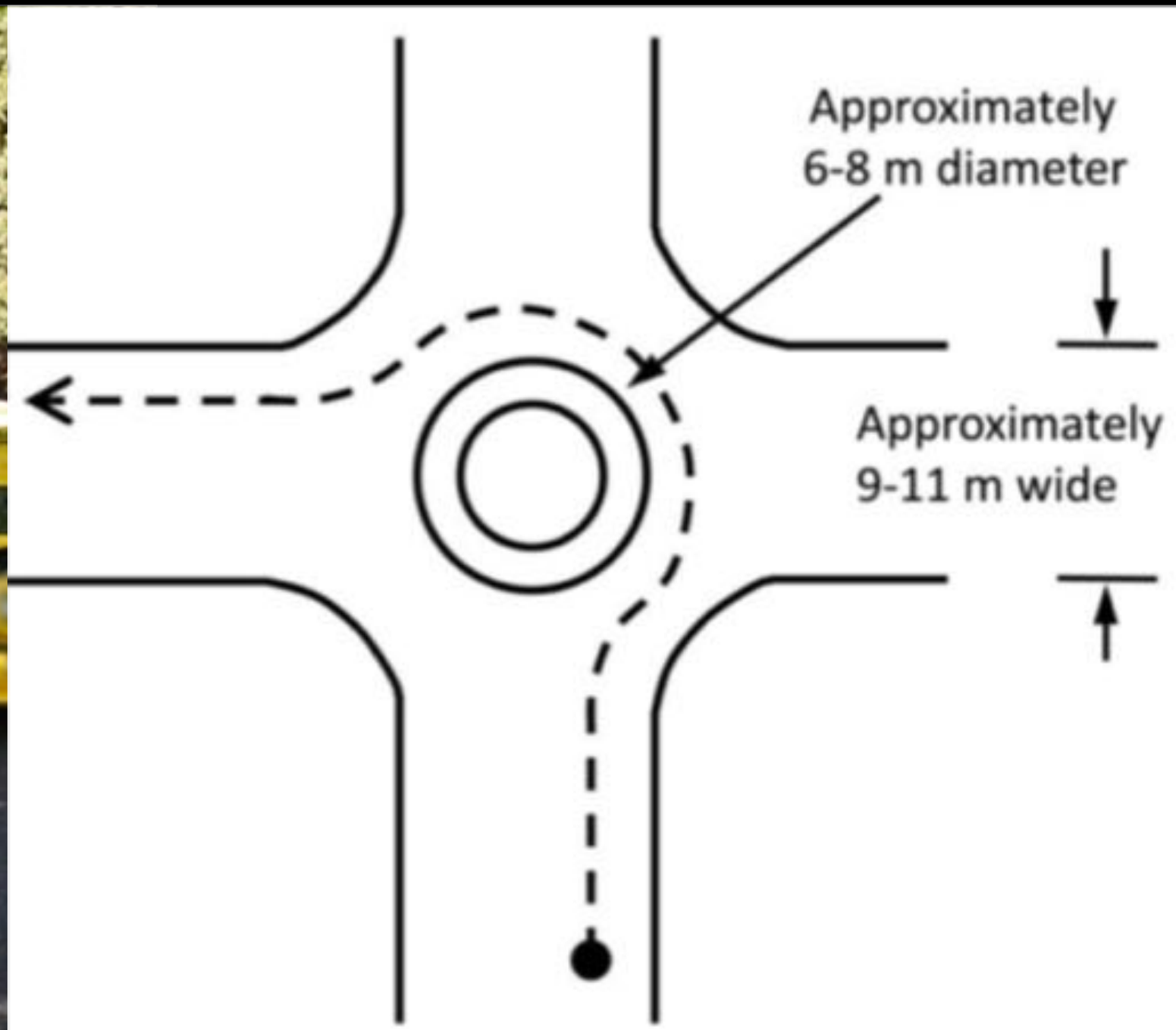
Traffic Circles – Impact on motor vehicle, cyclist, & pedestrian crashes with injuries

Kay Teschke[1], Hui Shen[1], Anna Chinn[1], Liliana Quintero[2], Felita Ong[2], James Wei[2]
[1] Cycling in Cities Research Program, University of British Columbia
[2] City of Vancouver

~ 200 Traffic Circles in Vancouver



→ at local street intersections

→ no yield signs, but signage indicating “drive to the right of the island”

→ typically some vegetation, of varying heights

What motivated this study?

In our case-crossover study of cycling injuries,

Traffic circles → 8-fold higher injury risk

compared to local street intersections with 2-way or 4-way stops

Photo: Ken Ohrn

½ of injuries = MV-bike

arrive at same time, confusion about who has right of way, both proceed at same time

Small intersection size → collision

½ of injuries = single cyclist crash

when can't make turn around circle →

- slide out, or
- hit curb

Photos: Google Streetview, Jonathan Hayward, Canadian Press

New study to consider not only injuries to bicyclists, but also to pedestrians & vehicle occupants

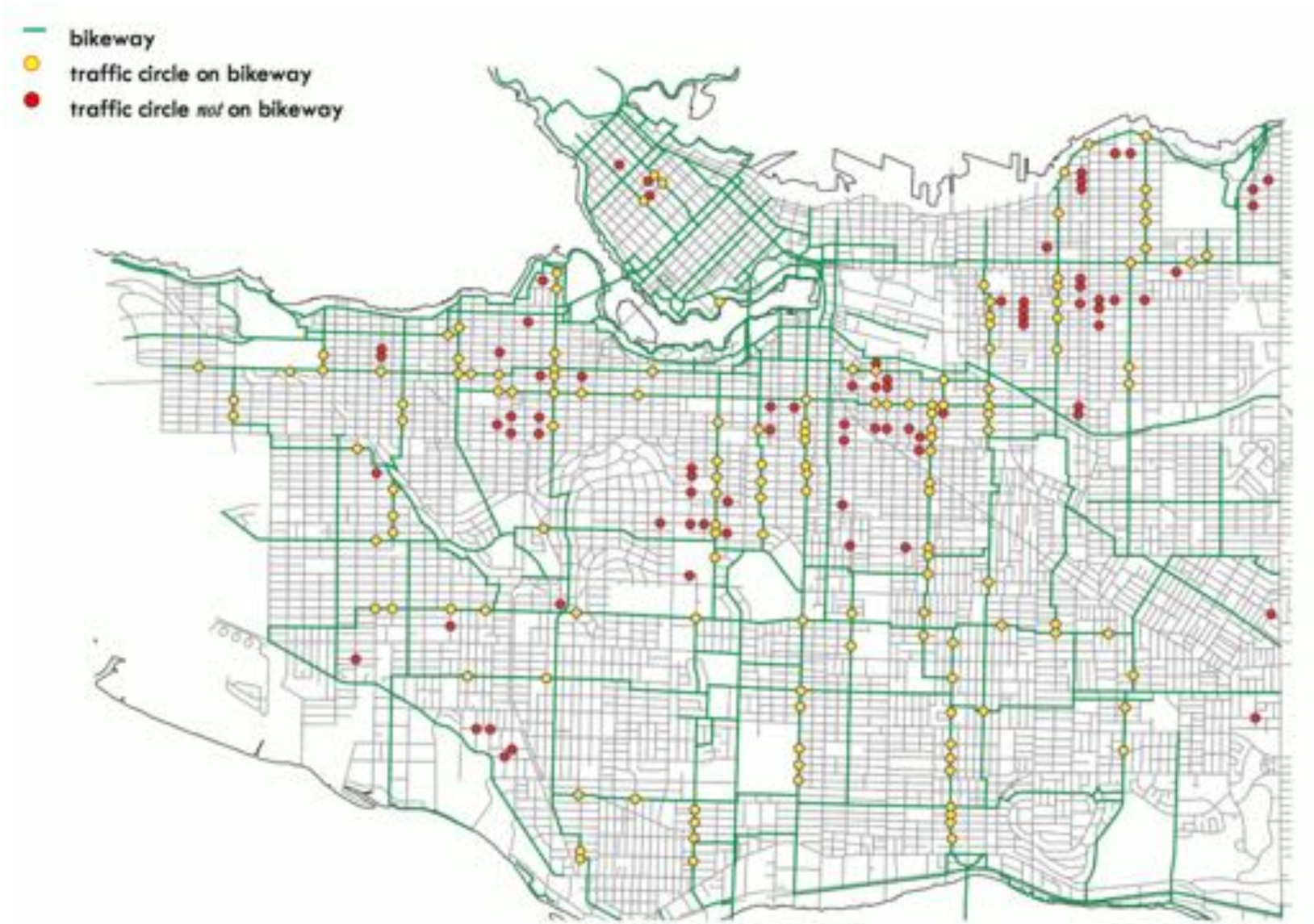
Data source, Injury numbers

Insurance Corporation of BC data from 1996 to 2013
~ 40,600 crashes on ~3,000 local street intersections, of which 187 have traffic circles

- 6,850 injuries in **MV only** crashes
- 1,070 injuries in **bike-MV** crashes
- 516 injuries in **pedestrian-MV** crashes

To study, three comparisons with different temporal & spatial matching ...

1. Local street intersections **with vs. without traffic circle**



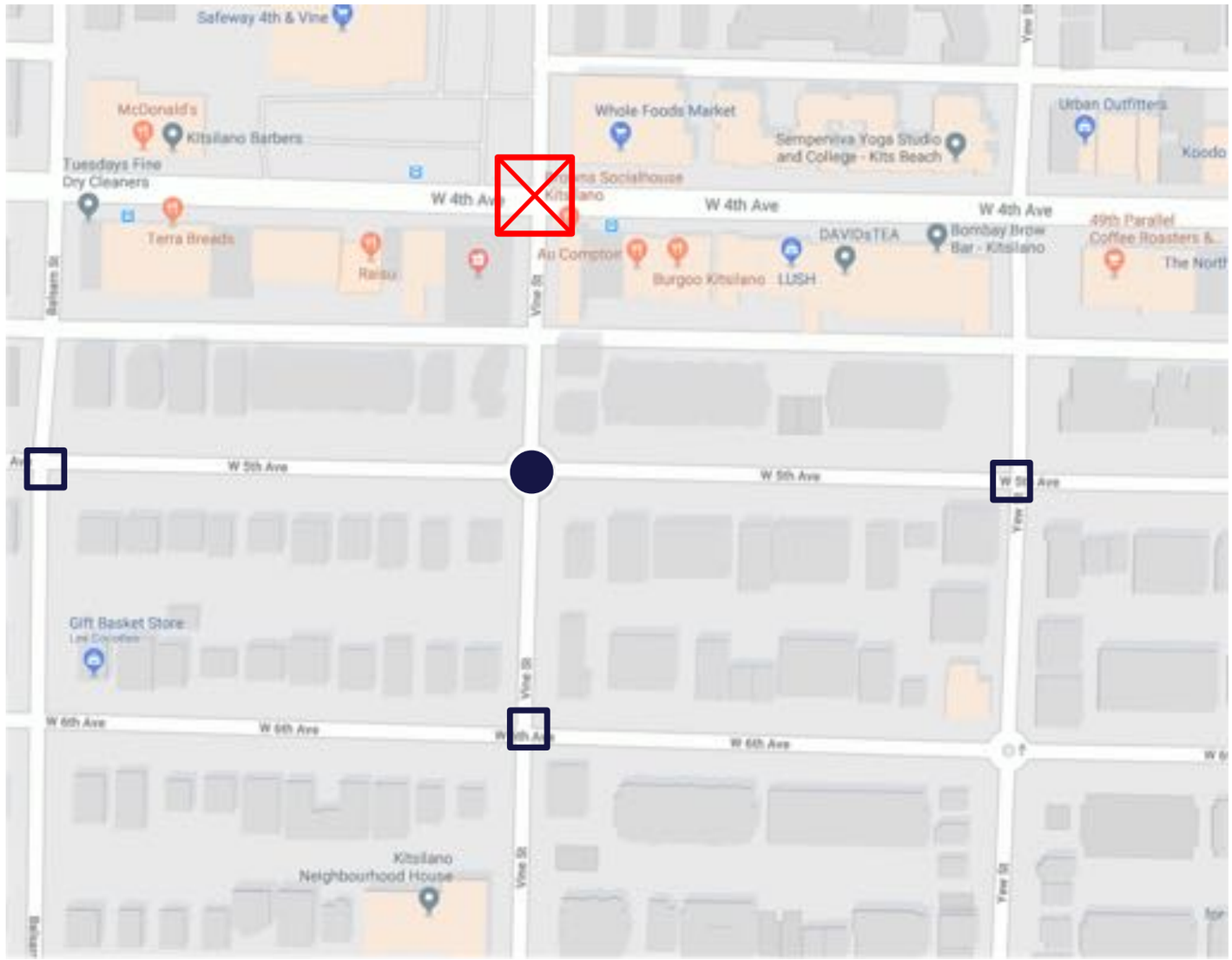
Advantages

- largest sample size (2,554 vs. 50,649 intersection-years)
- good temporal matching

Disadvantages

- least spatial matching, traffic circles not randomly distributed, differ in grade, bikeway presence, may differ in traffic volumes

2. **Traffic-circle vs. matched intersections** (within 1 block)



Advantages

- perfect temporal matching & very close spatial matching → grades the same, likely similar traffic volumes
- good sample size (2,302 vs. 5,293 intersection-years)

Disadvantages

- spatial matching not perfect, some differences in bikeway presence

3. After vs. before traffic circle installed

Advantages

- perfect spatial matching, so grades the same & bikeway status same or similar

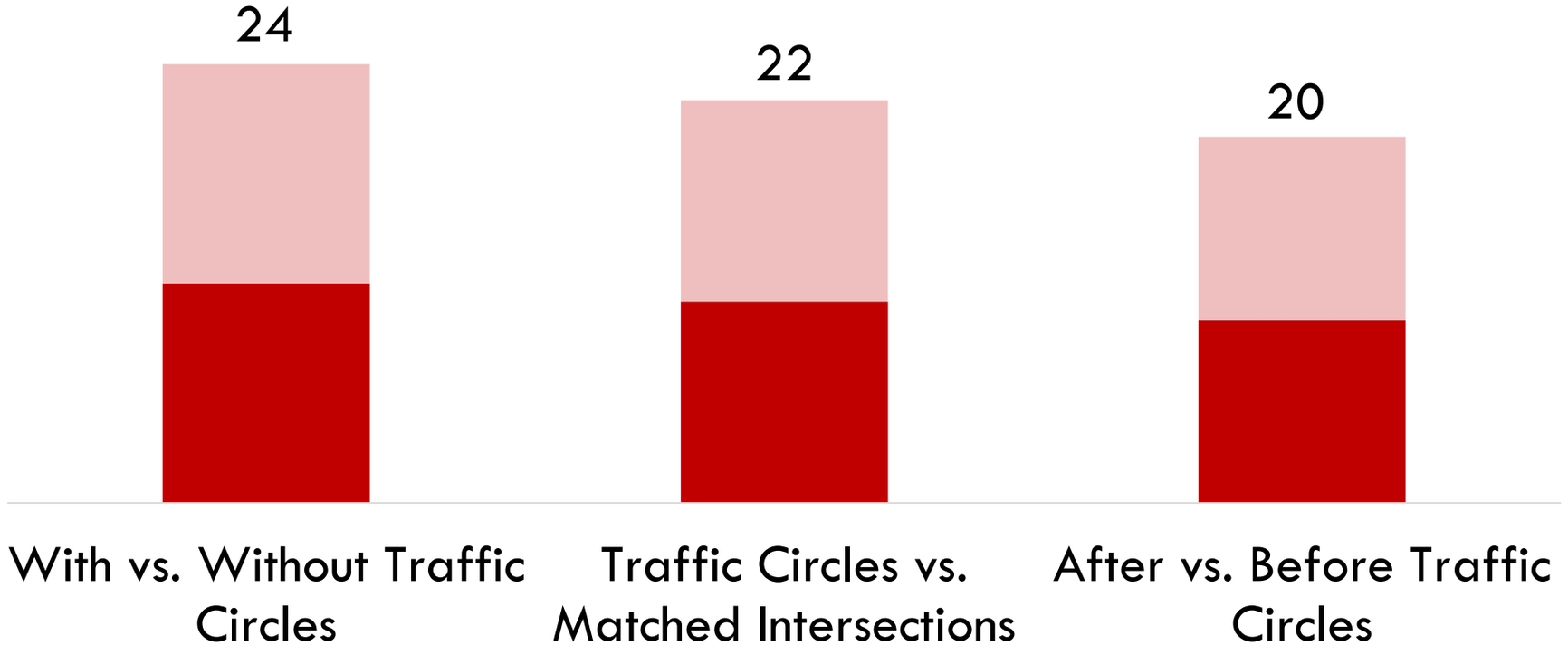
Disadvantages

- no temporal matching, so likely differ in traffic volumes & other factors
- smallest sample size (1,306 vs. 517 intersections-years)

Relative risks used to calculate estimated increase or decrease in injuries associated with traffic circles

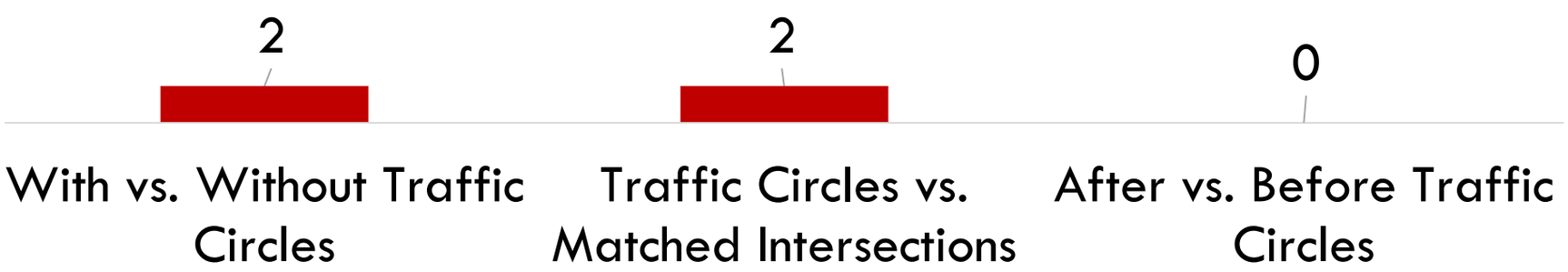
Bicyclist Injuries
results consistent across methods & with previous study results

Estimated annual increase in bicyclist injuries
associated with traffic circles

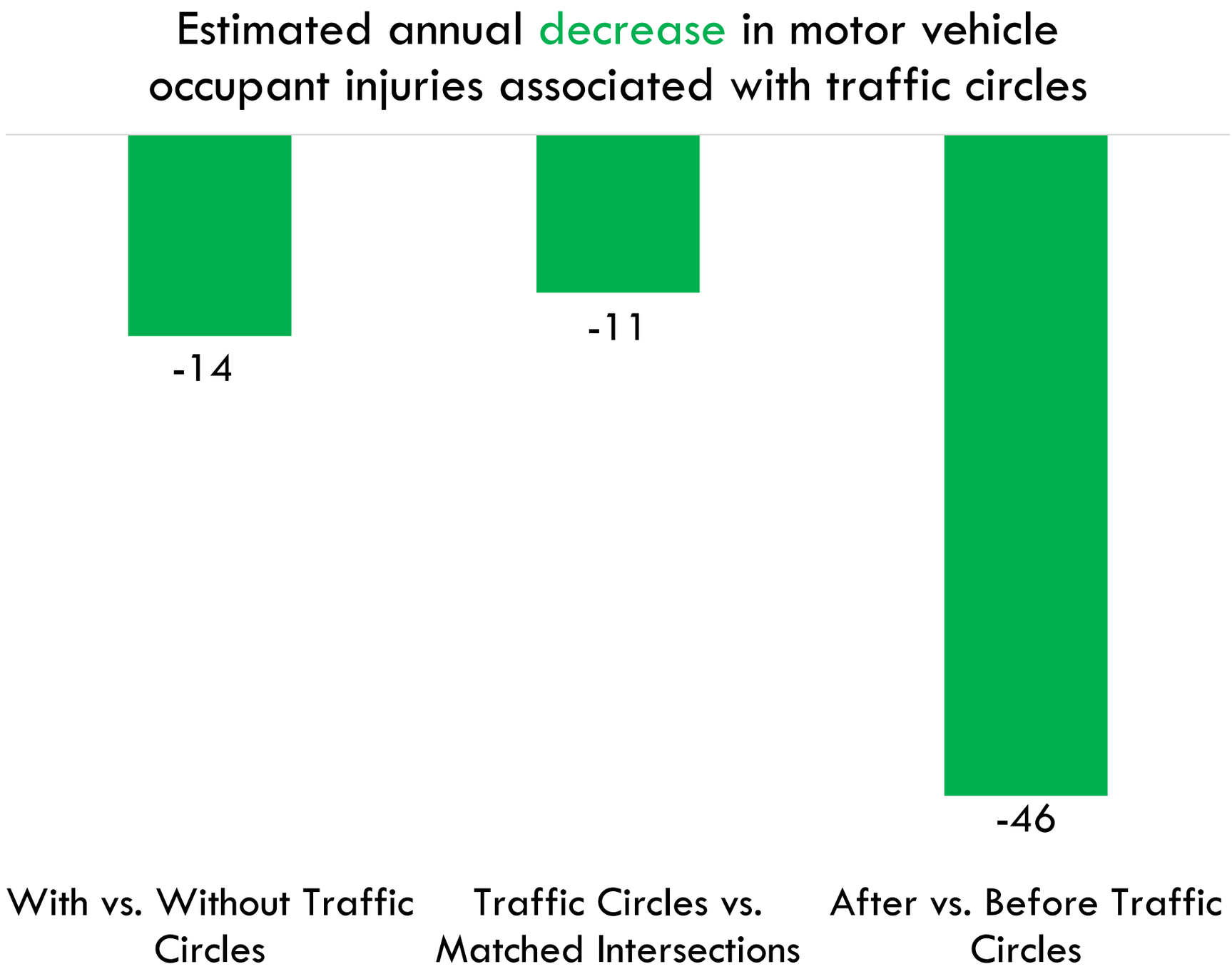


Pedestrian Injuries
results consistent across methods

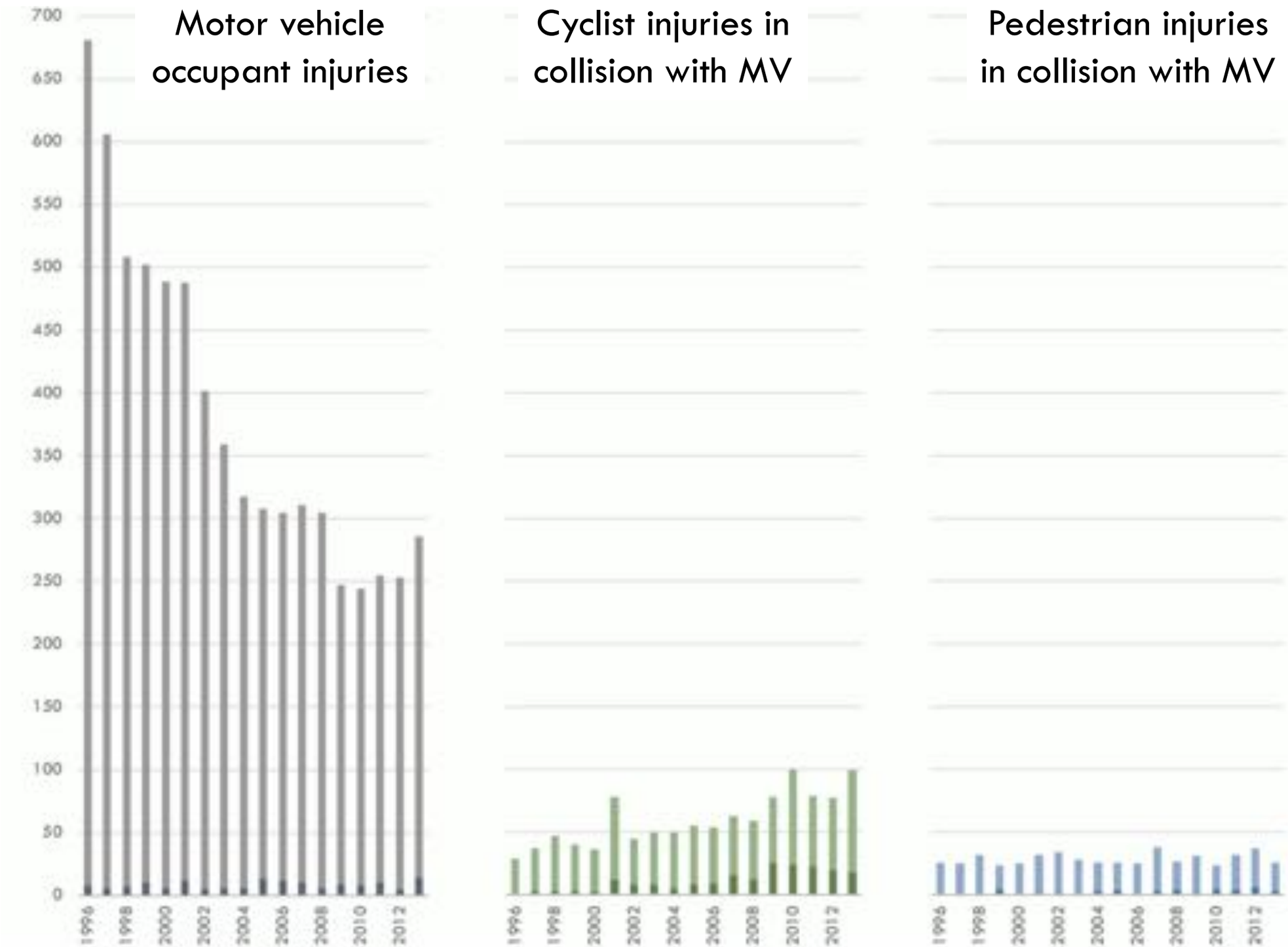
Estimated annual increase in pedestrian injuries
associated with traffic circles



MV Occupant Injuries
results direction consistent, but before vs. after differs in size



Why is "after vs. before" analysis so different for MVs?



Injuries at local street intersections over time … traffic circle crashes in darker shade

Background decline in MV injuries attributed to traffic circles

Conclusions

1. negative impact of traffic circles on cyclists similar to or greater than benefits to MV occupants
2. don't add traffic circles to bike routes → consider removal

Evidence-based alternatives to traffic circles

Photos: City of Vancouver, Google Streetview

Traffic diversion at arterials

Lowest risk of all residential street types

Photos: Google Streetview, Alternative Dept for Transport

Raised crossings

1/2 crash risk, makes right-of-way clear

Cycling in Cities Research Program
@kteschke

Photo Flickr: Boegh

Thank you … questions, comments?