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Safe cycling:
How do risk perceptions compare with actual risk?

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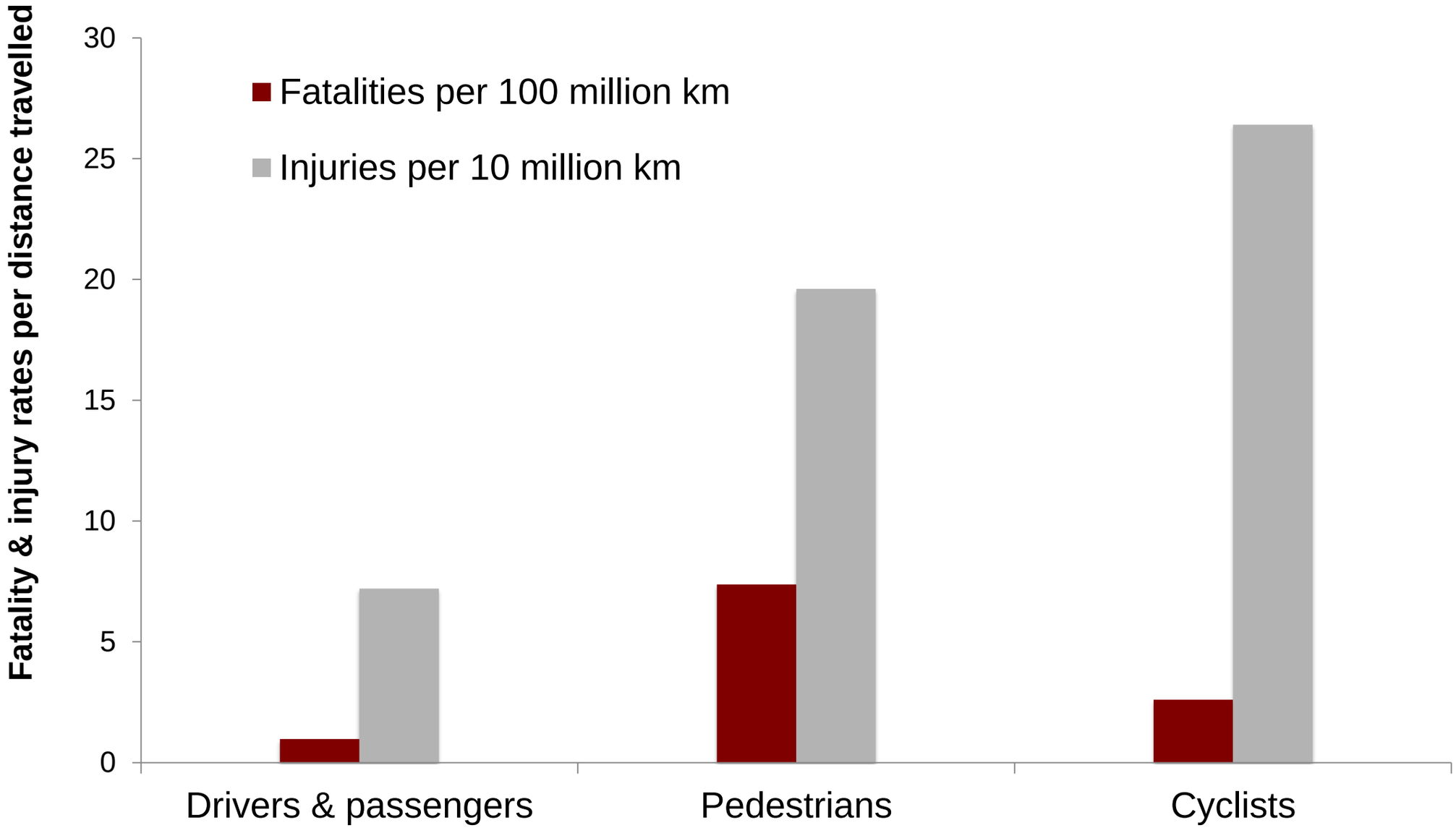
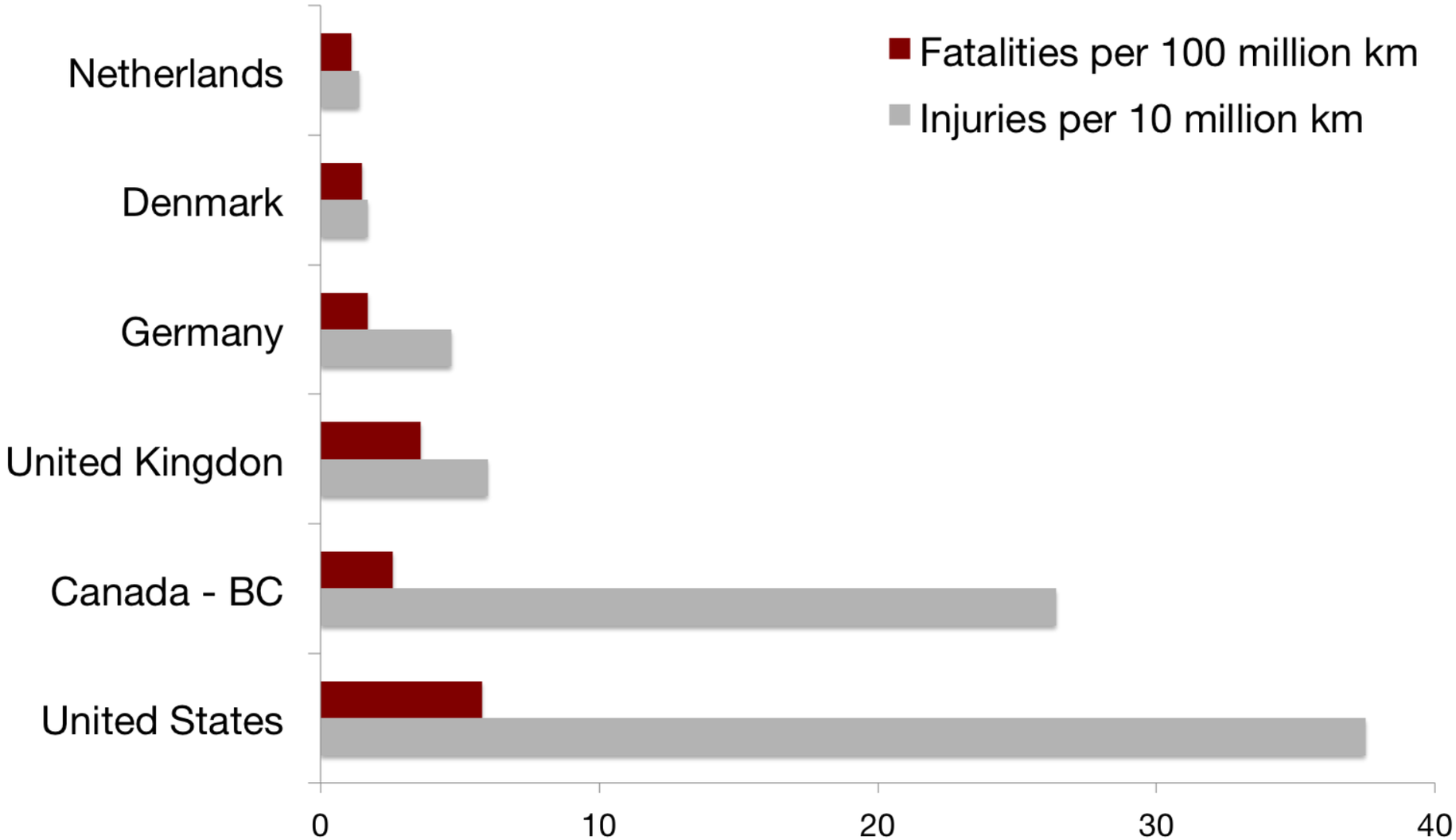
fatality & injury rates – per distance travelled



[data sources: BC Motor Vehicle Branch, 2005 to 2007, TransLink's 2008 Trip Diary Survey, Census 2006]

differences in cycling injury rates - Europe & NA



[data sources: International - Pucher & Buehler *Transport Reviews* 2008;28:495-528
BC - Motor Vehicle Branch, 2005 to 2007, TransLink's 2008 Trip Diary Survey, Census 2006]

safety is a deterrent (Winters et al, 2010)

- Metro Vancouver, 1,400 current and potential cyclists

"How does the following factor influence your decision to cycle?" (73 factors)

Top 10 deterrents

- route is icy or snowy
- street has a lot of car, bus, & truck traffic
- vehicles drive faster than 50 km/hr
- route has glass or debris
- risk from motorists who don't know how to drive safely near bikes
- risk of injury from car-bike collisions
- raining
- route has surfaces that can be slick when wet or icy when cold
- route is not well lit after dark
- need to carry bulky or heavy items

risk perceptions of different modes (Noland et al, 1995)

- Philidelphia, n=506 responses from general population + bicycle clubs, commute mode: 14% by bicycle, 65% by car, 7% walk, 14% by transit.
- “rate how likely YOU think it is for you to be in an accident, during the next five years, if you used [mode] for commuting to or from work or school”

Bicycle	4.16	~50% chance of having an accident
Auto	2.92	~ somewhat unlikely
Walking	2.85	
Transit	2.34	~ very unlikely to have an accident

- even the cyclists rated cycling as the highest risk

why focus on perceptions?

- decisions to cycle may be guided more by perceptions than injury data
- risk perceptions are influenced by:
  - the probability of an adverse event (e.g., the risk of a crash)
  - and the magnitude of the consequences (e.g., the severity of the injury)
- perceived reductions in risk may have greater than proportional effects on encouraging or discouraging cycling
- discordance between what is safe based on empirical evidence versus public perception, suggests that even if protective infrastructure is built people may choose not to cycle
- **goal: to compare the perceived and observed injury risk of route types**

Bicyclists’ Injuries & the Cycling Environment

participating cities

Toronto

- 2.5 million people, 1% of trips by bike
- snow in winter, heat in summer
- 3 participating hospitals

Vancouver

- 0.6 million people, 4% of trips by bike
- rain in winter, temperate summer
- 2 participating hospitals

study overview

Cyclist to emergency department

Interview

Site observations

Data analysis

interview to map route & choose control sites

Sequential Number: _____

Hospital: 1. St. Michael's
2. TGH
3. St. Paul's
4. VGH

Date Attended ED: ____ / ____ / _____
DD MM YYYY

Came by ambulance: 0. No
1. Yes

Admitted to Hospital: 0. No
1. Yes

CTAS: _____

INTERVIEW FORM

Thanks so much, *[name of participant]*, for agreeing to take part in this study. The interview should take about 45 minutes.

I'll ask you about the route you cycled when you were injured, including the injury site, and two other sites, randomly selected along the route.

Did you receive a copy of the consent form with our letter of introduction to the study?

*[If **no**, give a copy.]*

*[If **yes**:]* Do you have it with you?

*[If **no**, give a copy.]*

Do you have any questions about it?

If you haven't already done so, could you please read it and sign 2 of them? I'll keep one, and you keep one.

[Proceed when the consent form has been signed.]

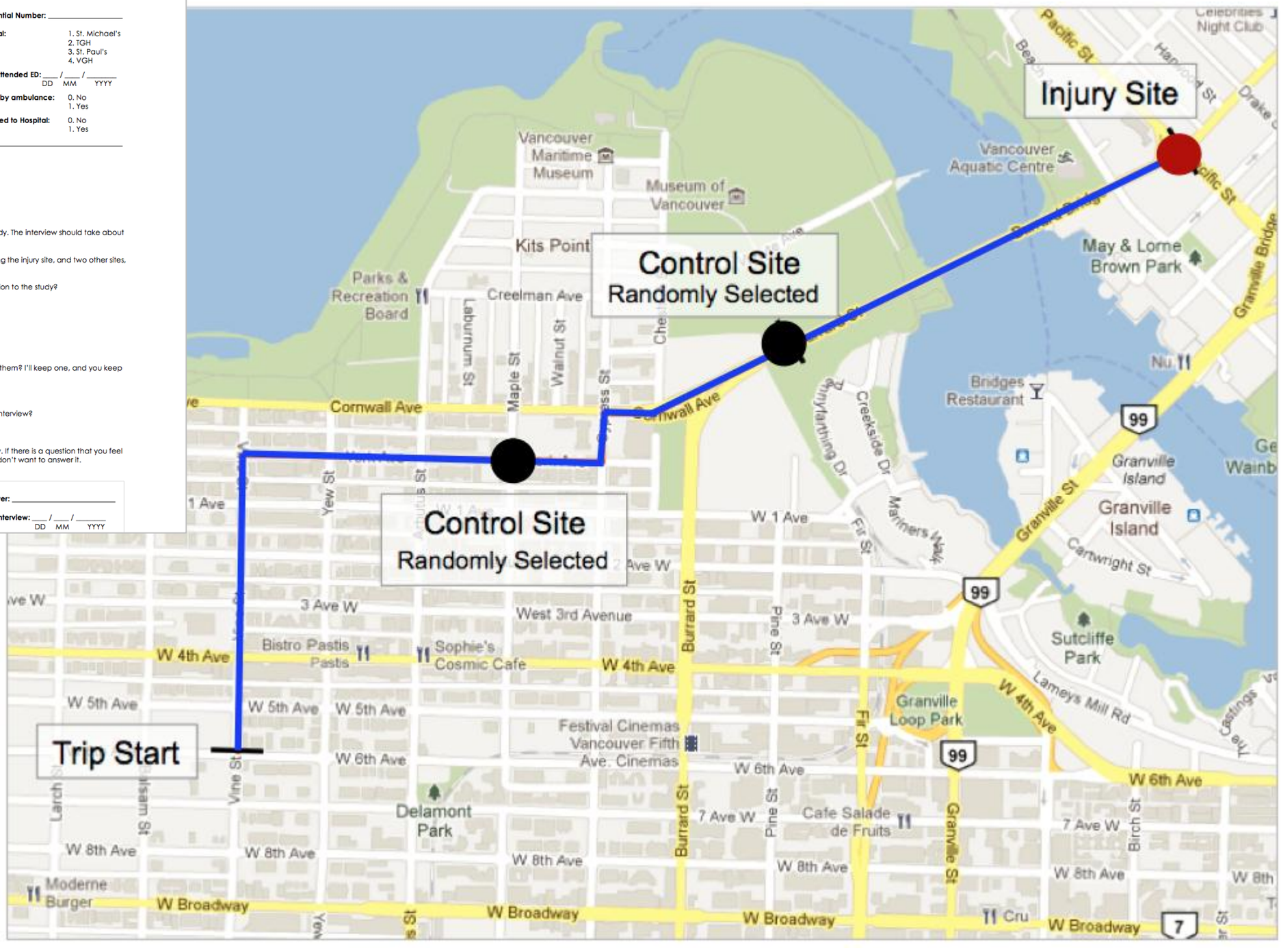
Are there any questions you'd like me to answer before we begin the interview?

[Give time to answer.]

Feel free to stop me and ask questions at any time during the interview. If there is a question that you feel uncomfortable answering, you are welcome to let me know that you don't want to answer it.

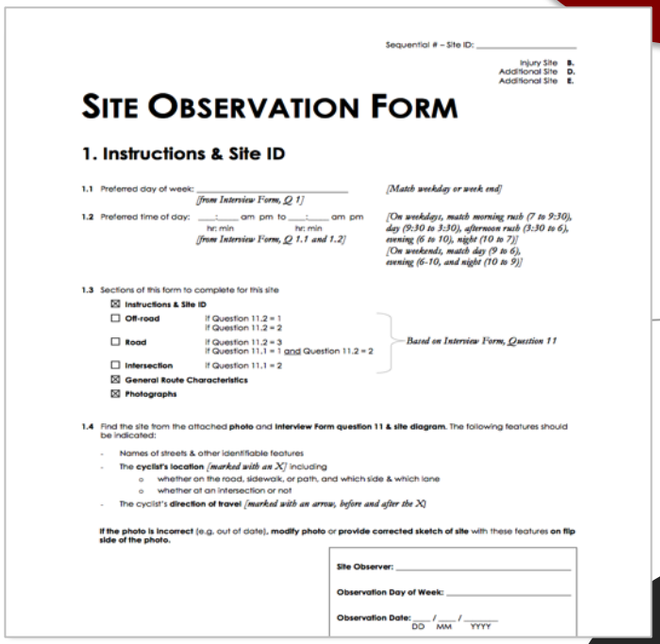
Interviewer: _____

Date of interview: ____ / ____ / _____
DD MM YYYY



observed relative risk

injury site



Sequential # – Site ID: _____

Injury Site **B.**
Additional Site **D.**
Additional Site **E.**

SITE OBSERVATION FORM

1. Instructions & Site ID

1.1 Preferred day of week: _____ *[Match weekday or week end]*
[from Interview Form, Q 1]

1.2 Preferred time of day: ___:___ am pm to ___:___ am pm *[On weekdays, match morning rush (7 to 9:30), day (9:30 to 3:30), afternoon rush (3:30 to 6), evening (6 to 10), night (10 to 7)]*
hr: min hr: min *[On weekends, match day (9 to 6), evening (6-10, and night (10 to 9)]*
[from Interview Form, Q 1.1 and 1.2]

1.3 Sections of this form to complete for this site

- ☒ **Instructions & Site ID**
- ☐ **Off-road** — If Question 11.2 = 1 / If Question 11.2 = 2
- ☐ **Road** — If Question 11.2 = 3 / If Question 11.1 = 1 and Question 11.2 = 2
- ☐ **Intersection** — If Question 11.1 = 2

Based on Interview Form, Question 11

- ☒ **General Route Characteristics**
- ☒ **Photographs**

1.4 Find the site from the attached **photo** and **Interview Form question 11 & site diagram**. The following features should be indicated:

- Names of streets & other identifiable features
- The **cyclist's location** *[marked with an X]* including
  - whether on the road, sidewalk, or path, and which side & which lane
  - whether at an intersection or not
- The cyclist's **direction of travel** *[marked with an arrow, before and after the X]*

If the photo is incorrect (e.g. out of date), **modify photo** or **provide corrected sketch of site** with these features **on flip side of the photo.**

Site Observer: _____

Observation Day of Week: _____

Observation Date: ___ / ___ / _____ (DD / MM / YYYY)

control site 1

control site 2

perceptions of risk

injury site

"how safe do you think this site was for cyclists on that trip?"

- very safe (1)
-somewhat safe (0.5)
-neither safe nor dangerous (0)
-somewhat dangerous (-0.5)
-very dangerous (-1)

control site 1

control site 2

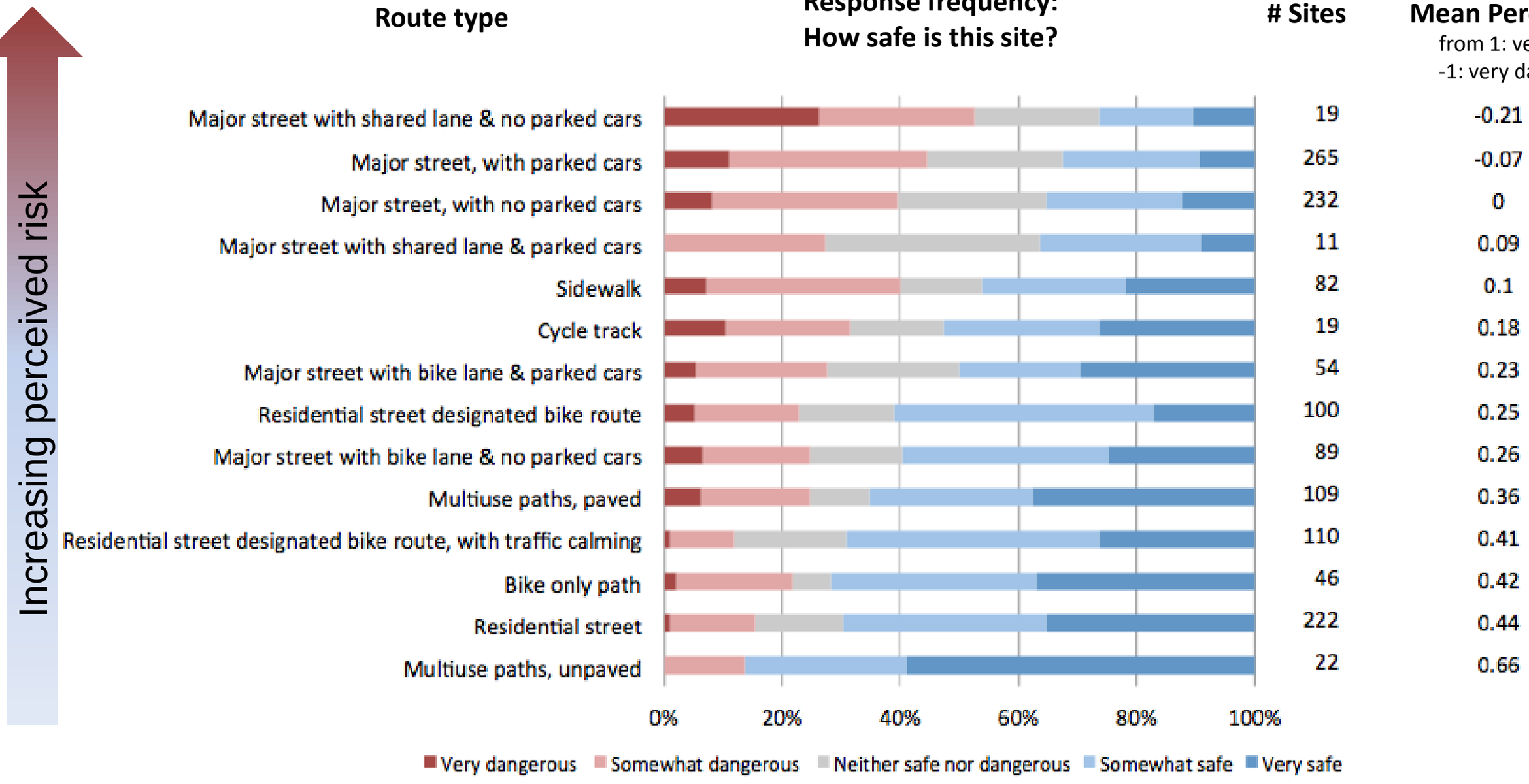
n=1380
control sites

study results

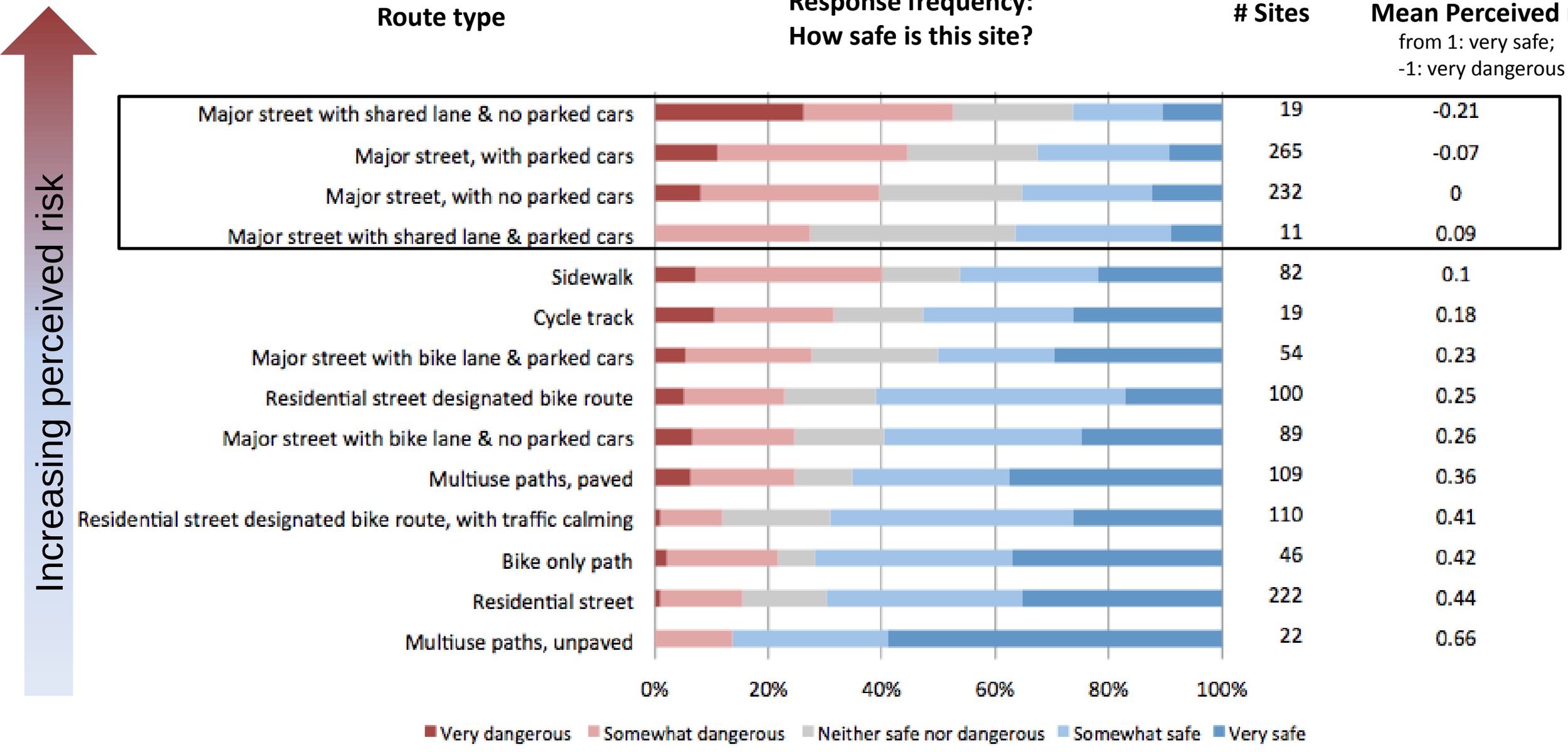
participants & trips

• Toronto	273	} 690
• Vancouver	417	
• male	59%	
• 19 to 39 years old	62%	
• income > $50,000	56%	
• cycle > 52 times/year	88%	
• trip < 5 km	68%	
• weekday, daylight	77%	

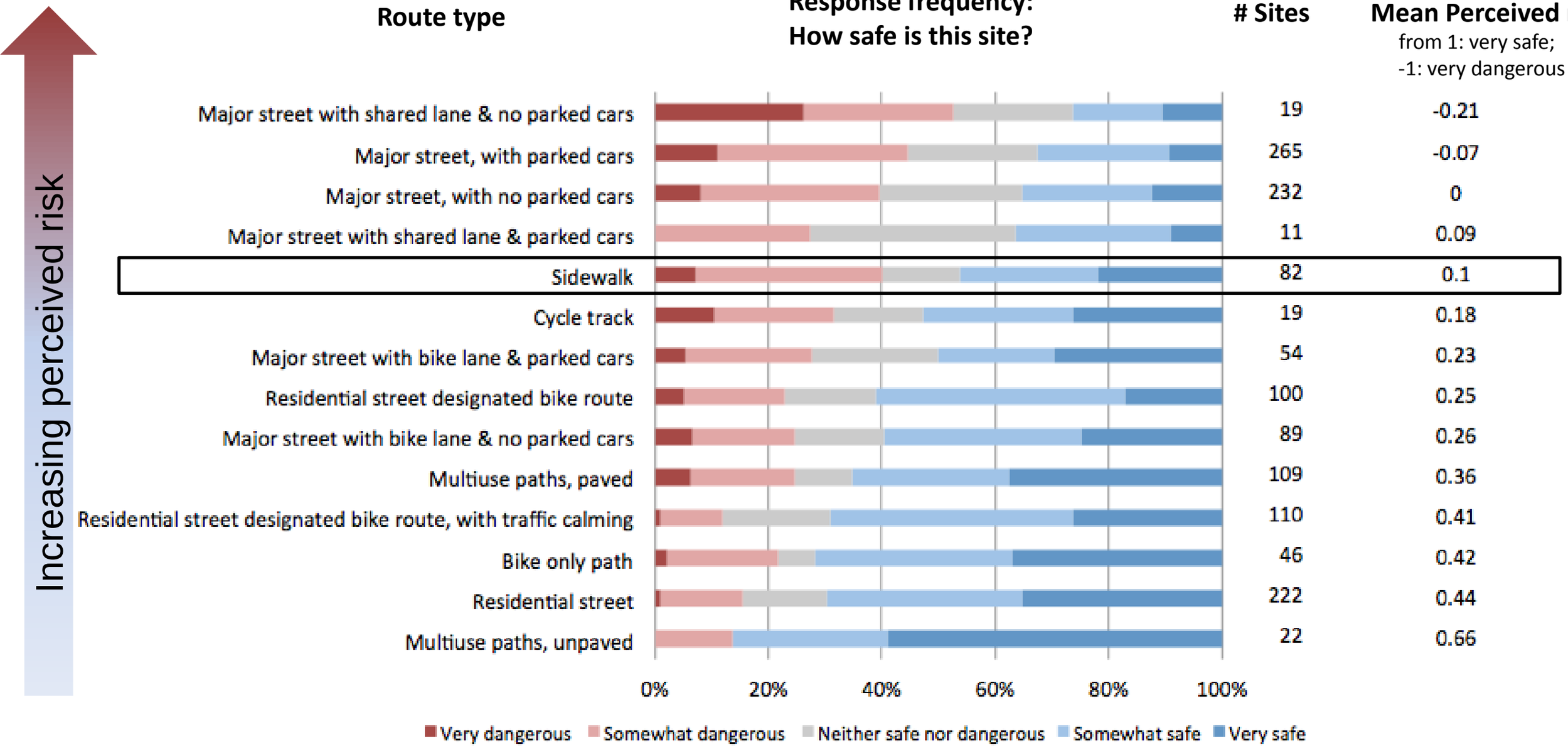
perceived risk



perceived risk



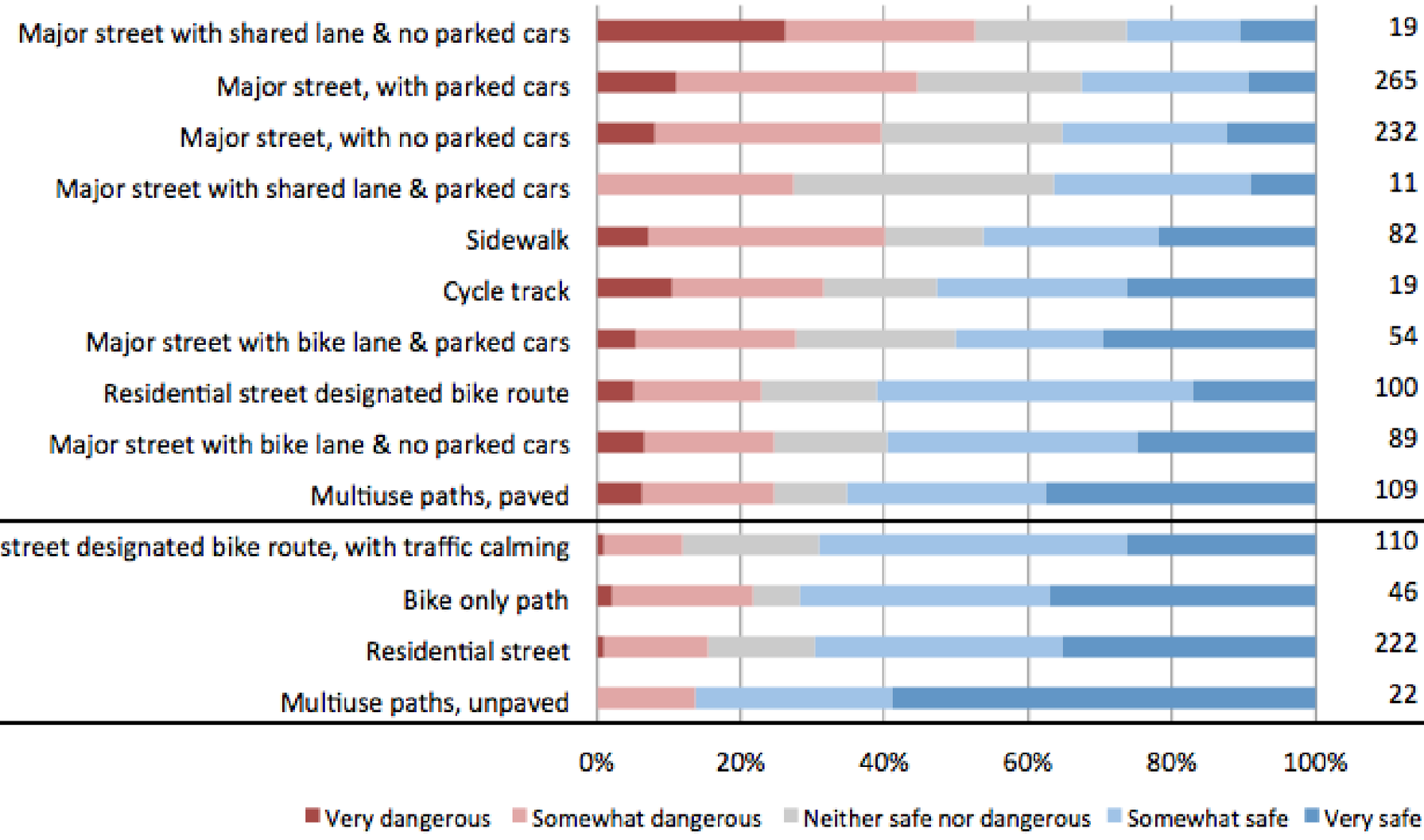
perceived risk



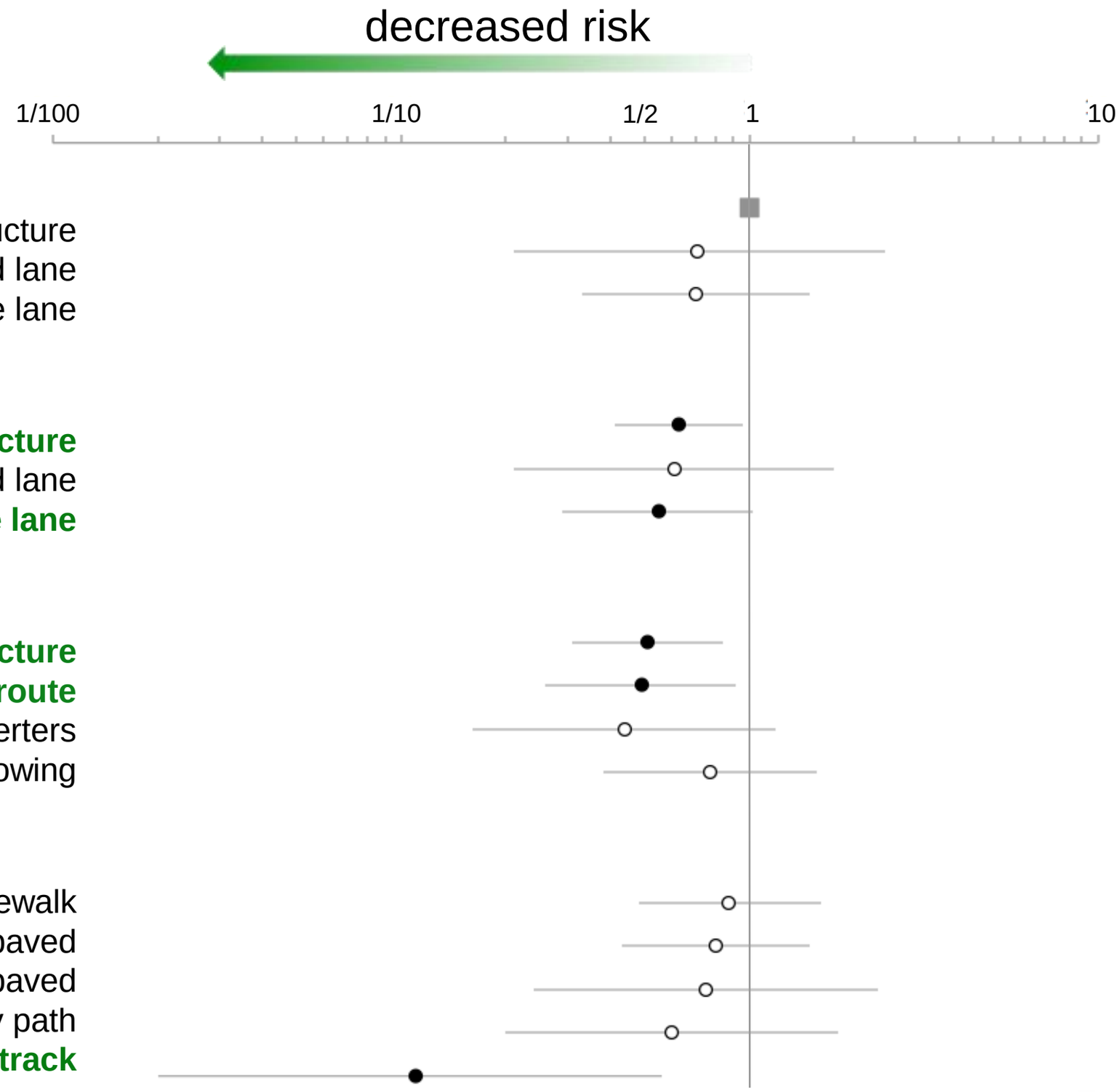
perceived risk

Increasing perceived risk

Route type	Response frequency: How safe is this site?	# Sites	Mean Perceived risk (from 1: very safe; -1: very dangerous)
Major street with shared lane & no parked cars		19	-0.21
Major street, with parked cars		265	-0.07
Major street, with no parked cars		232	0
Major street with shared lane & parked cars		11	0.09
Sidewalk		82	0.1
Cycle track		19	0.18
Major street with bike lane & parked cars		54	0.23
Residential street designated bike route		100	0.25
Major street with bike lane & no parked cars		89	0.26
Multiuse paths, paved		109	0.36
Residential street designated bike route, with traffic calming		110	0.41
Bike only path		46	0.42
Residential street		222	0.44
Multiuse paths, unpaved		22	0.66

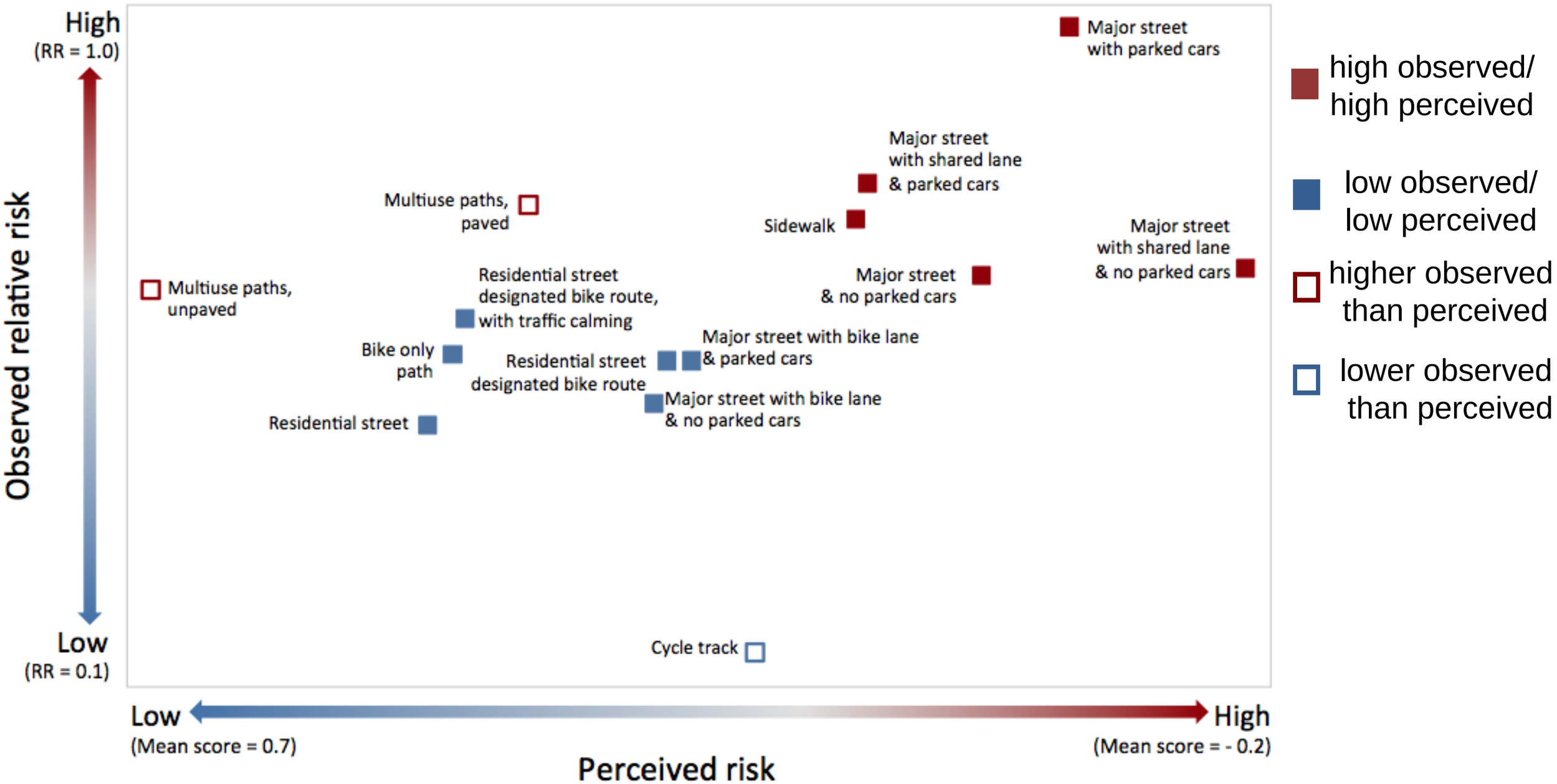


observed risk (relative risks) by route type



are safe routes *perceived* as safe?

observed risk vs. perceived risk



discrepancies
perceived risk higher than observed risk

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cycle tracks
along major streets

people **overestimate** the risk….

observed risk (OR = 0.12) – nearly 1/10th the risk of major streets with no cycling infrastructure

perceived risk – moderate (0.18) – “neither safe nor dangerous”

unfamiliarity?
cycle tracks are relatively rare in North America

discrepancies
perceived risk lower than observed risk

unpaved or paved
multi-use paths

people **underestimate** the risk….

observed risk-unpaved OR = 0.63
-paved OR = 0.75
(compared to major streets with no cycling infrastructure)

perceived risk
-unpaved - the safest type (0.66)
-paved “somewhat safe” (0.36)

safety considerations focused on motor vehicles?
- *not taking into account crashes with pedestrians, other cyclists, animals, or from slippery surfaces or infrastructure?*

limitations

severity of injury

- perceived “risk of any injury” versus “risk of severe injury”
- all injured had attended emergency department within 24 hours
- evidence elsewhere that the most severe injures and fatalities result from crashes with motor vehicles

safety of “the site”

- responses interpreted as related to route infrastructure
- cannot know if the response reflected other factors (e.g., traffic speed, volume, weather)
- does not address safety related to personal crime, bicycle theft, or health risk from air pollution exposure

conclusions

generally good alignment between perceptions and observed safety

- separated routes > residential routes > major streets

misconceptions around some separated routes

- perceived risk for cycle tracks overestimated observed risk
- perceived risk for multiuse paths underestimated observed risk

education and media may be useful tools to align public opinion with evidence on observed risk

thanks to everyone

Photos by BICE Study, Cycling Embassy of Denmark, Martin De, Calvin Ge, Imelda Wong, Glenys Webster, Dave Bryson (The Tyee)

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