Predictors of bicycling injury in a mid-sized North American city: an assessment using crowdsourced data

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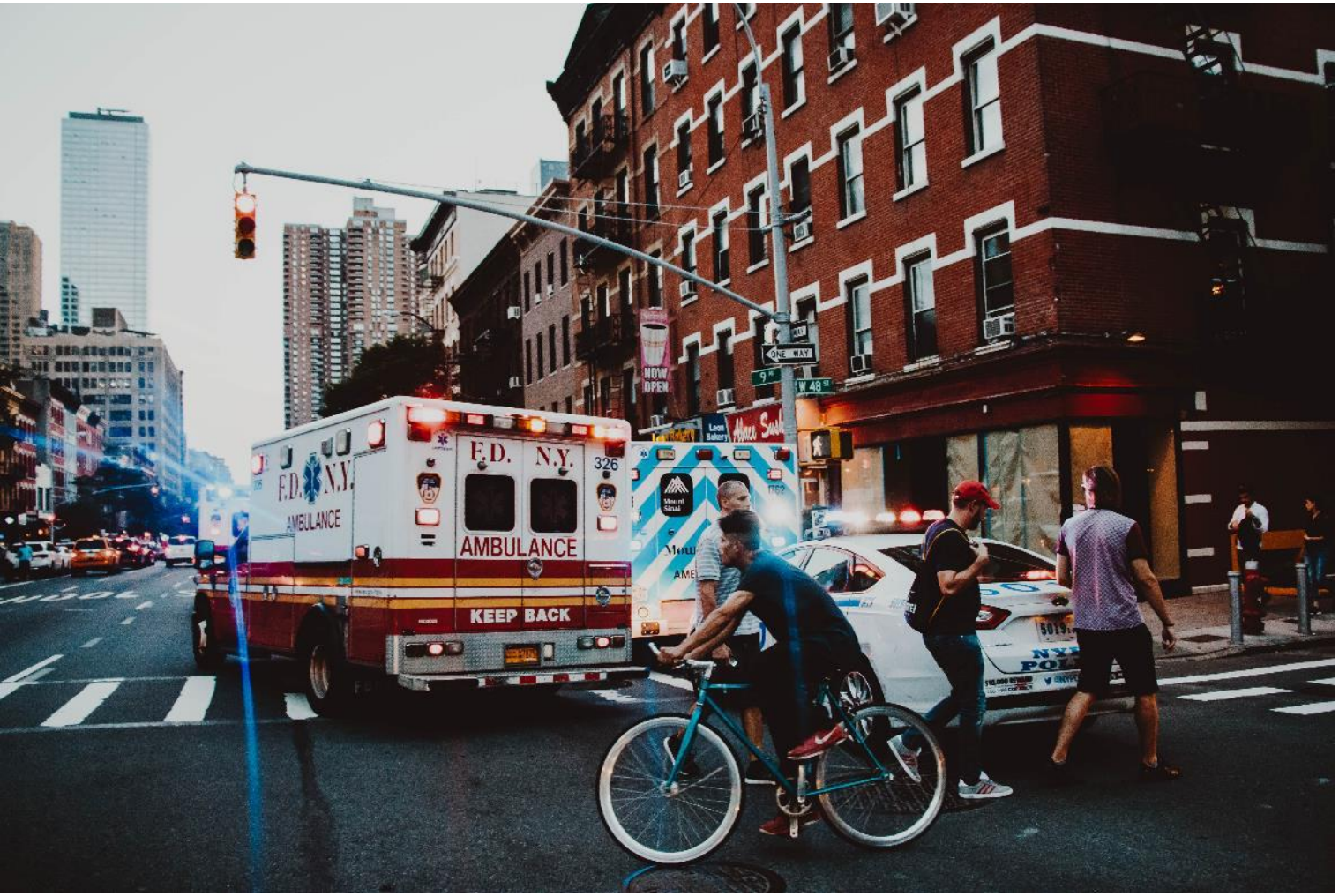
BikeMaps.org

Overview

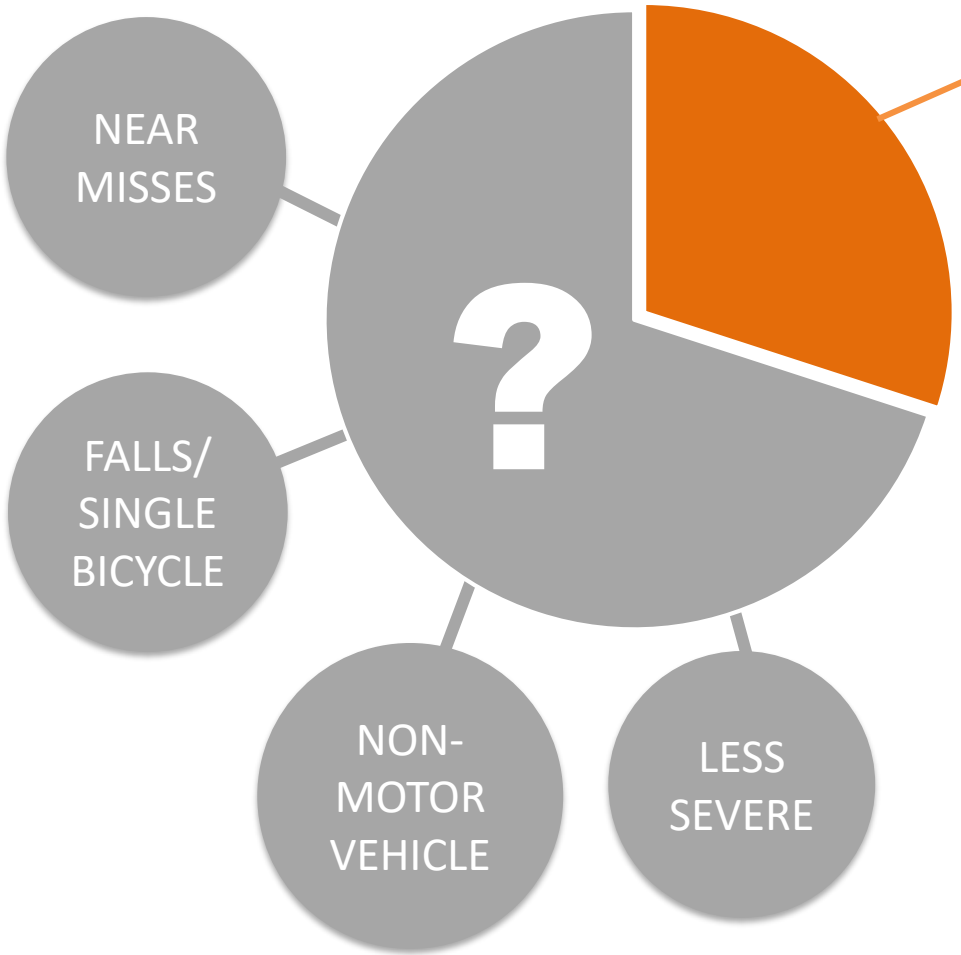
- Gaps in bicycling safety data
- Response: BikeMaps.org
- Predicting injury using crowdsourced data

Bicycling safety data



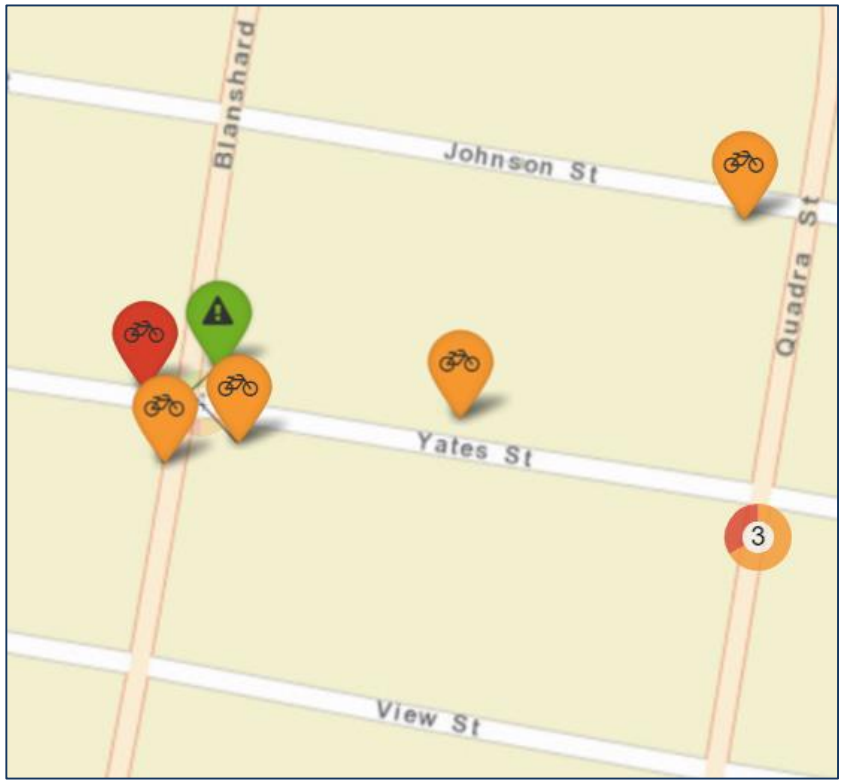
- Police
- Insurance
- Hospital admin

Bicycling safety data are incomplete

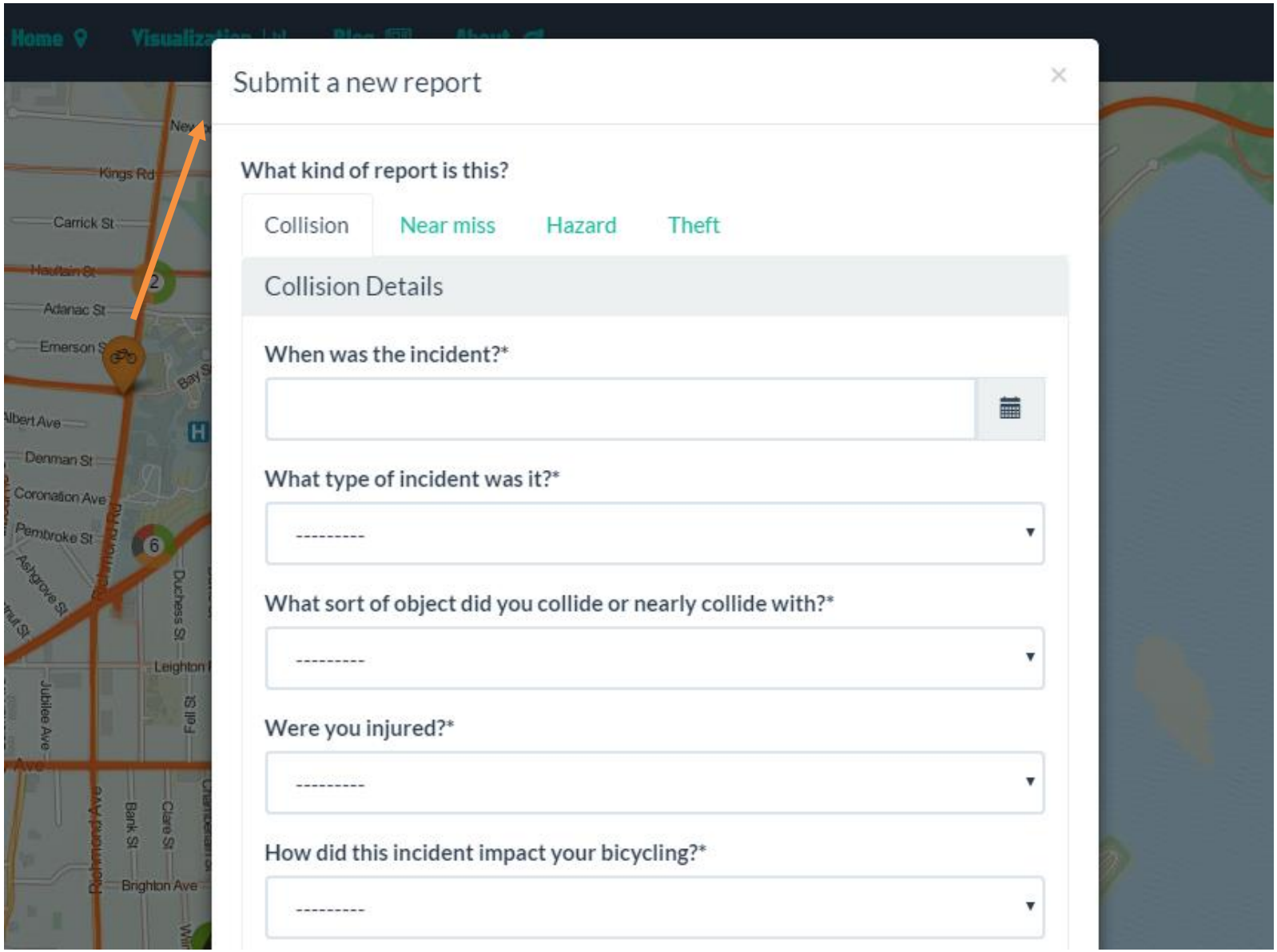


Less than 30% of all bicycling crashes are captured in official data sets

BikeMaps.org

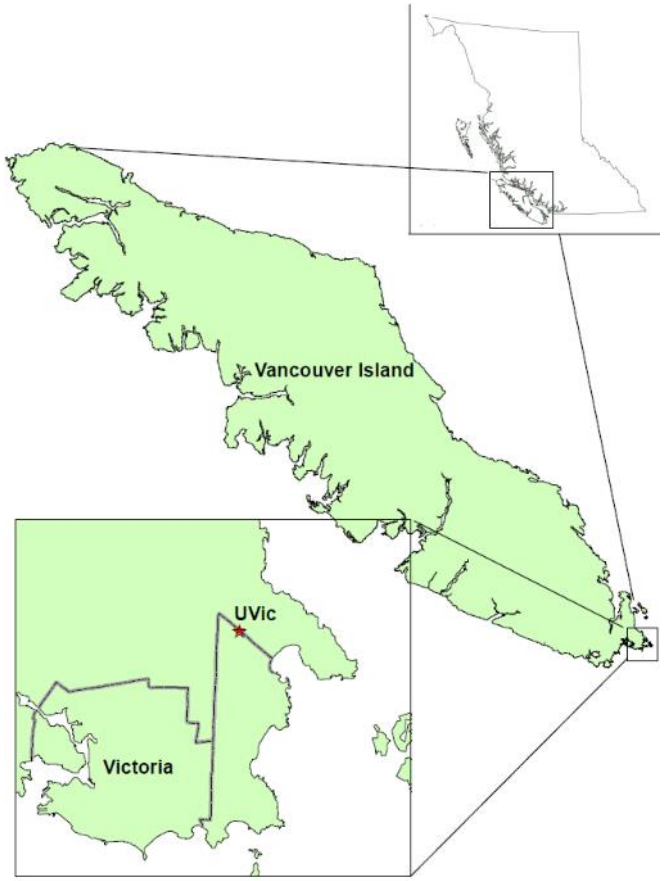


BikeMaps.org



Analysis

Detect patterns of injury in BikeMaps.org reports for the City of Victoria

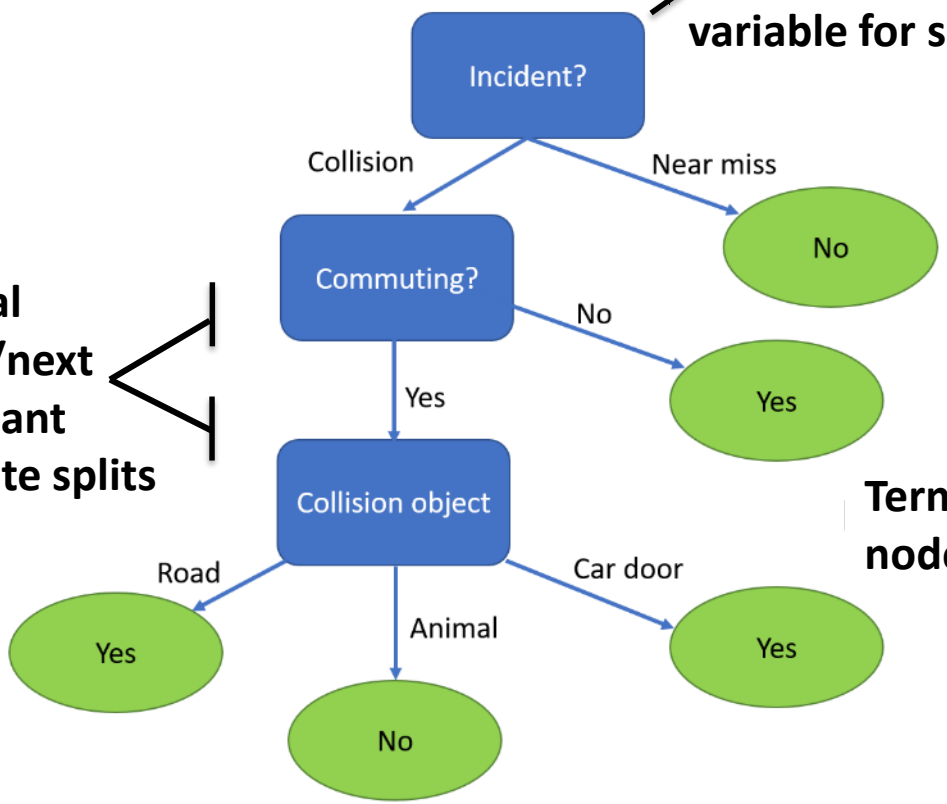


- What variables are important in predicting cycling injury?
- What are some data gaps that BikeMaps.org might help address?

Methods: Random Forest

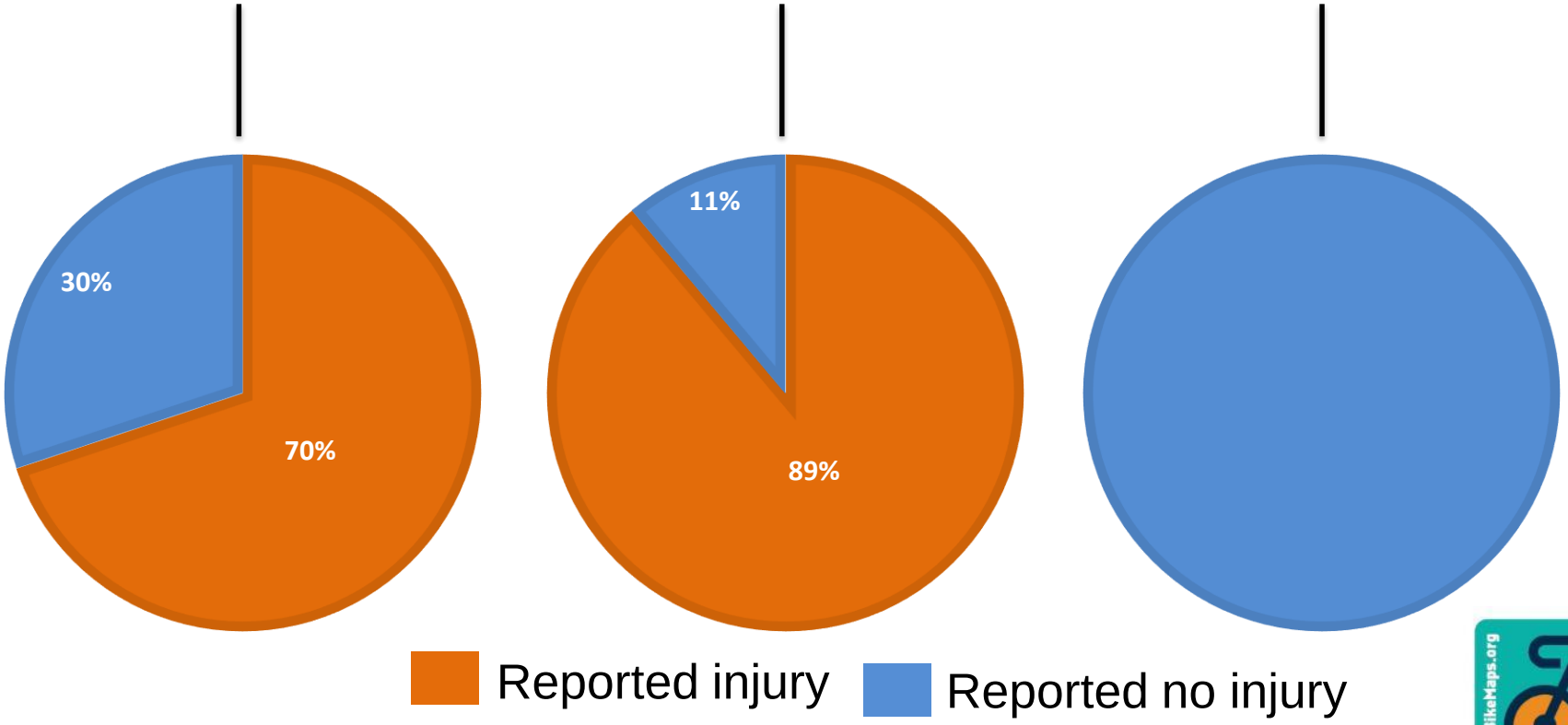
What variables are the most important for predicting cycling injury?

Predict answer: Were you injured?



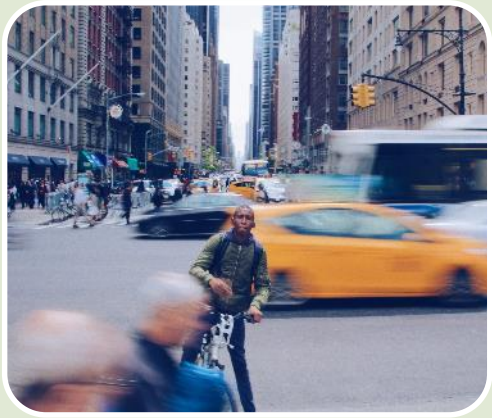
Data: BikeMaps.org

Crashes w/ object or vehicle	Falls/single bicycle crashes	Near misses
N=83	N=27	N=236



Data: BikeMaps.org

Incident details



- Incident type
- Time/day
- Injury outcome
- Collision object
- Trip purpose

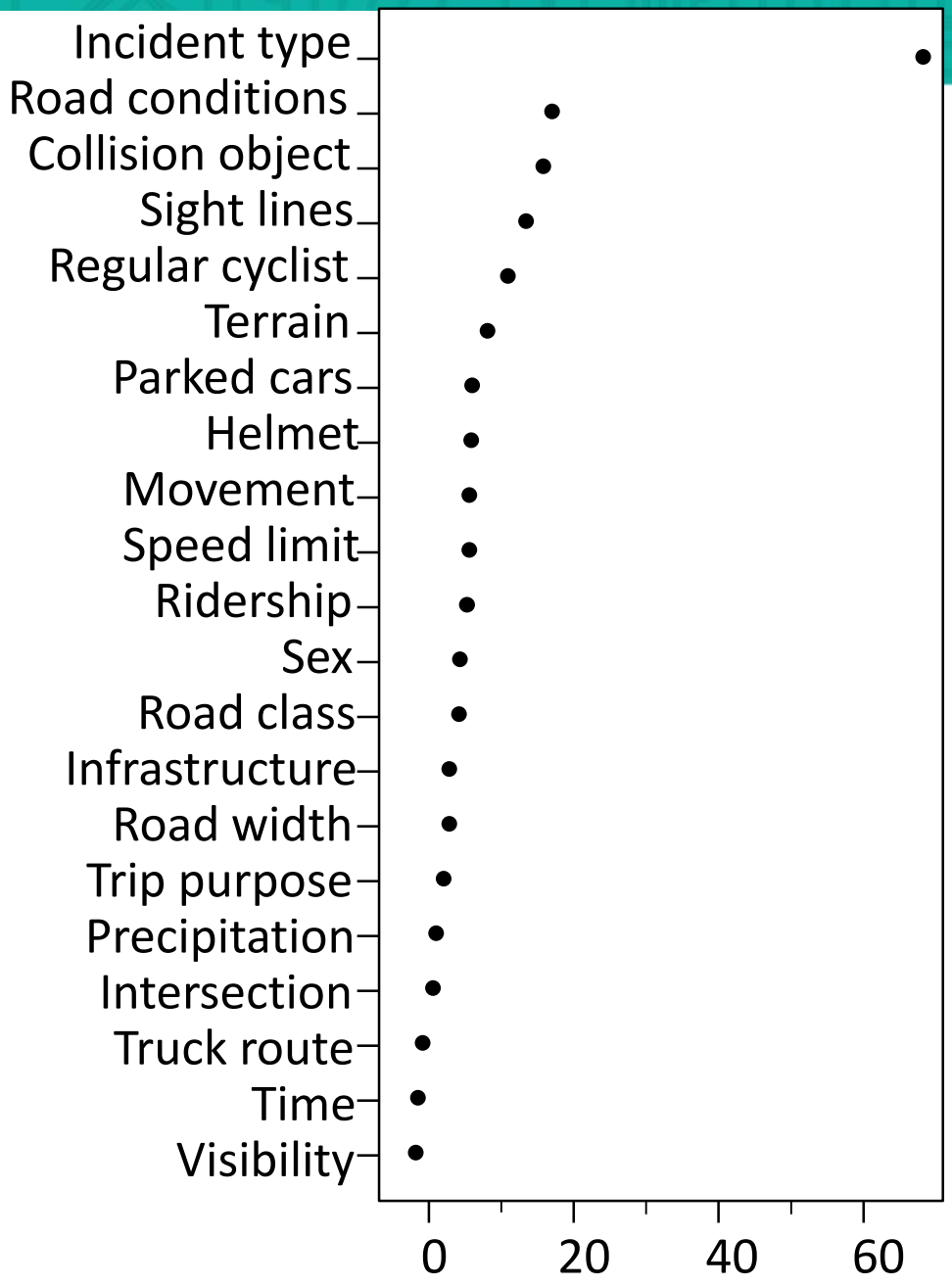
Conditions

- Road conditions
- Sight lines
- Parked cars
- Infrastructure
- Terrain
- Movement
- Weather
- Visibility

Personal details

- Age
- Sex
- Bicycling frequency
- Helmet
- Intoxicated

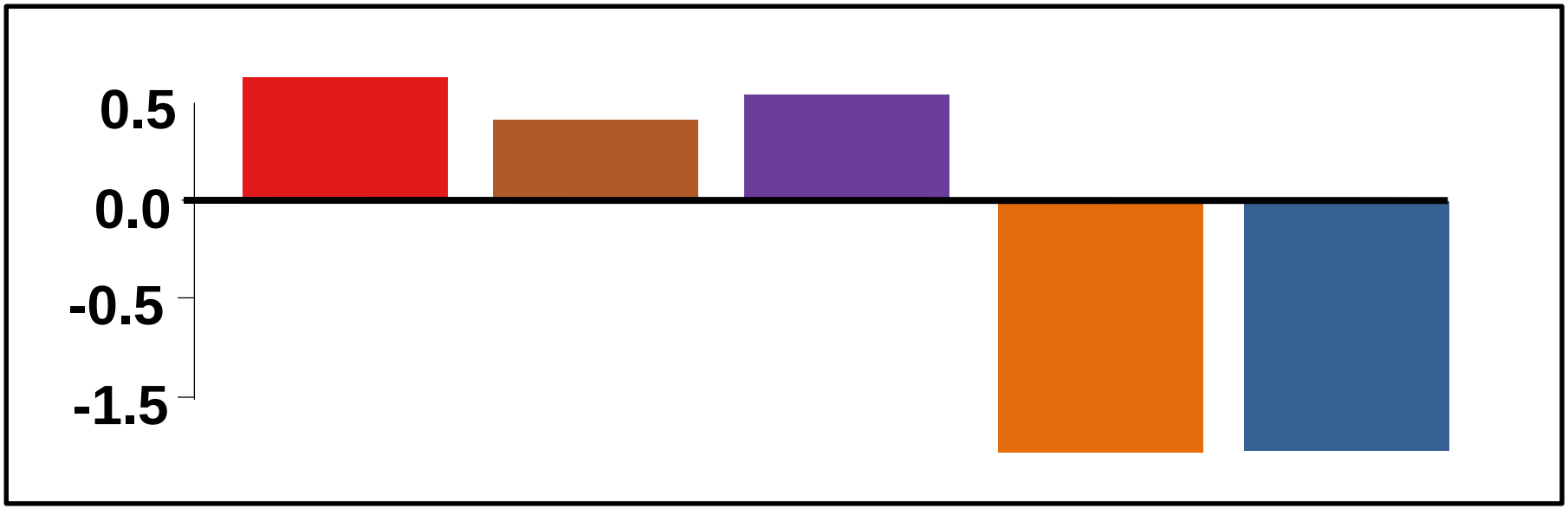
Results



Predict answer: Were you injured?

Results

Predict answer: Were you injured?



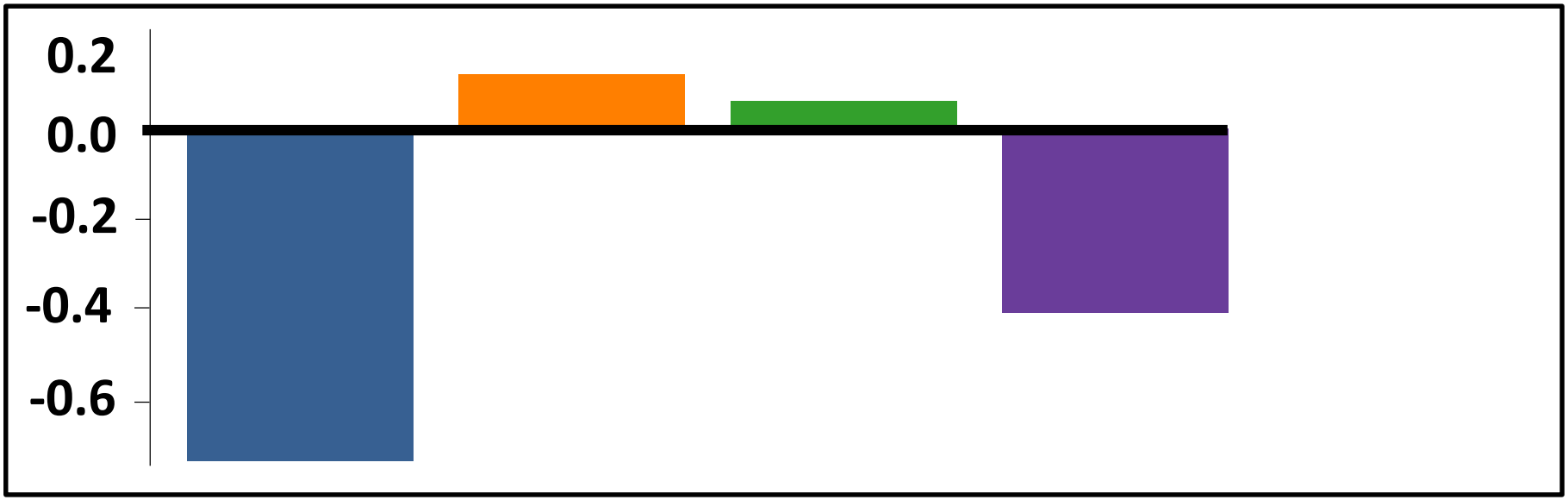
#1: What type of incident was it?

- Collision: moving object/vehicle
- Collision: stationary object/vehicle
- Fall
- Near collision: moving object/vehicle
- Near collision: stationary object/vehicle

Data gap: falls and single bicycle crashes

In Victoria, 46% of cyclists involved in a fall or single bicycle crash required medical attention

Predict answer: Were you injured?



#2: What were the road conditions?

Dry
Loose sand, gravel or dirt
Icy
Wet

Data gap: route conditions

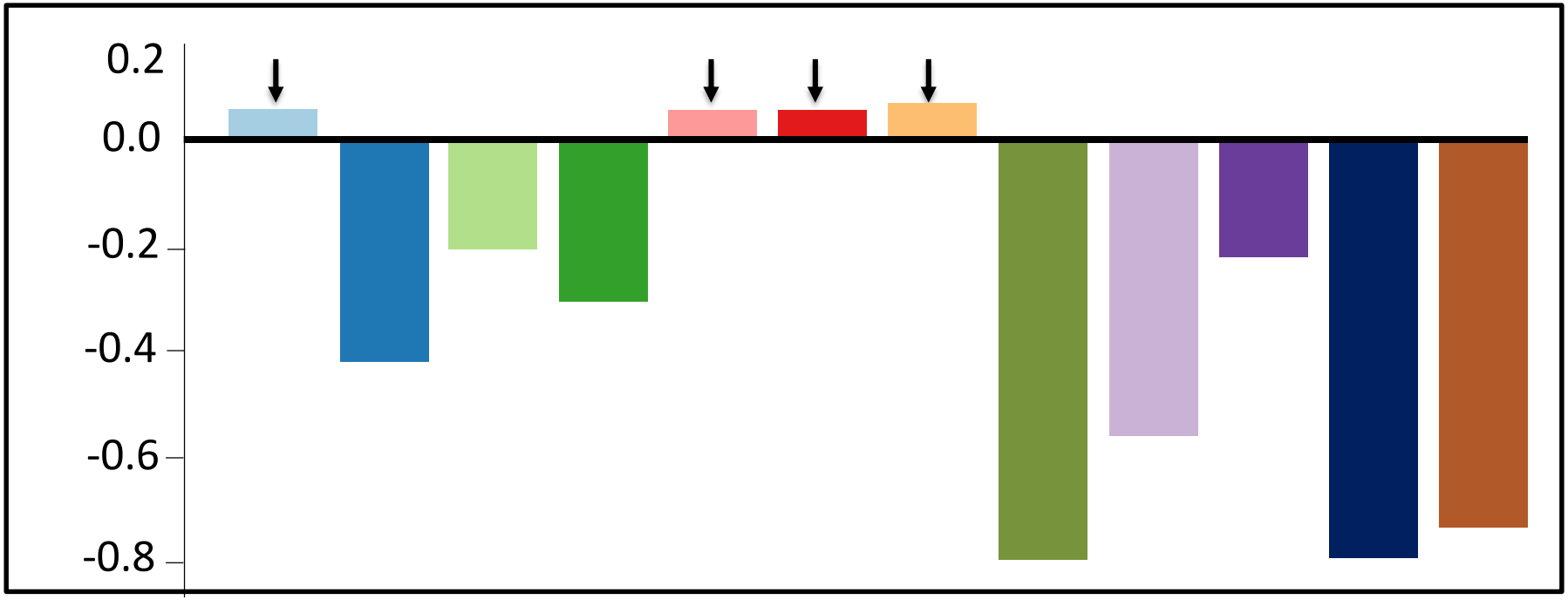
"Persistent gravel spot in intersection. Lost traction. [Fell], resulting in much blood from head requiring stitches"

"…hit a patch of black ice and fell"

"The bike lane was painted green in the curve that crosses the railroad tracks. The wet surface made it slippery, which caused me to skid [and fall] while following the curve.

Results

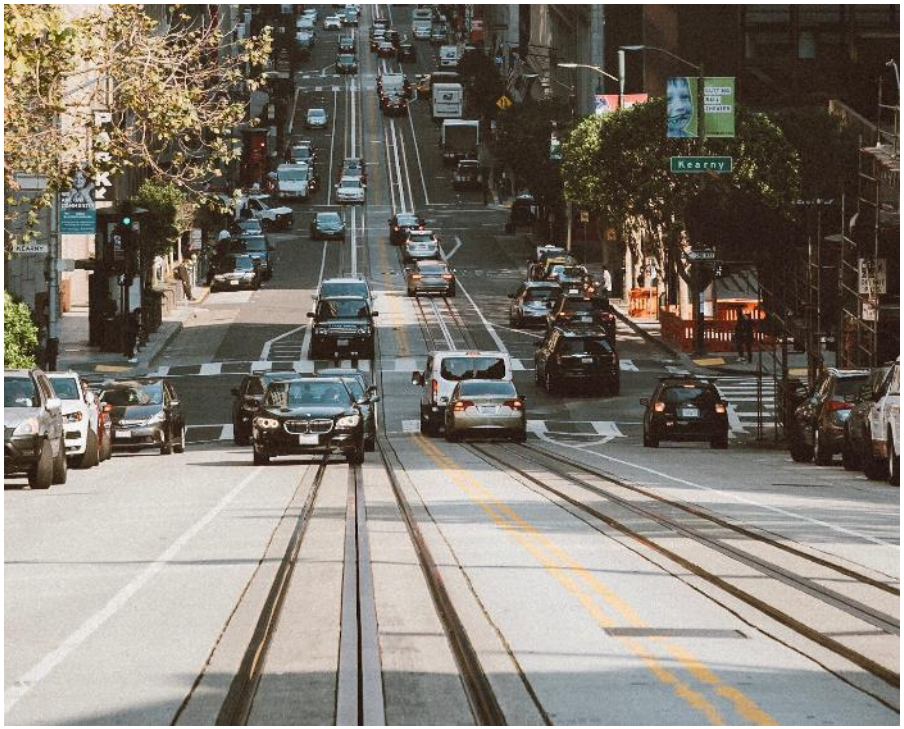
Predict answer: Were you injured?



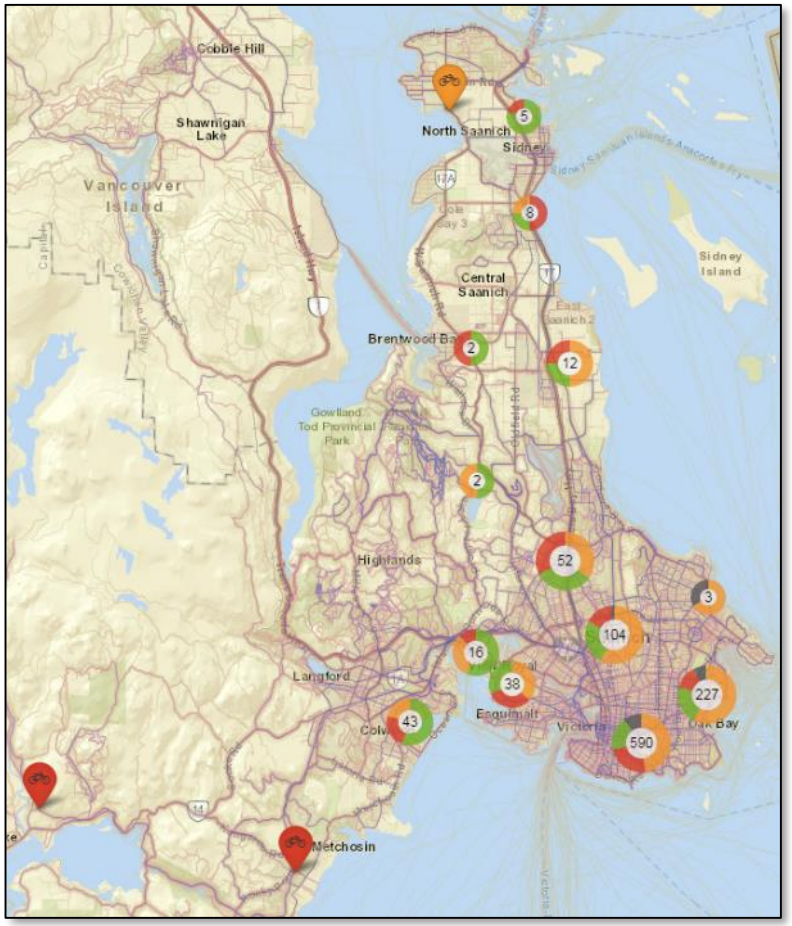
#3: What sort of object did you collide with?

- **Animal**
- Bicyclist
- Other
- Pedestrian
- **Pothole**
- **Roadway**
- **Train tracks**
- Vehicle, angle
- Vehicle, head on
- **Vehicle, open door**
- Vehicle, rear end
- Vehicle, side

Data gap: route characteristics



Take home



- Broader understanding of cycling safety
- Complimentary data on non-motor vehicle crashes and route characteristics
- Potential to supplement safety research in any city

The Team

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Agence de la santé publique du Canada

CAA

NSERC CRSNG

University of Victoria

SFU

CRD

Making a difference...together

TIRF

Saanich Police

ICBC

Saanich

CITY OF VICTORIA

BikeMaps.org

Thank You

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Methods

Random record selection (~60%)

Fit a tree using *m* random variables

Predict injury using out-of-bag (40%)

Repeat hundreds of times

Trees in the forest vote for best class prediction

Random forest: were you injured?

Injury Severity, Falls vs Collisions (Victoria BC)