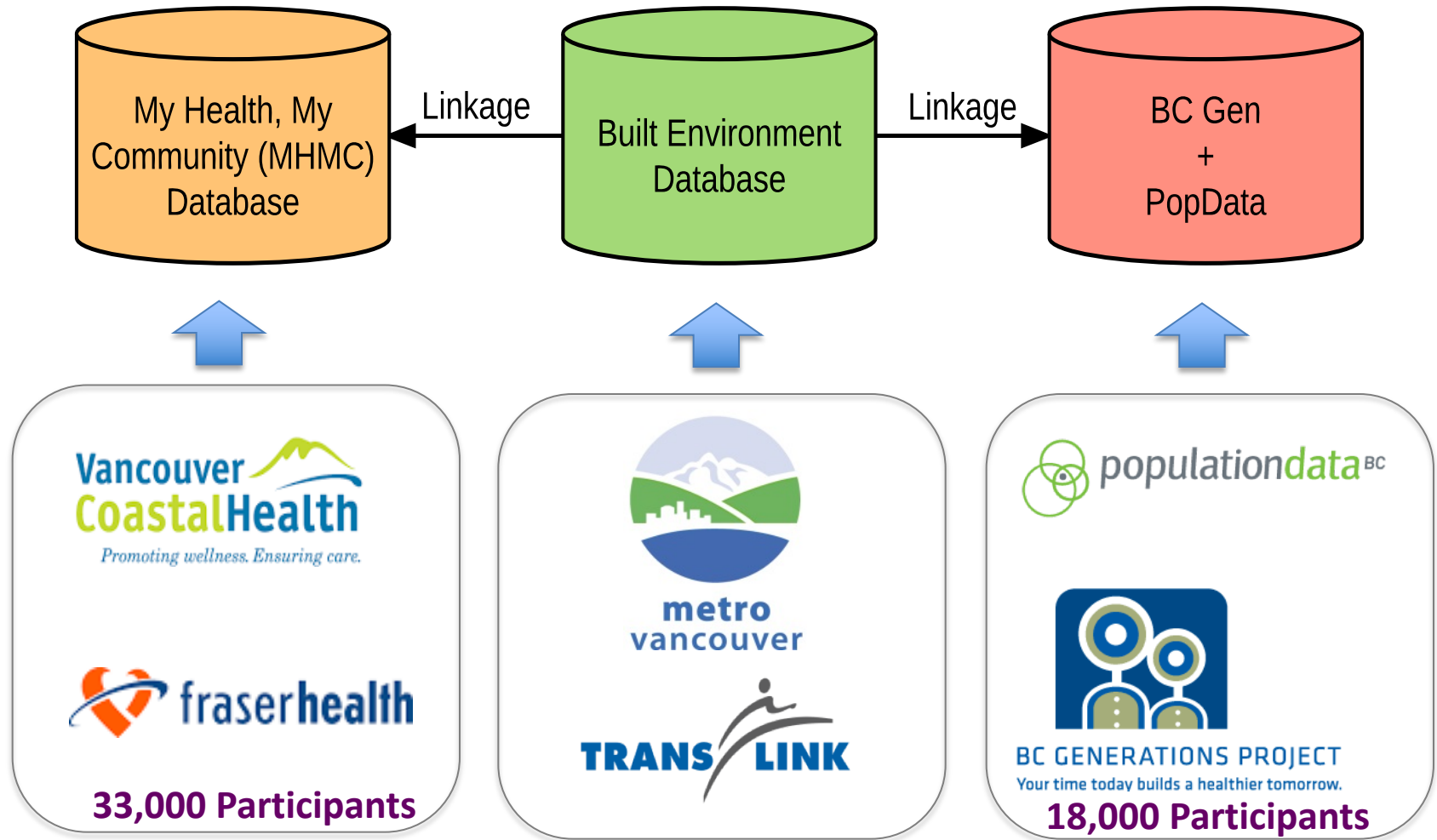
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Vancouver Coastal Health



Vancouver Laboratory



Evidence Links

Built Environment to Health

- regional accessibility
- walkable neighborhoods
- pedestrian micro-scale



- ✓ Physical Activity
- ✓ Body Mass Index
- ✓ Obesity
- ✓ Diabetes
- ✓ Cardiovascular Disease
- ✓ Mental Health
- ✓ Cancers

Schoner J., Chapman, J., Brookes A., MacLeod K., Fox E., Iroz-Elardo, N, Frank, L.D.: Bringing health into transportation and land use scenario planning: Creating a National Public Health Assessment Model (N-PHAM). 2018. [Journal of Transportation and Health](#).

CALIFORNIA PUBLIC HEALTH ASSESSMENT MODULE (CPHAM)

Funders: California Strategic Growth Council (Lead) Office of Policy Research, SCAG, SACOG



CALIFORNIA STRATEGIC
GROWTH COUNCIL

Key Elements:

- Quantitative statistical models of **built environment & health**
 - BMI, likelihood of being obese, likelihood of having high blood pressure/heart disease/type 2 diabetes



STRENGTH OF APPROACH

- **Large sample sizes**
 - 53,733 California Household Travel Survey participants
 - 40,617 California Health Interview Survey participants
- **Cohort-specific model development**
 - 4 age groups (seniors, adults, teens, children)
 - For adults, three HH income groups (<\$50k, \$50-100k, >\$100k)
- **California-specific evidence base**
 - CHIS and CHTS data were collected from a representative cross-section of Californians
- **Variability in built environment characteristics**
 - 30-county study area covers a broad range of built environments and travel behaviors across California

ADVISORY PANEL – CPHAM

- Transportation, Built Environment, and Public Health Experts including from:
 - UCLA
 - UC Berkeley
 - Rand Corporation
 - California Dept. of Public Health
 - San Diego County Health and Human Service
 - Strategic Growth Council
 - Governor's Office of Policy Research
 - MPO's (SCAG / LA Region, SACOG Sacramento Region)

"GREEN PRESCRIPTION"

Background: Exposure to **nature and green** space help to:

- Encourage physical activity
- Reduce stress
- Promote restoration
- Improve air quality



Project: Green Prescription,
Sacramento Tree Foundation

Purpose:

- Identify the health impact of urban **tree canopy**
- Understand health-related benefits of **tree planting**



"GREEN PRESCRIPTION"

Results: ↑ neighborhood tree canopy associated with:

- Adults
 - More vigorous physical activity
 - Less obesity/overweight status
 - Less asthma
 - Better general health
 - Better social cohesion
- Teens
 - Less obesity/overweight status
 - Better general health
 - Fewer depressive symptoms
- Children
 - Less obesity/overweight status
 - Better general health



It 's All About Energy



On 350 calories — one apple tart or a “special” slice of Ray's Pizza — a cyclist can travel 10 miles, a pedestrian 3.5 miles, and an automobile 100 feet.

Transportation Alternatives, Bicycle Blueprint, 1998

TRANSPORTATION ENERGY INDEX

THE GLOBAL WARMING GAMBLE



FUEL MIX



VEHICLE
EFFICIENCY

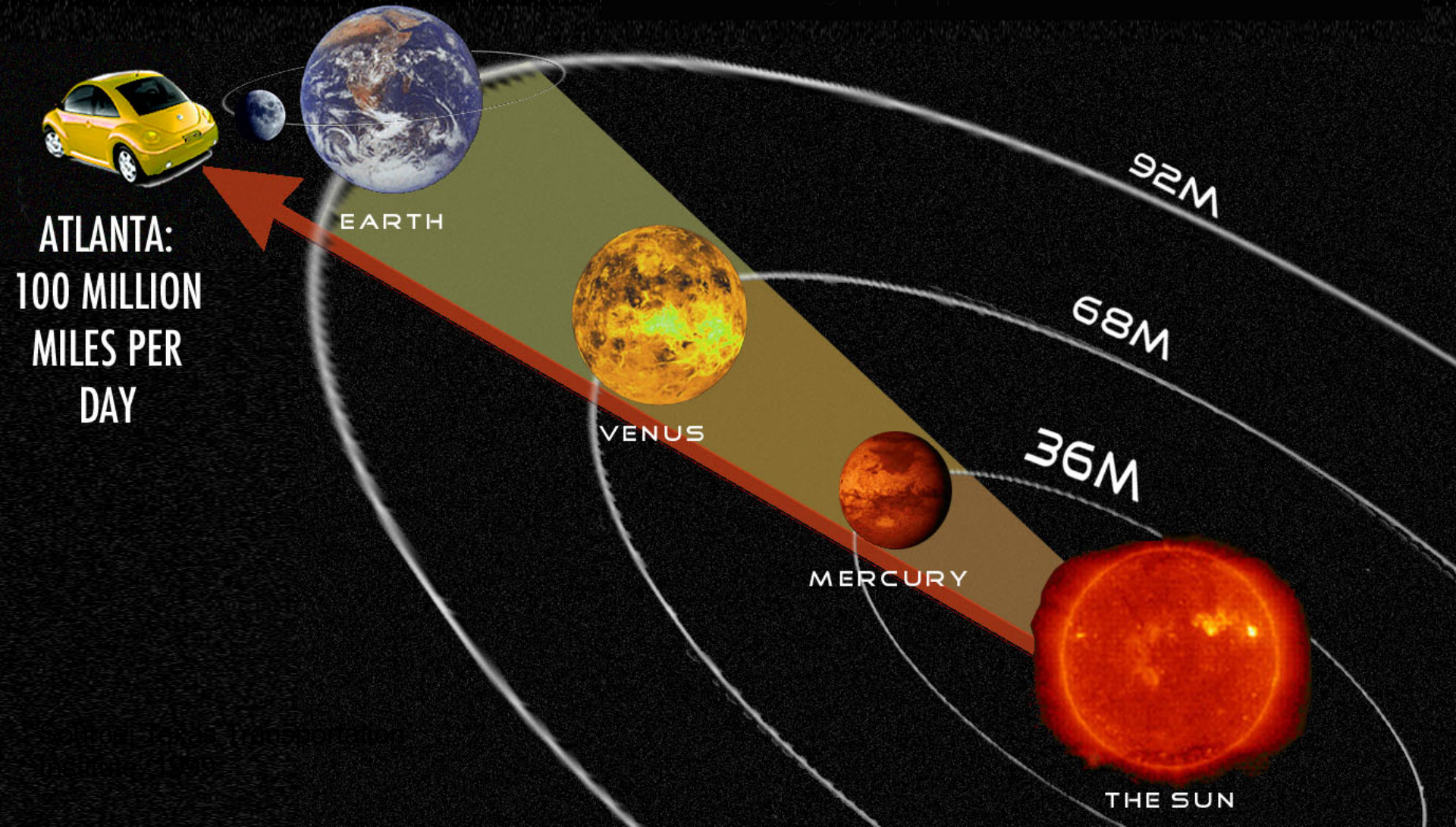


DEMAND

Policy Levers to Reduce
Transportation - Related CO₂ emissions



A Day in the Life ...



Questions?

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SLIDE 20

<https://health-design.spph.ubc.ca>