cycling and health

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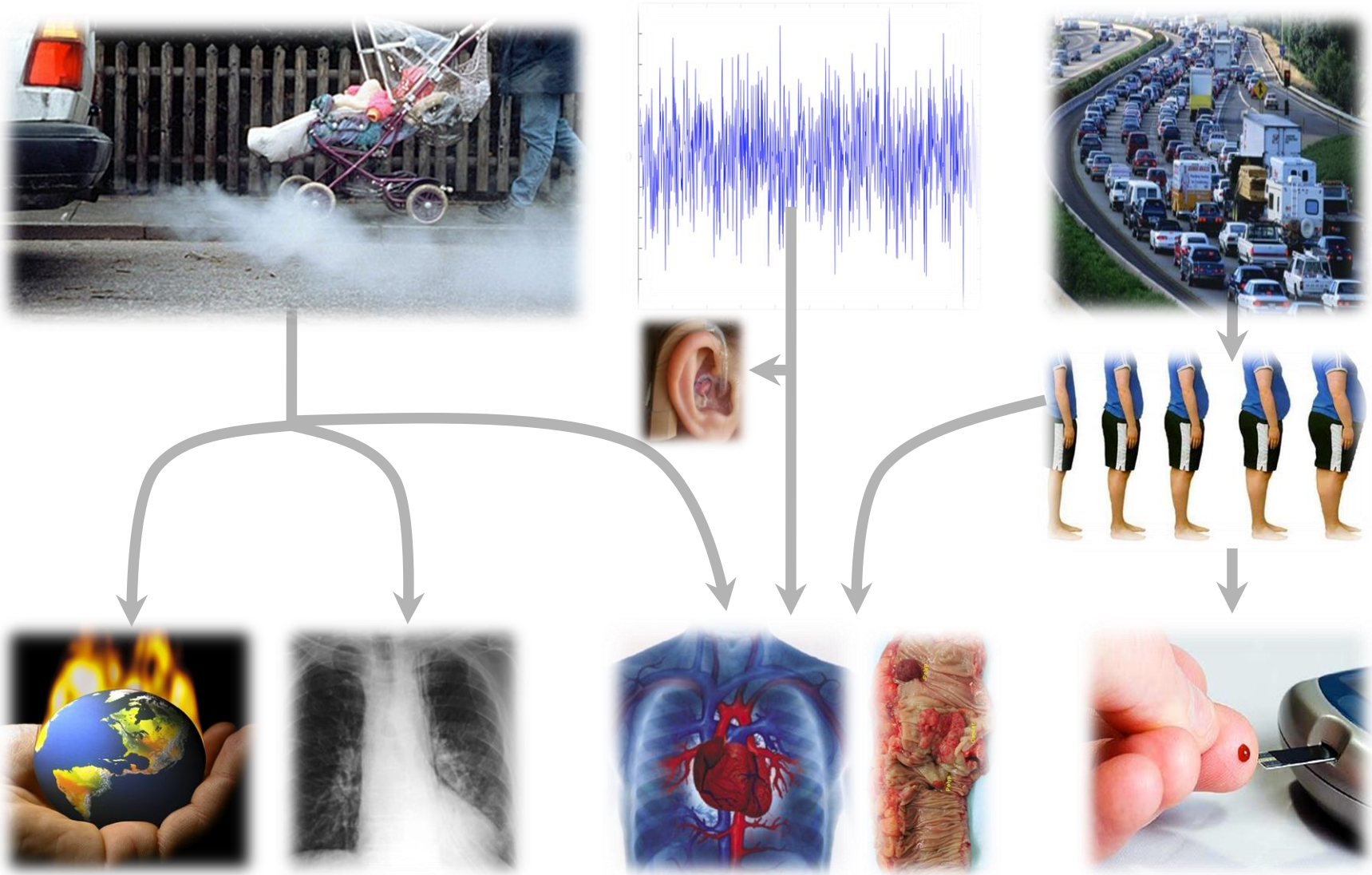
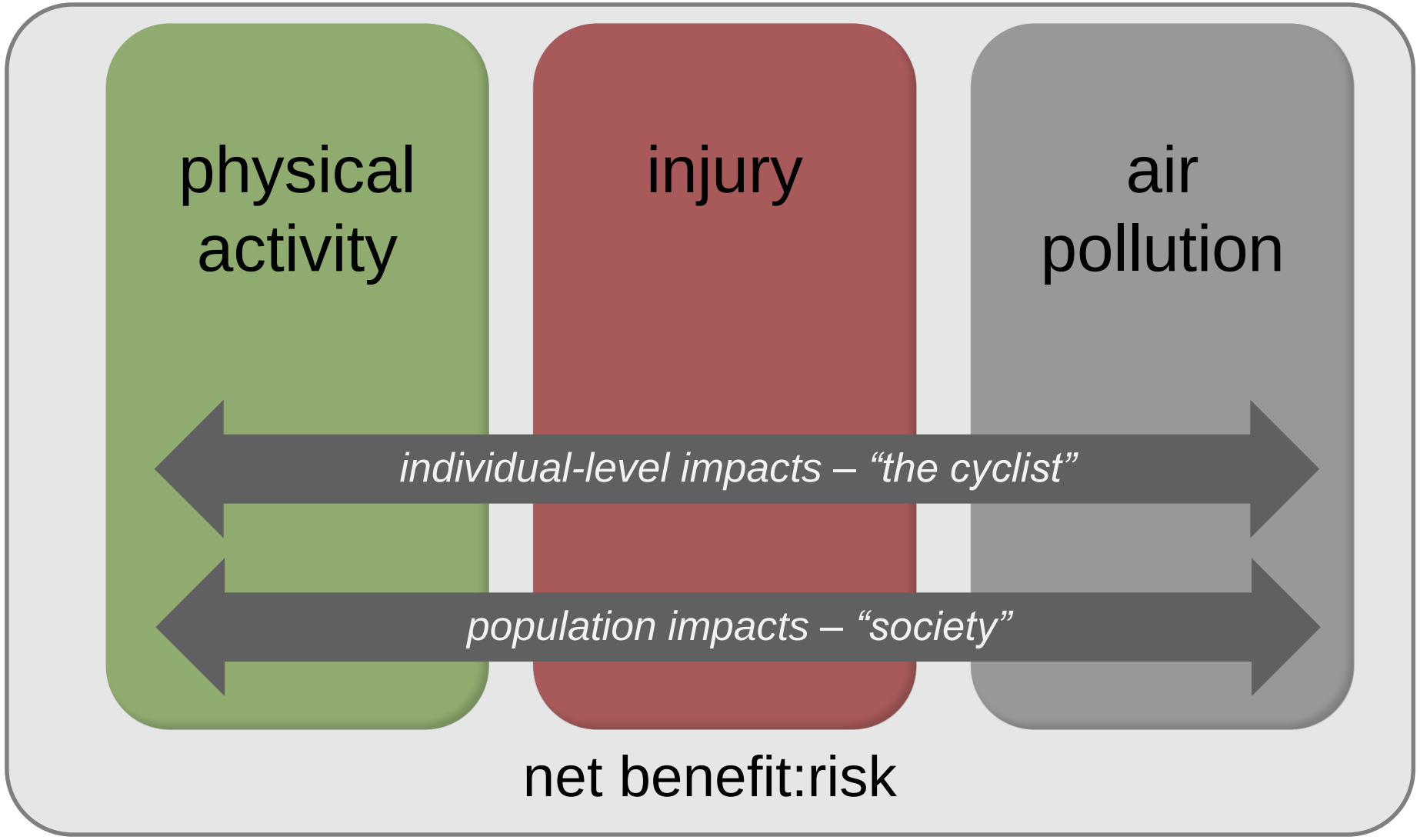
transportation and health



cycling and health



physical activity: benefits to individual

Strong evidence of reduced rates of:

- All-cause mortality
- Coronary heart disease
- High blood pressure
- Stroke
- Metabolic syndrome
- Type 2 diabetes
- Breast cancer
- Colon cancer
- Depression
- Falling

Strong evidence of:

- Increased cardiorespiratory and muscular fitness
- Healthier body mass and composition
- Improved bone health
- Increased functional health
- Improved cognitive function

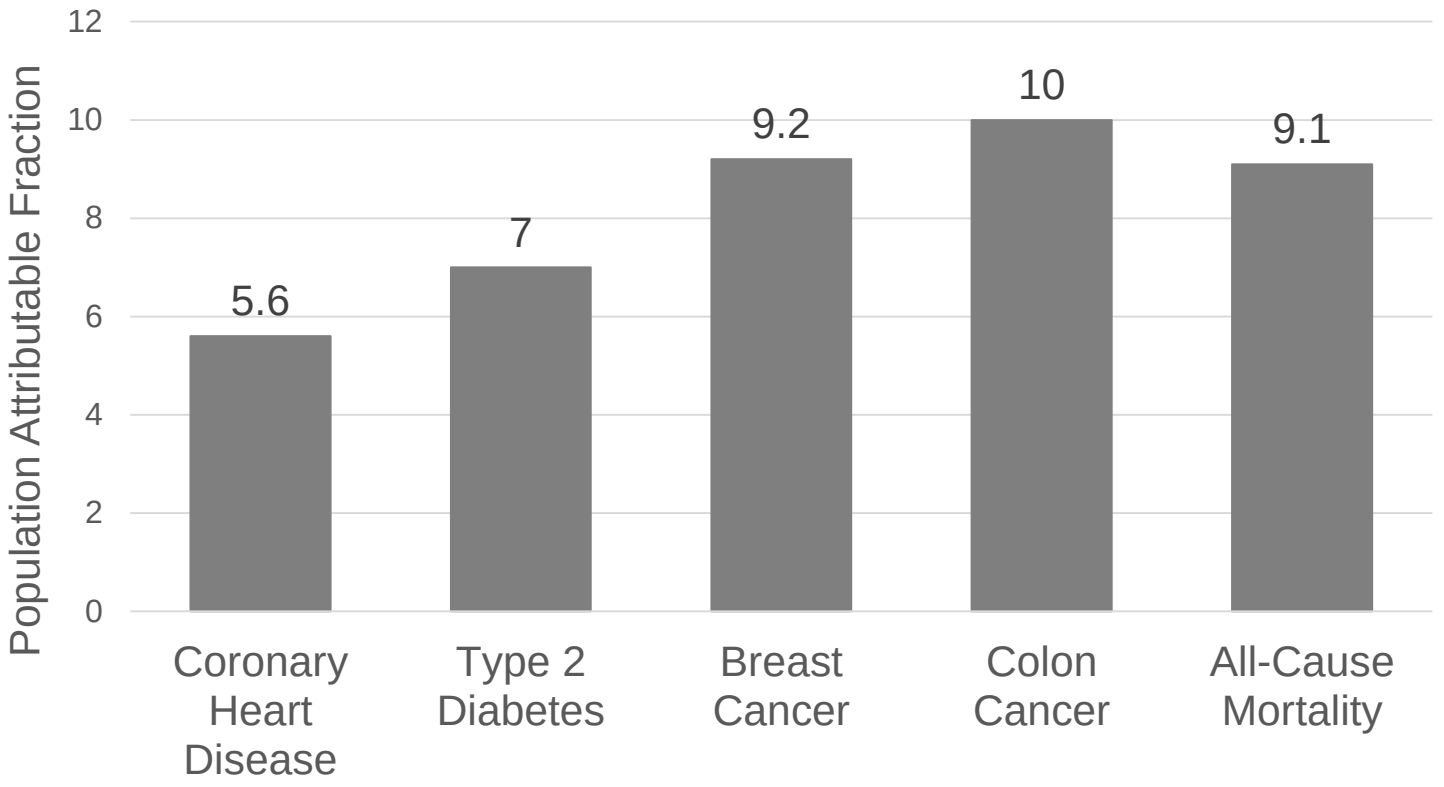
[Source: Lee et al, 2012, The Lancet]

physical activity: societal-level impacts

85% of adults and **93%** of children and youth do not meet recommended physical activity guidelines

health care costs of physical inactivity exceed **2 billion** annually in Canada

proportion of cases that would not occur if all people were active



[Sources: Katzmarzyk, 2000; ActiveCanada 2020]

[Source: Lee et al, 2012]

physical activity: cycling-specific studies

- compared to those who don't cycle to work, those who cycle regularly to work (3 hr/wk) have lower mortality (72% of the risk), accounting leisure time physical activity and other health indicators [Source: Anderson et al, 2000, Danish cohort]
- in male civil servants, those who cycled for ≥1 hr/ week experienced less than half the non-fatal and fatal coronary heart disease those who did not [Source: Morris et al, 1990, UK]
- employees who cycle regularly to work are less frequently ill, with greater than one day per year less absenteeism than colleagues who do not cycle to work [Source: Hendrikson et al, 2010, Dutch working population]

cycling-specific epidemiological studies are from Europe, UK, Asia

safety by mode in BC

fatality rates, 1 death per…

bus passengers - 250 million trips (US data)

driver/passengers – 10 million trips
cyclists - 7.2 million trips
pedestrian - 6.8 million trips

motorcyclist - 186,000 trips* (US data)

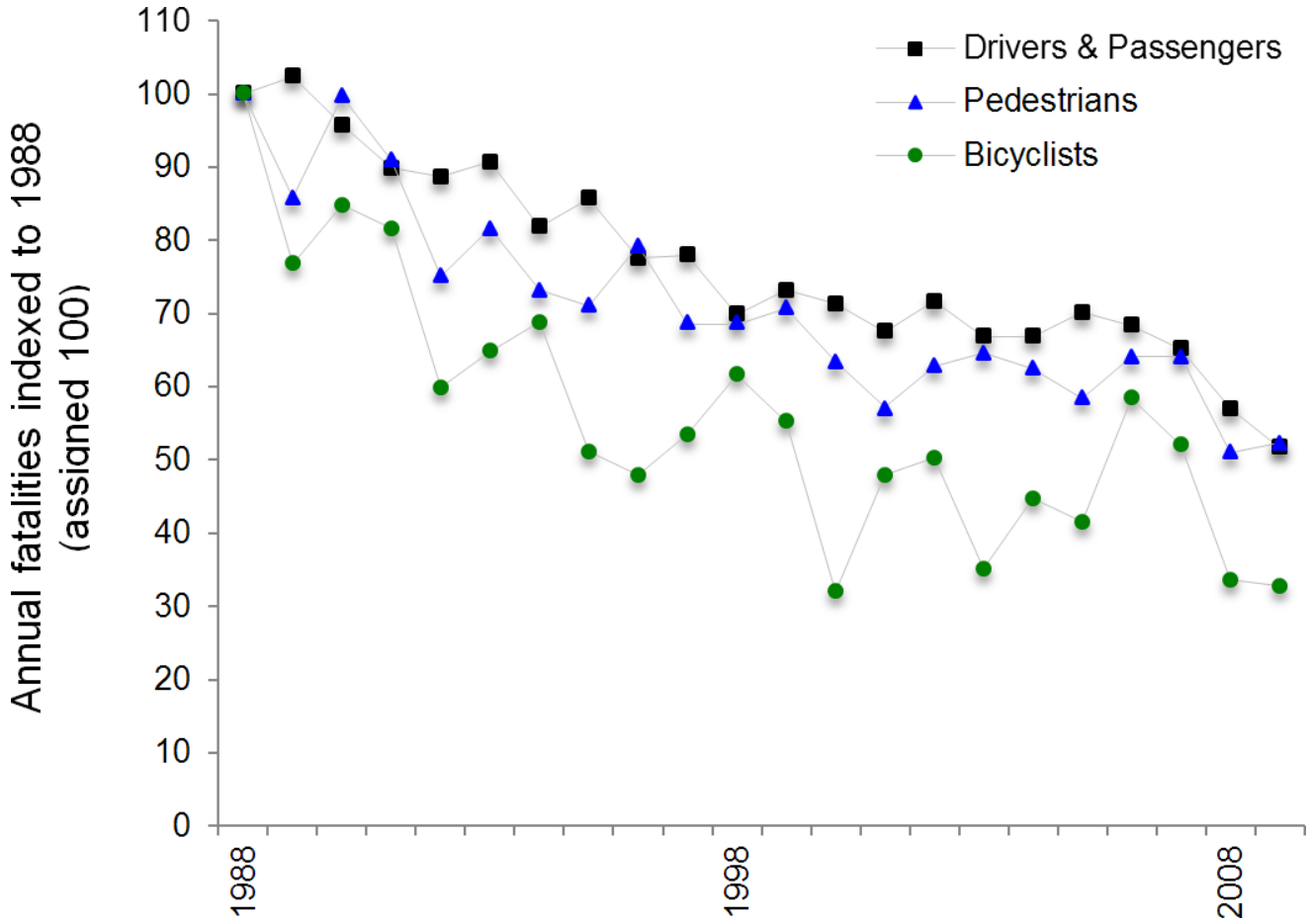
injury rates, 1 injury per….

pedestrian - 255,000 trips
driver/passengers - 140,000 trips
cyclists - 71,000 trips

summary statistics mask differences in urban/rural or demographics, underreporting of injuries

[Source: Teschke et al, 2013, ICBC data]

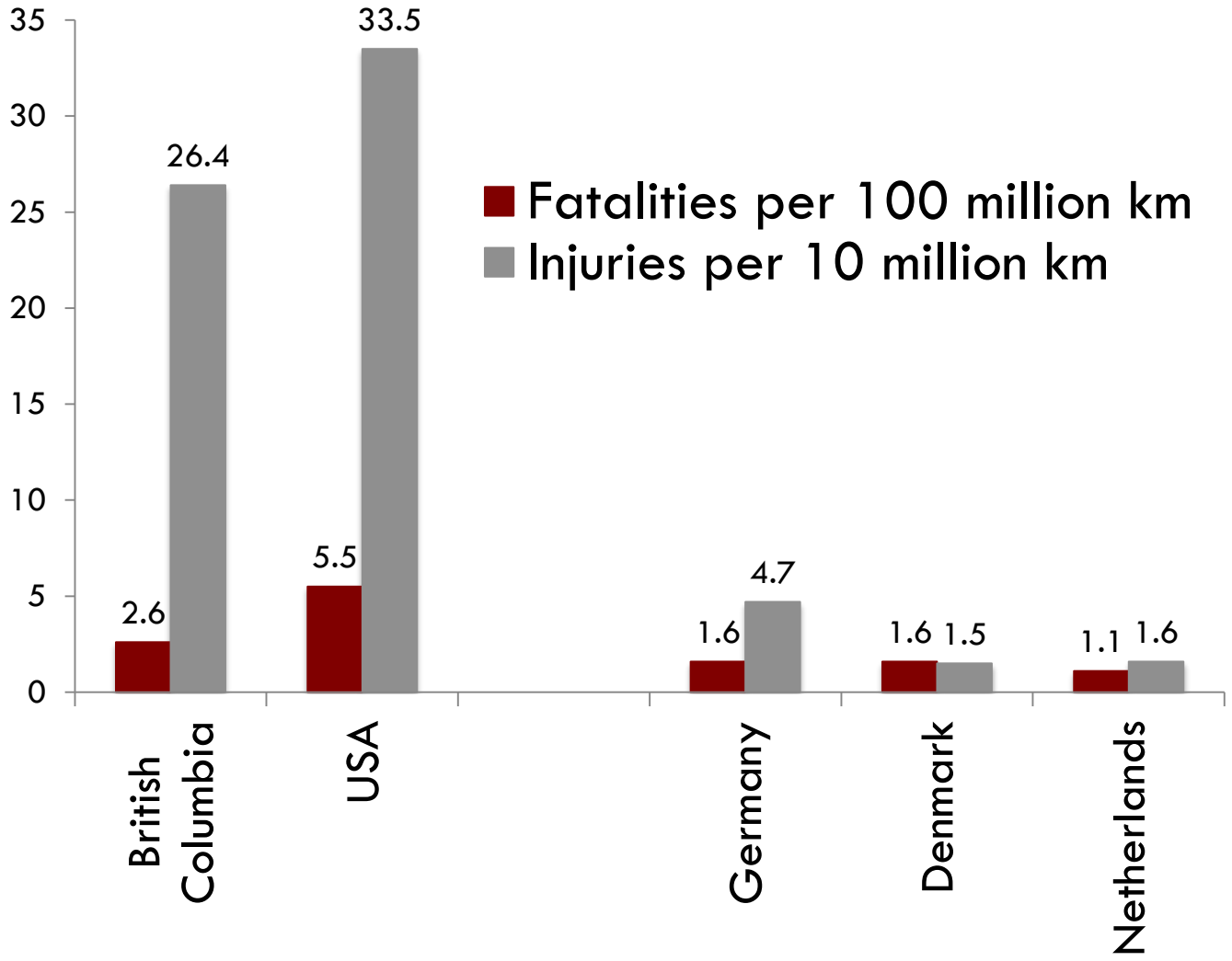
safety: trends over time in Canada



[Source: Teschke et al, 2012, Transport Canada Data]

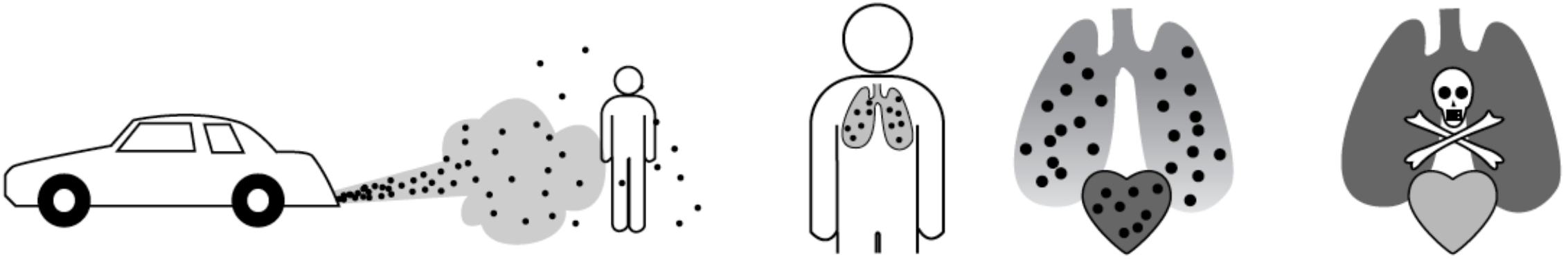
safety: looking to other countries

differences:
cycling rates?
infrastructure?



[Sources: Pucher & Buehler, City Cycling, 2012; BC – Teschke et al, 2013]

air pollution: exposure, intake, health effects



Emissions ⇨ Concentration ⇨ Exposure ⇨ Intake ⇨ Dose ⇨ Health Effects

exposure = concentration x duration

intake = exposure x inhalation

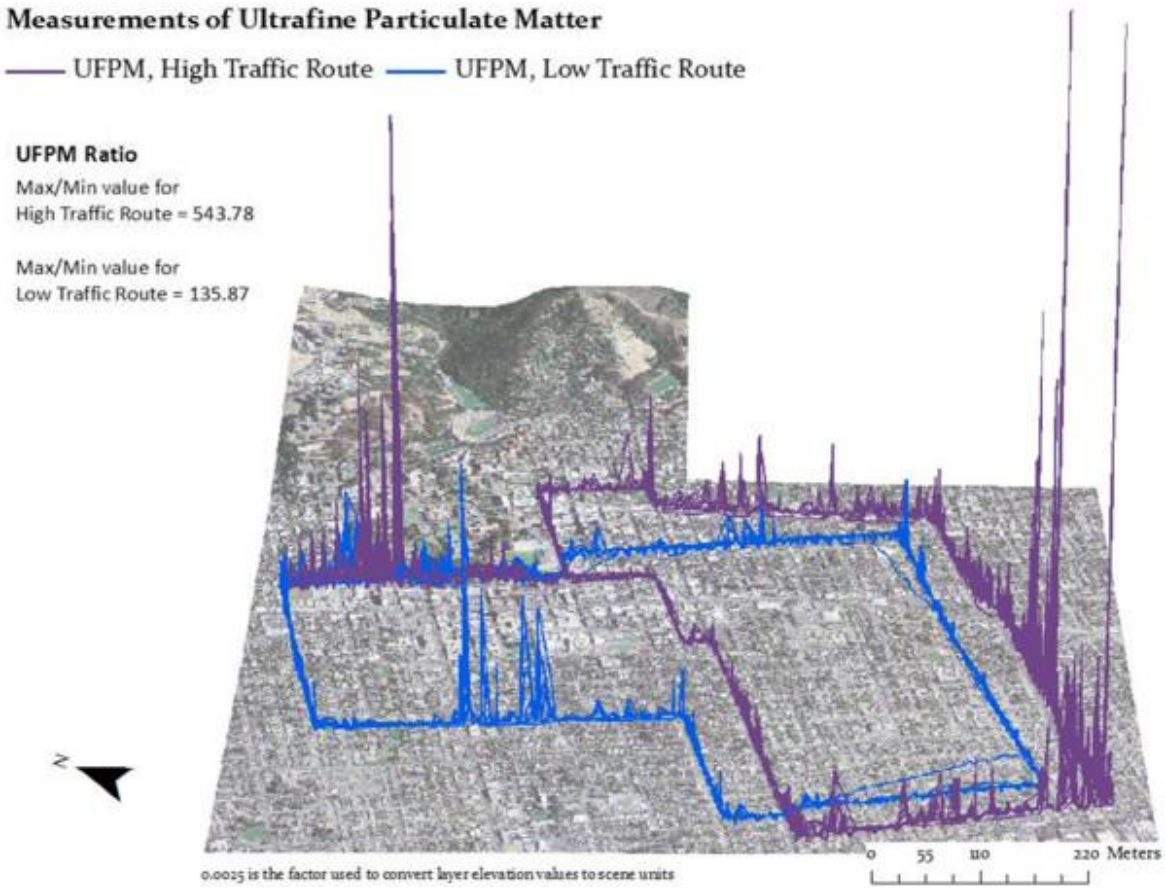
factors: travel mode, route choice, exertion, pollutant type

air pollution

Cyclist route choice, traffic-related air pollution, and lung function: a scripted exposure study

Sarah Jarjour[1*], Michael Jerrett[1], Dane Westerdahl[2], Audrey de Nazelle[3], Cooper Hanning[1], Laura Daly[1], Jonah Lipsitt[1] and John Balmes[1,4]

- Berkeley, 15 healthy adults
- two routes – a low-traffic Bicycle Boulevard route and a high-traffic route
- ultrafine particulate matter, carbon monoxide, and black carbon were **elevated on the high-traffic route**
- **no corresponding changes in the lung function** of healthy non-asthmatics



air pollution: a summary of evidence on impacts to the cyclist

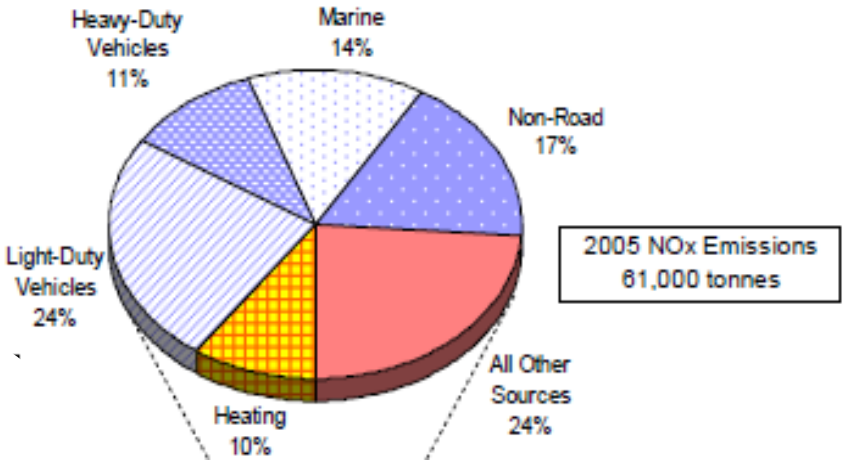
- compared to other modes, cyclists experience similar/slightly lower pollutant **concentrations**
- concentrations differ dramatically based on route *(1-2 m separation reduced exposures by 8 – 38%)*
- however…cyclists receive increased pollution **intake** due to increased inhalation and travel duration *(pedestrians > cyclists > car)*
- **some** evidence of **subtle** health impacts amongst cyclists in traffic compared to low/no traffic routes

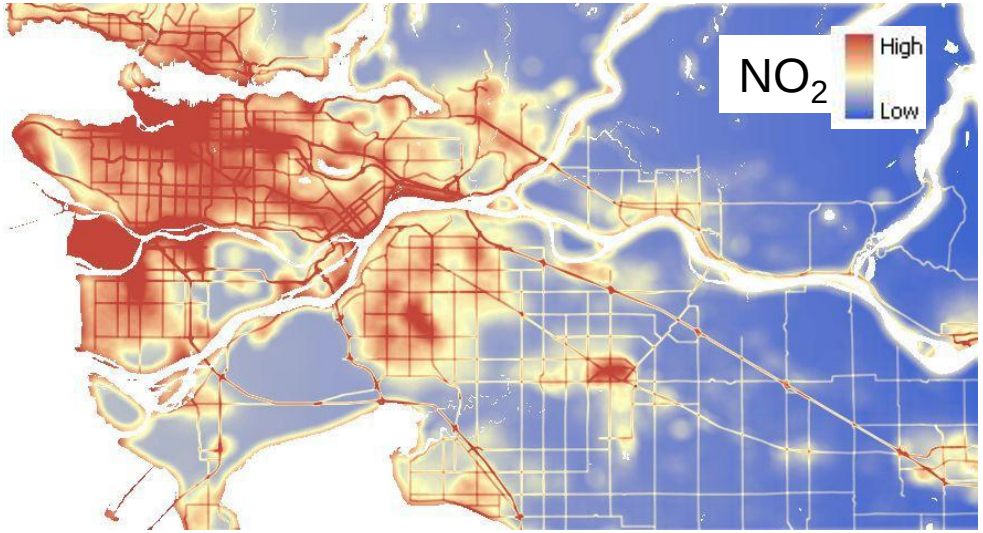
air pollution: a summary of evidence on impacts to society

- in urban areas, traffic is the predominant source of emissions
- cycling produces no emissions and is frequently argued to improve air quality

however….

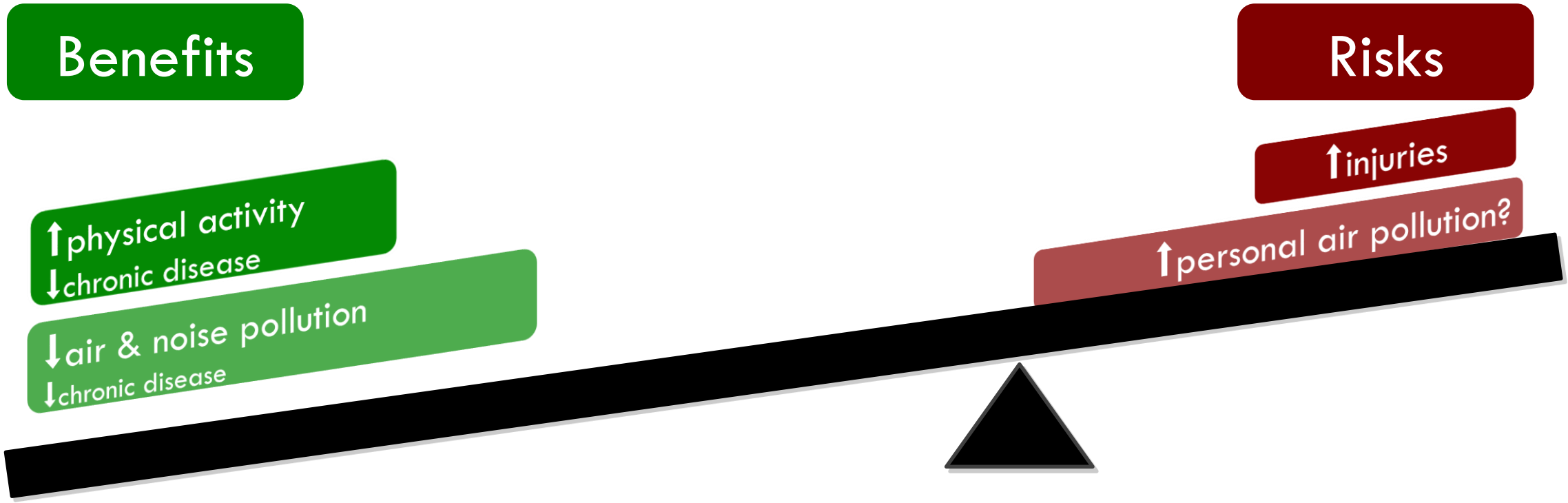
- for these benefits to be realized, cycling must replace a **substantial proportion** of motorized trips
- hard to discern spatial variation of impacts, pollutant types, and downstream health effects





[Sources: Metro Vancouver, 2007; Henderson, 2007]

benefits vs. risks of cycling



benefits vs. risks of cycling: methods

500,000 people make a transition from car to bicycle for short trips on a daily basis in the Netherlands

- physical activity: 14 – 90 life-day increase
- air pollution: 0.8 - 40 life-day decrease
- traffic accidents: 5 - 9 life-day decrease

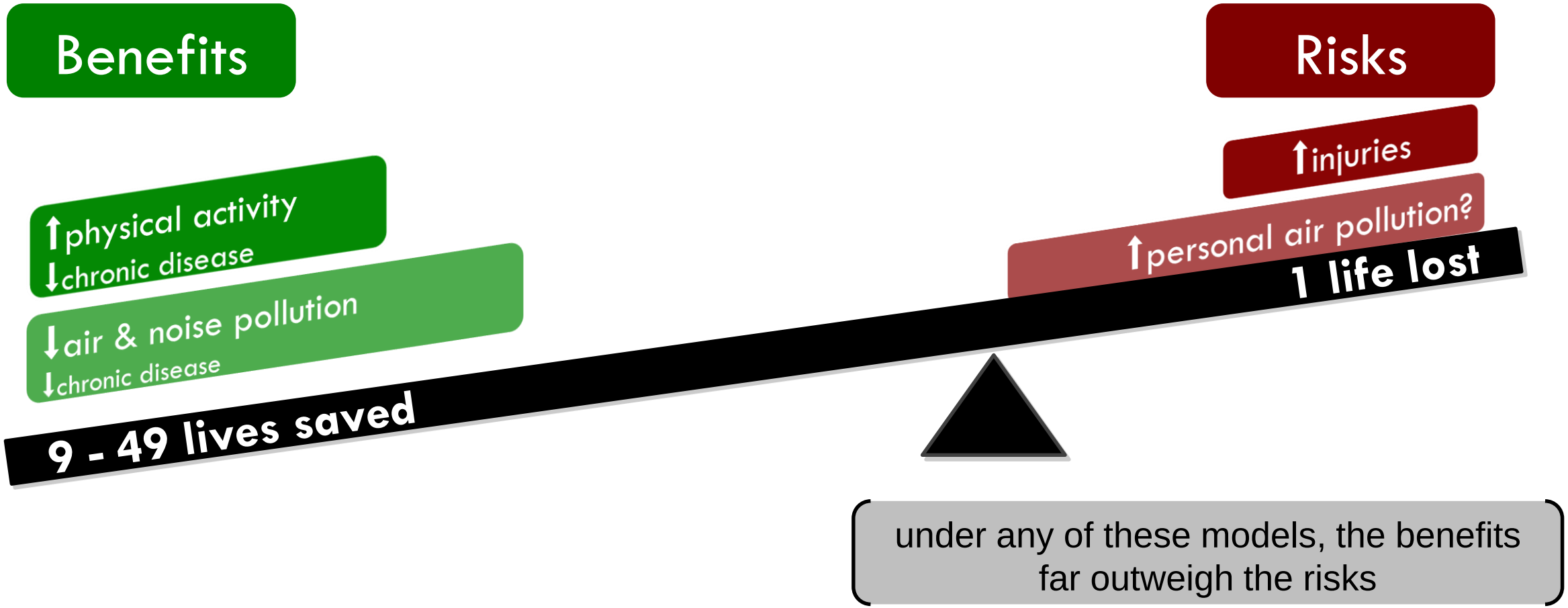
[Source: de Hartog et al, 2010]

modeling studies: scenario, inputs, parameters

benefits vs. risks of cycling

authors	location	benefits & risks taken into account			ratio of benefit : risk
		physical activity	injuries	air pollution	
British Medical Association, 1992	United Kingdom	↑physical activity	↑traffic crashes		**20 : 1** lives saved vs. lost
Woodcock et al., 2009	London, England	↑physical activity	↑traffic crashes	↓populat'n air pollution	**49 : 1** lives saved vs. lost **15 : 1** DALYs saved vs. lost
de Hartog et al., 2010	Netherlands	↑physical activity	↑traffic crashes	↑individual air pollution	**9 : 1** lives saved vs. lost
Rabl & de Nazelle, 2012	Europe	↑physical activity	↑traffic crashes	↓populat'n air pollution ↑individual air pollution	**19 : 1** Euros saved vs. lost

benefits vs. risks of cycling



under any of these models, the benefits far outweigh the risks

[Sources: Reynolds et al, 2010; Teschke et al, 2012]

hot topics: health impacts of public bike share

Barcelona *Bicing* bike share (28,251 regular users)

- physical activity: 12 deaths avoided
- air pollution: 0.13 increased deaths
- traffic accidents: 0.03 increased deaths

[Source: Rojas-Rueda et al., 2011]

authors	location	benefits & risks taken into account			ratio of benefit : risk
		physical activity	injuries	air pollution	
Rojas-Rueda et al., 2011	Barcelona, Spain	↑physical activity	↑traffic crashes	↑individual air pollution	**96 : 1** lives saved vs. lost

hot topics: e-bikes

e-bikes could expand the cycling demographic

- Japan: 3/4 of purchasers are women, 2/3 were over 50 years old [Source: Rose, 2012; Dill and Rose, 2012]

physical activity [Source: Sperlich et al, 2012]

- energy burning: need to cycle 3-4 times/wk for 10 km on varying terrain to achieve guidelines
- 2-3 times/wk on conventional bike ~ 3-4 times/wk on e-bike

safety

- China: slightly higher fatality rates e-bikes vs. conventional - 0.023 vs. 0.013 per million VKT [Source: Cherry, 2007]

hot topics: ciclovia

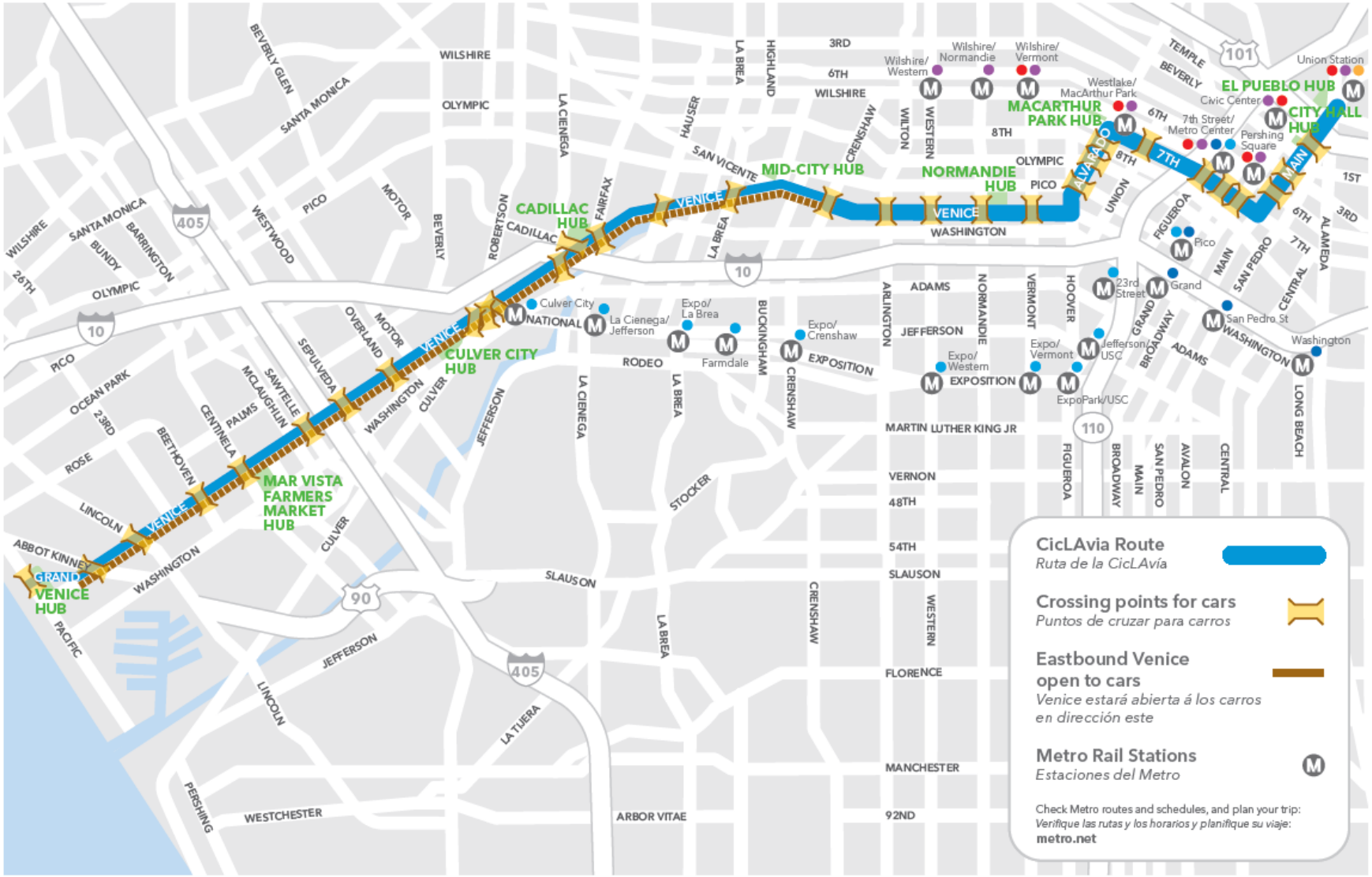
- road closures which aim to enhance physical activity, recreation, social interaction
- Bogota, 72 events/year
  - 600,000 – 1,400,000 participants each
- 46% bicyclists, 48% pedestrians, primarily low- and middle- income
- benefit: cost ratio (physical activity only)
  - Bogotá - 3.23–4.26
  - Guadalajara - 1.02–1.23
  - Medellín - 1.83
  - San Francisco – 2.32

[Sources: Sarmiento, 2010; Torres, 2012; Montes, 2013]

CICLAVIA

ROUTE FOR SUNDAY, APRIL 21, 2013

Ruta del Domingo, 21 de Abril, 2013

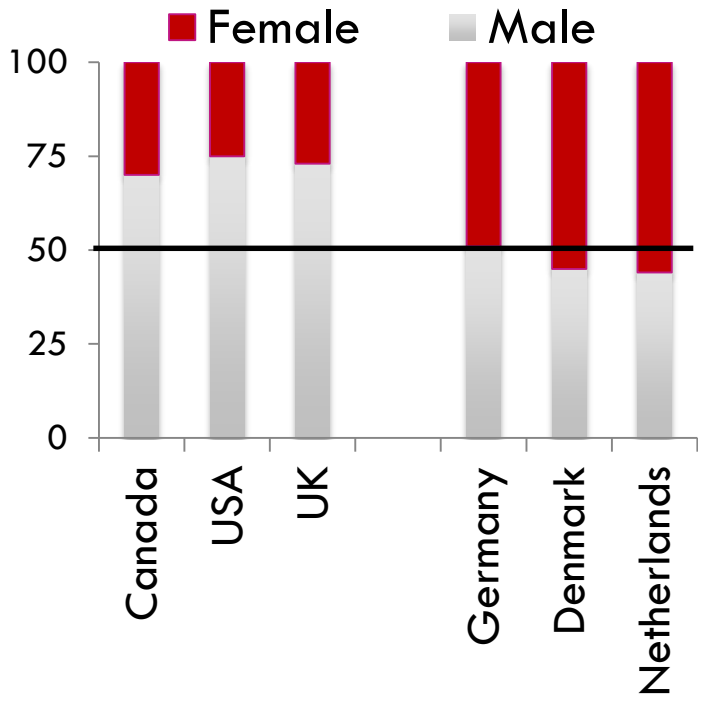


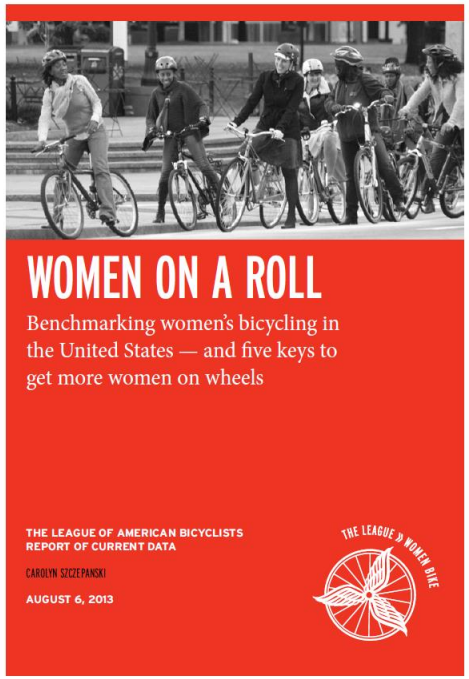
"started in 2010, CicLAvia has quickly become Los Angeles County's most popular public event, consistently attracting more than 100,000 participants"

hot topics: demographics of cycling

women:

- 5C's that will get women cycling:
- Comfort, Convenience, Confidence, Consumer Products, Community





[Source: Pucher & Buehler, City Cycling, 2012]

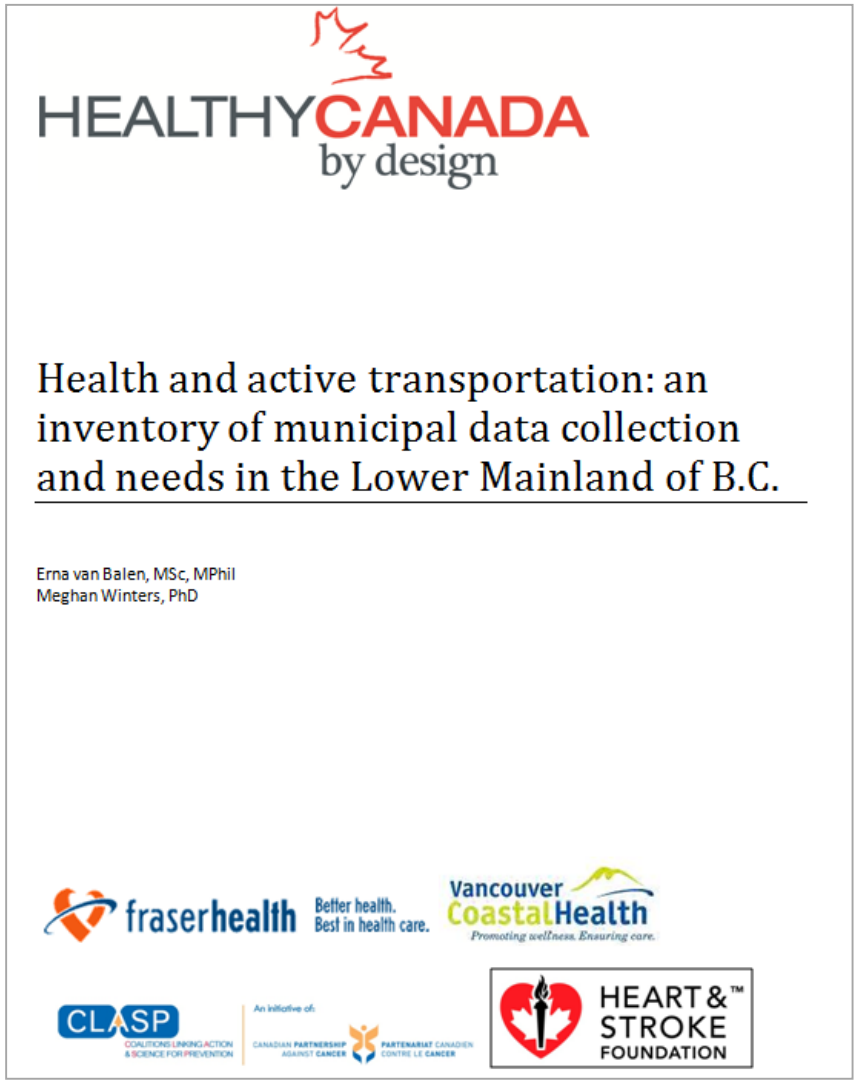
older adults:

- cycling mode share for 65+
- US NHTS data: 0.4%
- Translink Trip Diary: 0.5%
- Comox-Helmcken residents (60+): 3.2%

integrating health into transportation planning:

what can municipalities, health authorities, and interested citizens do?

new report



General Recommendations

1. establish a regional approach to data collection for transportation and health
2. establish a regional database of transportation and health data
3. leverage funding and resources
4. enhance knowledge exchange between municipalities

Integrating health into transportation planning

	Tier 1	Tier 2	Tier 3
Data currently available	• Traffic counts, if any, are for motorized traffic only • Do not have health data	• Have traffic counts, including some AT data • Have some injury data	• Have extensive count programs, including AT • Have injury data from several sources, but no other health data
Data needed	• More/better data on active transportation • Best practice of data collection	• Best practice of data collection • Sharing data and accessibility	• Sharing data and accessibility • Linking health and transportation
Promising practices	• National Count Day • Peel Data Centre	• National Count Day • Peel Data Centre • Injury and crash maps	• Injury and crash maps • Toronto diabetes map • HEAT, Health Impact Assessments
Recommendations	1 - 4 5	1 - 4 5 - 6	1 - 4 6 - 9

Integrating health into transportation planning

Tier 1

Data currently available

- Traffic counts, if any, are for motorized traffic only
- Do not have health data

Data needed

- More/better data on active transportation
- Best practice of data collection

Promising practices

- National Count Day
- Peel Data Centre

Recommendations

1 - 4
5

Recommendation:

- Expand existing municipal intersection counts to include active transportation

Integrating health into transportation planning

Tier 2

Data currently available

- Have traffic counts, including some AT data
- Have some injury data

Data needed

- Best practice of data collection
- Sharing data and accessibility

Promising practices

- National Count Day
- Peel Data Centre
- Injury and crash maps

Recommendations

1 - 4
5 - 6

Recommendations:

- Expand and align existing count programs
- Use health and injury data sources already available

Integrating health into transportation planning

Tier 3

Data currently available

- Have extensive count programs, including AT
- Have injury data from several sources, but no other health data

Data needed

- Sharing data and accessibility
- Linking health and transportation

Promising practices

- Injury and crash maps
- Toronto diabetes map
- HEAT, Health Impact Assessments

Recommendations

1 - 4
6 - 9

Recommendations:

- Access existing health and injury data sources
- Add health-related questions to surveys
- Carry out health impact assessments, HEAT
- Make use of advancing technology

Health Economic Assessment Tool (HEAT) for cycling

- online tool to help conduct an economic assessment of the health benefits
- estimates value of reduced mortality resulting from specified amounts of cycling
- useful for:
  - cost-benefit of planning new infrastructure
  - valuing current levels
  - modelling future scenarios
- limitations: mortality only, spatial resolution, assumptions
- online training available

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

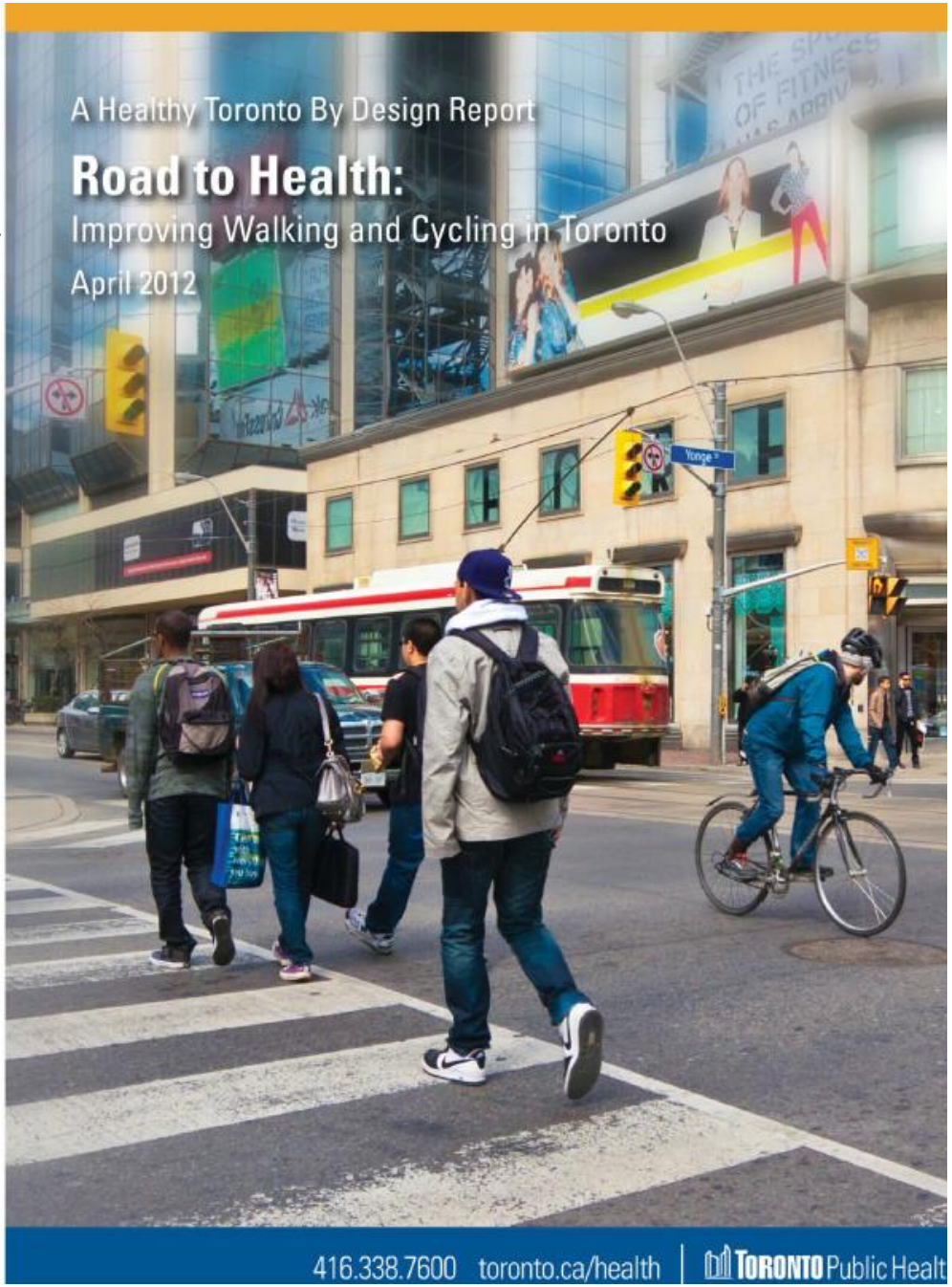
ECONOMIC ASSESSMENT OF TRANSPORT INFRASTRUCTURE AND POLICIES

http://www.heatwalkingcycling.org/

HEAT example

In Toronto, walking prevented 60 deaths per year and cycling 49 deaths per year (2006 levels), representing $130 to $478 million in health benefits

Achieving walking and cycling mode shares of 12% and 6%, respectively, would prevent about 100 additional deaths each year



HEAT inputs

- How many people are walking/cycling *- Trip Diary, municipal counts*
- Average duration of walking/cycling per person (distance, duration, or trips)
  - Trip Diary
- Crude mortality rate – *default value, Statistics Canada/health authorities*
- Value of a statistical life - *default value*
- Time period over which health benefits calculated
- Discount rate

cycling and health: conclusions

“in spite of the hostile environment in which most cyclists currently ride, the benefits in terms of health promotion & longevity far outweigh the loss of life years in injury on the roads”

[source: British Medical Association. *Cycling: Towards Health and Safety*,1992]

action

cycling is healthy, but we need to mitigate risks.
evidence exists on how to make it safer, e.g.,

- safety in numbers
- building safe infrastructure (BICE study)
- reducing speeds

there are examples of good data collection practices in transportation and in health in Metro Vancouver

- let’s move this forward

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Cycling in Cities: cyclingincities.spph.ubc.ca
Healthy Canada by Design: hcbd-clasp.com