

# Improving Cycling Safety in Toronto

A data-driven investigation into how the City of Toronto can improve cycling safety

2024 SAS Safe Roads Competition

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# Our Team

**Seneca**  
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Analytics and Business  
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**Yuseung Lee**

Business Analytics  
Business Accelerator  
Market Research Analyst  
Bachelor's BBA

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# Datasets Used

## KSI

Killed, Serious, Injured Collisions

Source: Toronto Police Service Public Safety Portal

## Traffic Collisions

Traffic Collisions Open Data

Source: Toronto Police Service Public Safety Portal

## Bike Share Ridership

Ridership data of Toronto Bike Share

Source: City of Toronto

## Toronto Cycling Network

Map of Cycling Track Types

Source: City of Toronto



# Agenda

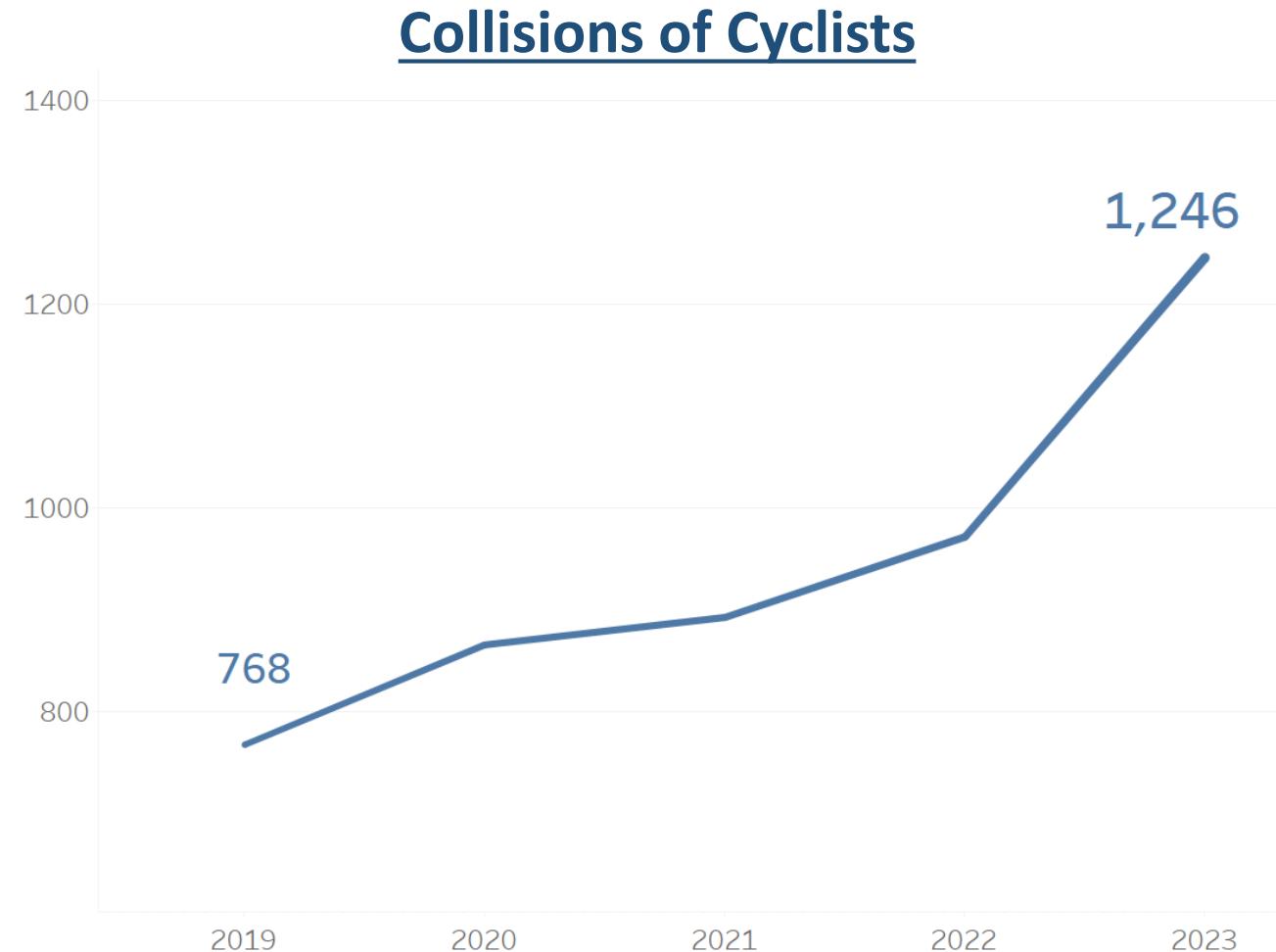
- 01** | Why study Cyclists?
- 02** | Background on Cyclist Behaviour
- 03** | Why do collisions occur?
- 04** | Summary & Recommendations

# Why study Cyclists?

The number of collisions related to cyclists has steadily increased each year since the pandemic.

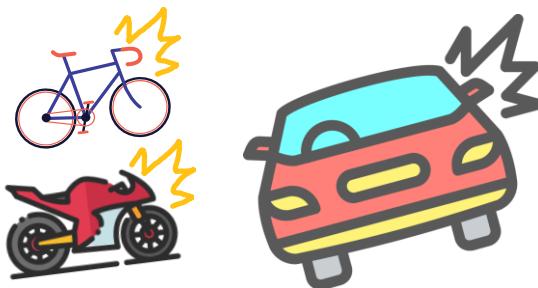


Data: Traffic Collisions (ASR-T-TBL-001)

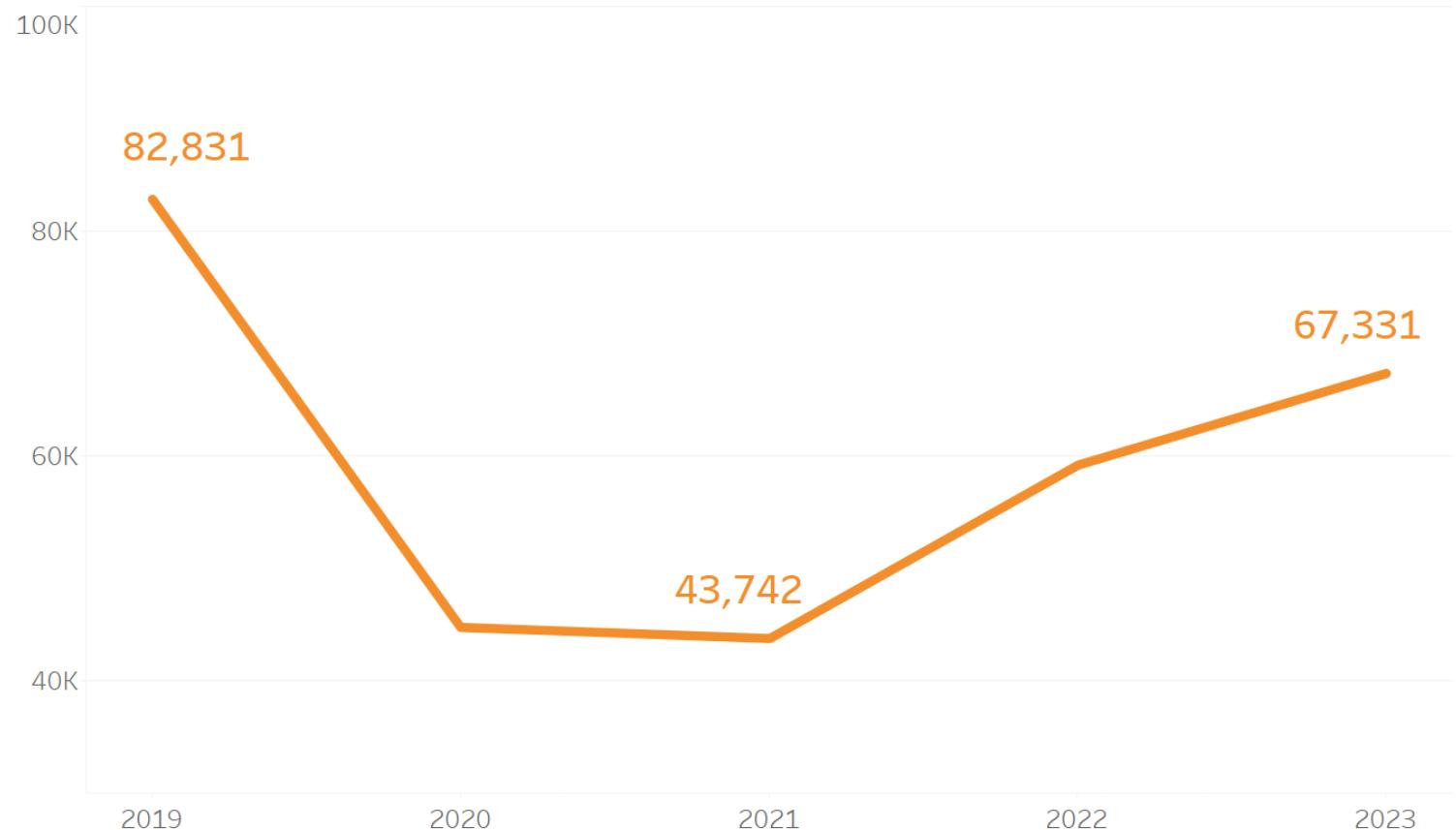


# Why study Cyclists?

Meanwhile, the number of total collisions fell by 15% in the period 2019 to 2023



Total Number of Collisions

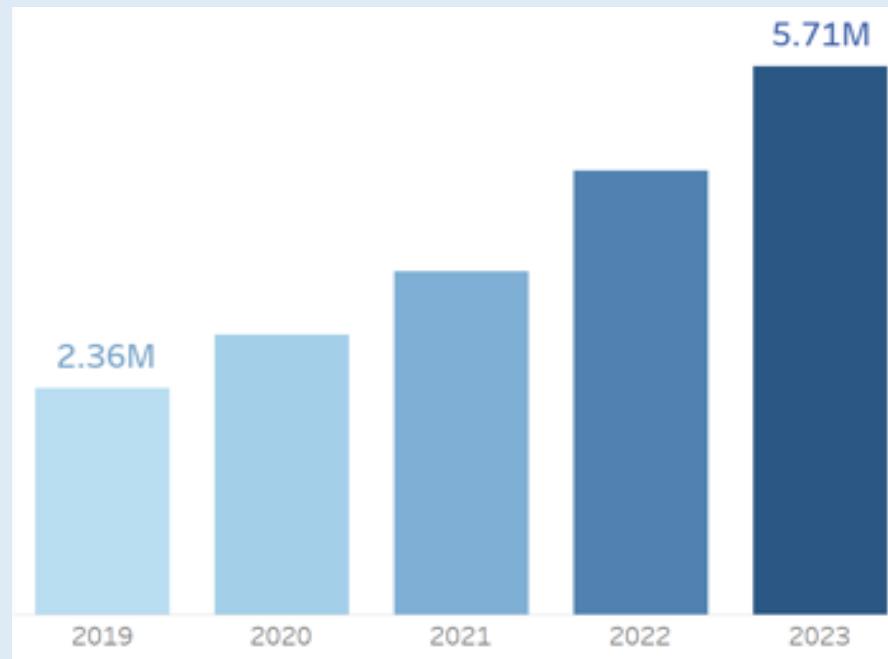


# Why study Cyclists?

Support Vision Zero and improve safety for most vulnerable road user types

## Growing Demand

Almost 6 million total rides taken in 2023, just on the bike share platform



## Why it is alarming?

**68%** **Cycling  
collision injury rate**

**~12%** **Automotive / Motorcycle  
collision injury rate**

Cyclists do not have the protection that other modes of transport provide, increasing the risk of a serious injury.



# Background

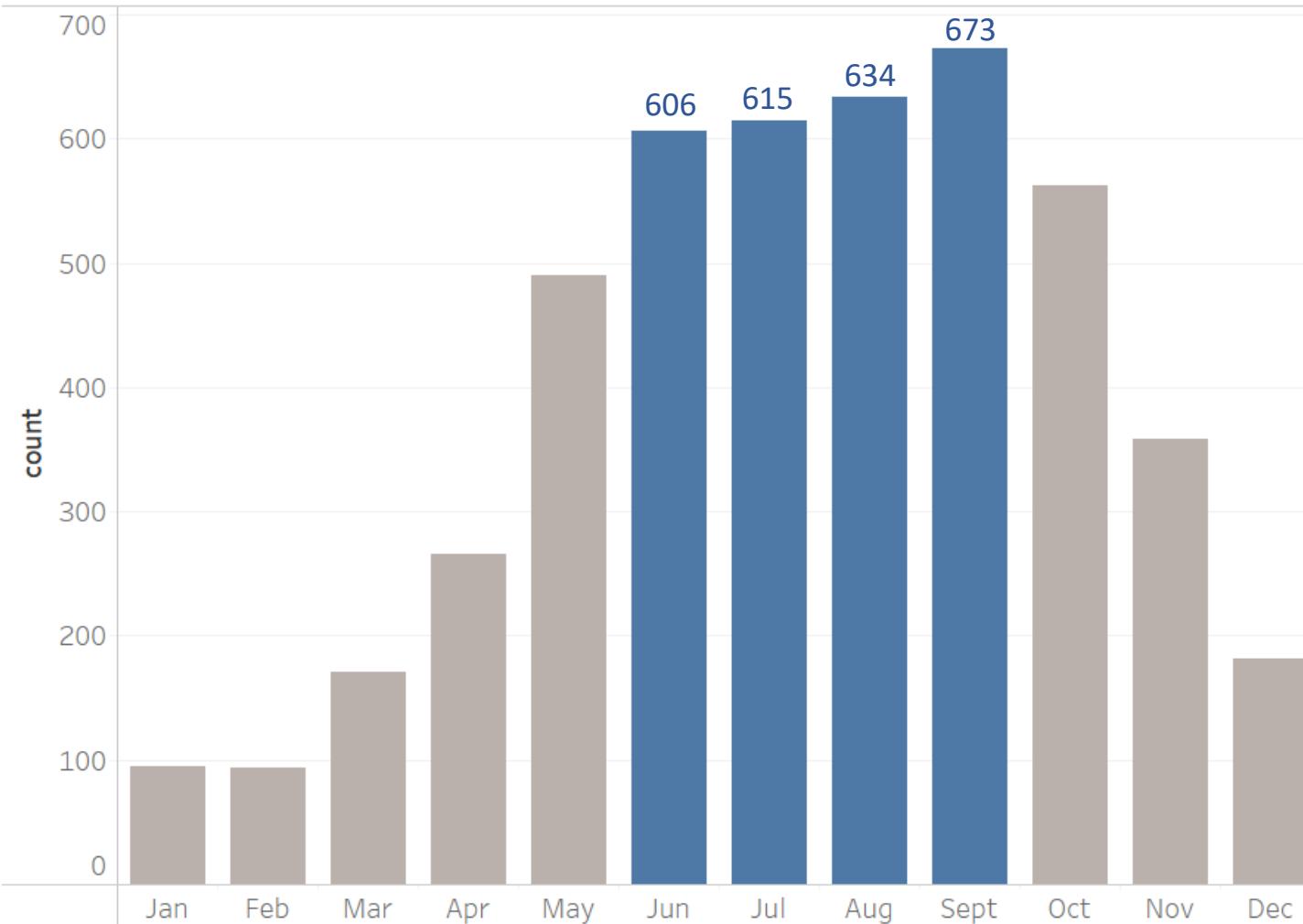
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Tracking Cyclist Behavior



# Which months do most collisions happen?

Total Bicycle Collisions per month from 2019-2023



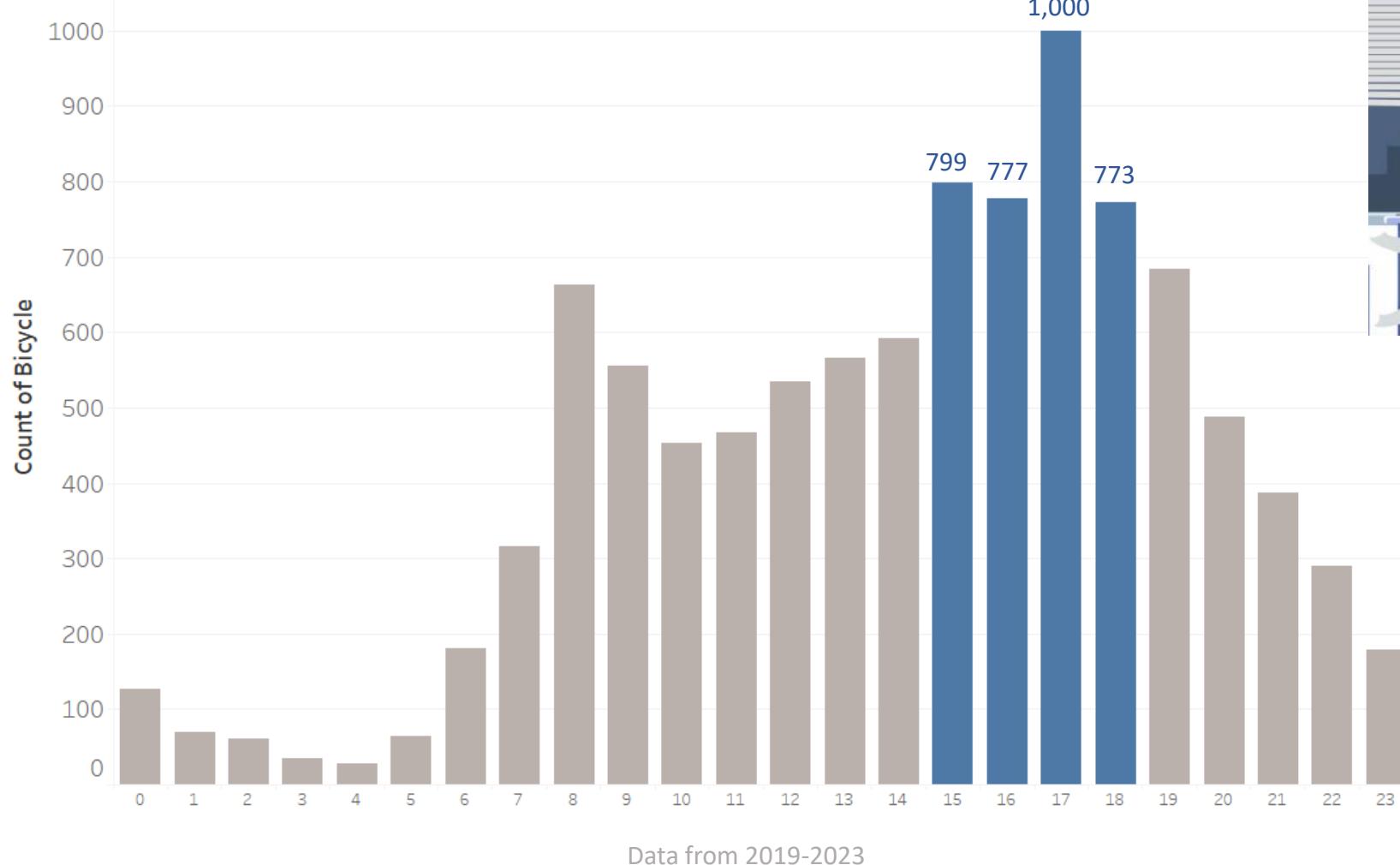
June to September  
(Summer & Autumn)

Good weather encourages people cycling.



# What time does most collisions take place?

Bicycle Collision by Time



3:00pm to 6:00pm

# Where do the accidents happen?



Data: Traffic Collisions (ASR-T-TBL-001)

# Where do the accidents happen?

Bicycle collisions frequently occurred on Spadina Ave, College St, University Ave

## Top 10 locations : Bicycle collisions



| Rank | Street Name                  | Collisions |
|------|------------------------------|------------|
| 1    | College St/University Ave    | 29         |
| 2    | Dundas St W/Spadina Ave      | 28         |
| 3    | College St/Spadina Ave       | 27         |
| 4    | Carlton St/Sherbourne St     | 26         |
| 5    | Bloor St W/Spadina Ave       | 25         |
| 6    | Queen St/Dufferin St         | 24         |
| 6    | Richmond St W/University Ave | 24         |
| 6    | Bloor St E/Broadview Ave     | 24         |
| 9    | Carlton St/Church St         | 23         |
| 10   | Queen St W/Bathurst St       | 22         |
| 10   | Bloor St W/Keele St          | 22         |

# Why do collisions happen?



# Why do collisions happen?

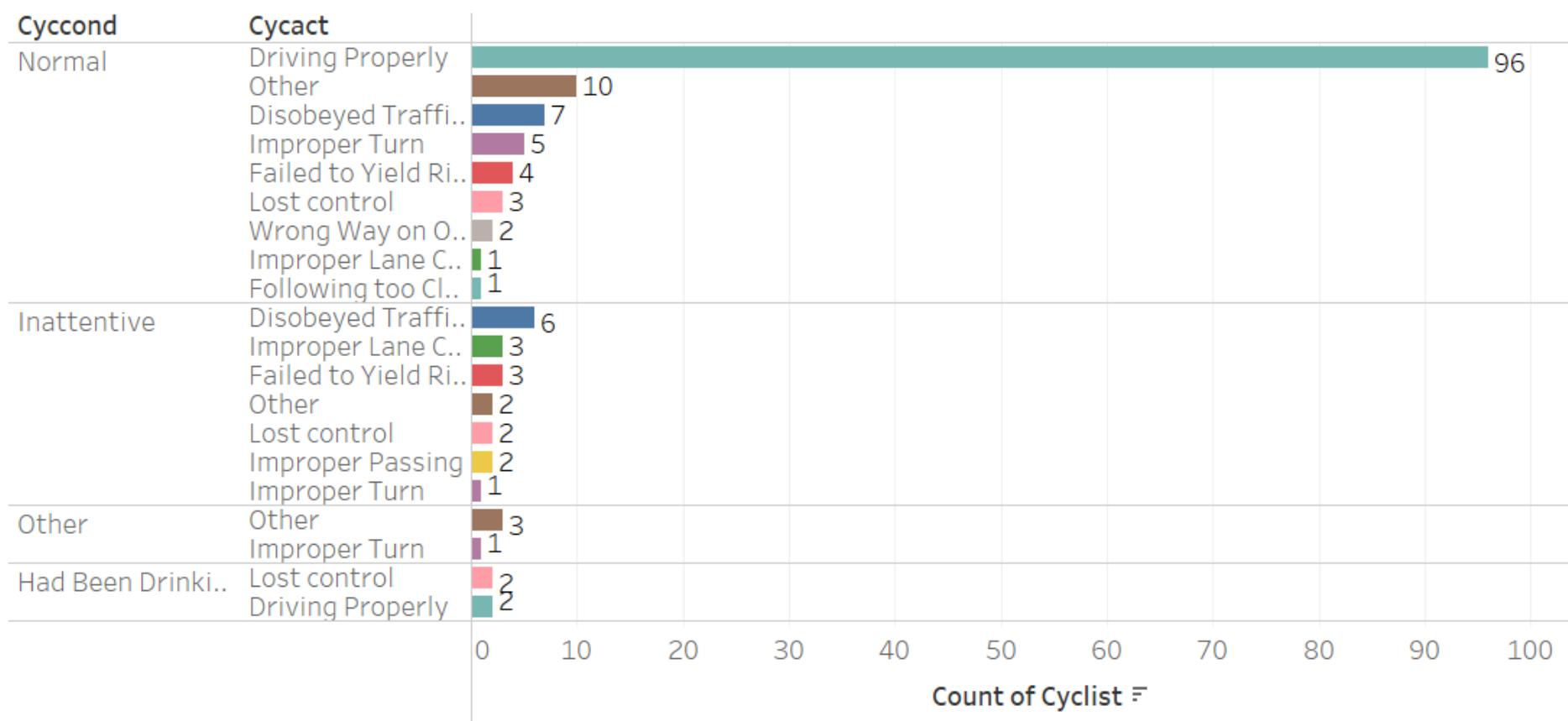


Lack of traffic control

# Lack of traffic control on roads

Most collisions happen when cyclists are in normal condition and driving properly. Why do collisions still take place?

Reasons for Collisions and Conditions of Cyclists

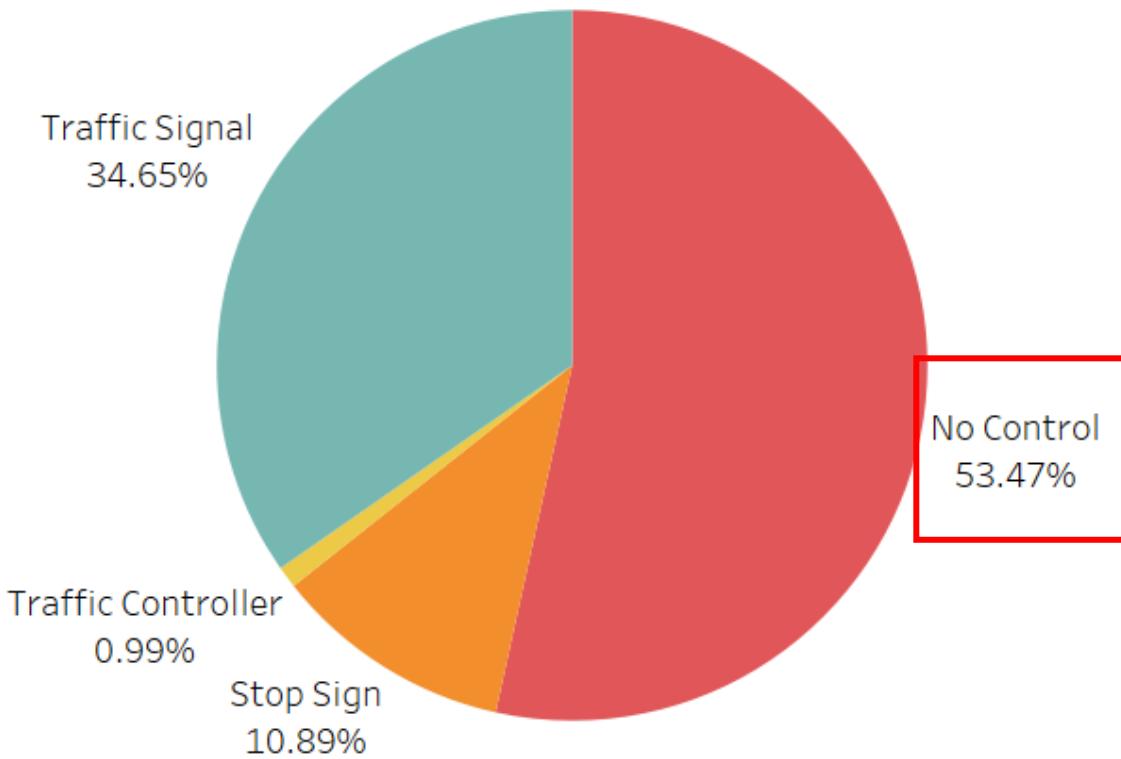


Normal: 129  
Inattentive: 19



# Lack of traffic control on roads

Reasons of collisions for normal cyclists who drive properly



**Since 2019,  
no traffic control is the core  
reason for cyclist collisions**

# Details on why collisions happen under no control

## Why Collisions Happen? No Control

|   |    |
|---|----|
| → Motorist turned left across cyclists path.  | 18 |
| → Cyclist and Driver travelling in same direction. One vehicle sideswipes the other.            | 17 |
| → Motorist turns right at non-signal Inter.(stop, yield, no cont.,and dwy) and strikes cyclist. | 12 |
| → Cyclist and Driver travelling in same direction. One vehicle rear-ended the other.            | 7  |
| → Cyclist struck opened vehicle door  | 5  |
| → Cyclist turned left across motorists path.  | 4  |
| → Cyclist without ROW rides into path of motorist at inter, Inwy, dwy-Cyclist not turn.         | 3  |
| → Motorist without ROW drives into path of cyclist at inter, Inwy, dwy-Driver not turn.         | 3  |
| → Insufficient information (to determine cyclist crash type).                                   | 2  |
| → Cyclist falls off bike - no contact with motorist.  | 1  |
| → Cyclist loses control and strikes object (pole, ttc track)                                    | 1  |
| → Cyclist strikes pedestrian.   | 1  |
| → Motorist makes u-turn in-front of cyclist.  | 1  |
| → Motorist reversing struck cyclist.  | 1  |

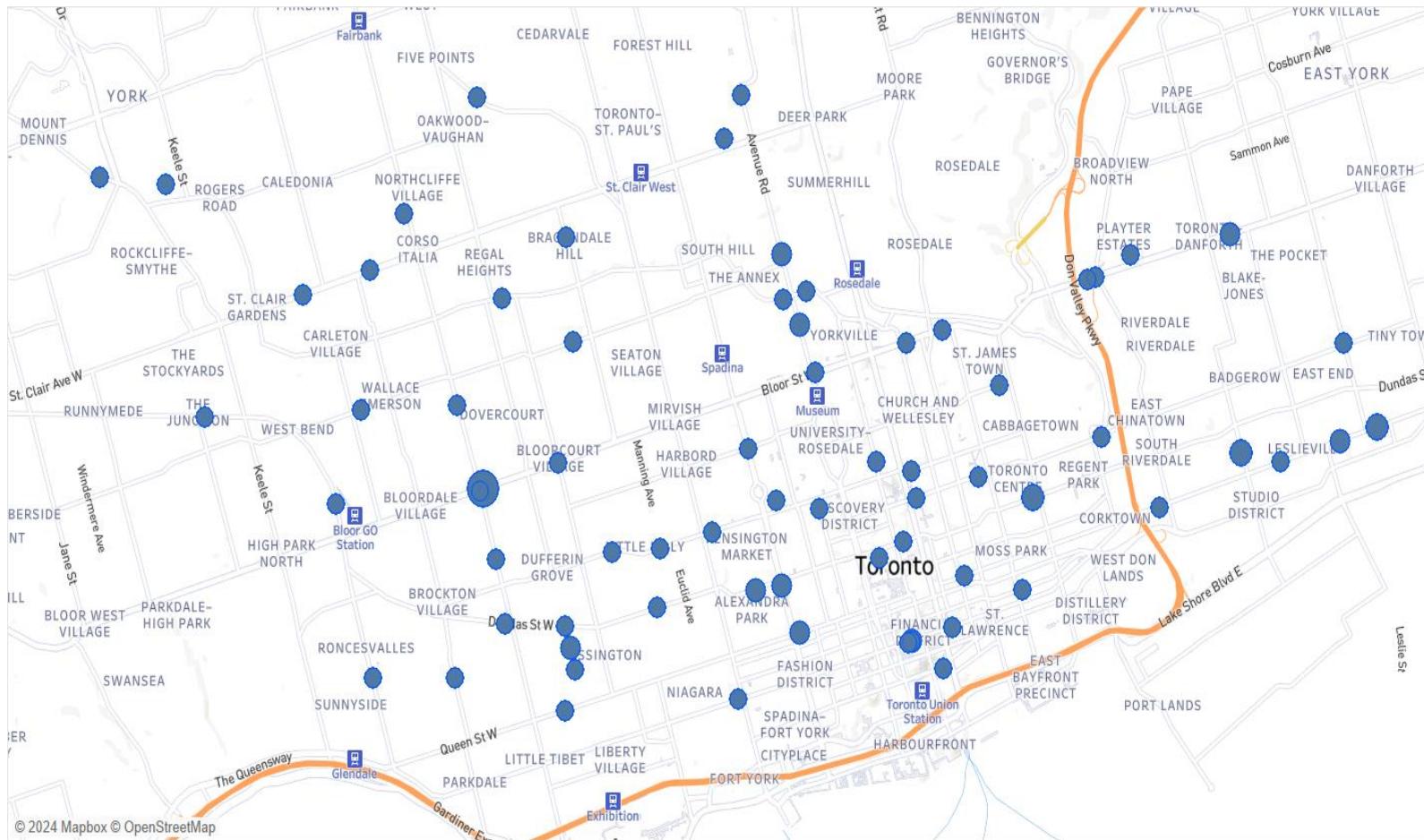
- Collisions resulted from cyclists
- Collisions resulted from motorists/ other vehicle users
- Collisions responsibility shared by both cyclists and other vehicle users

Collisions resulted from

- Cyclists,
- Other vehicles users
- Shared responsibilities

# Lack of traffic control on roads

Collisions Locations where there is no traffic control, map of (>3) collisions



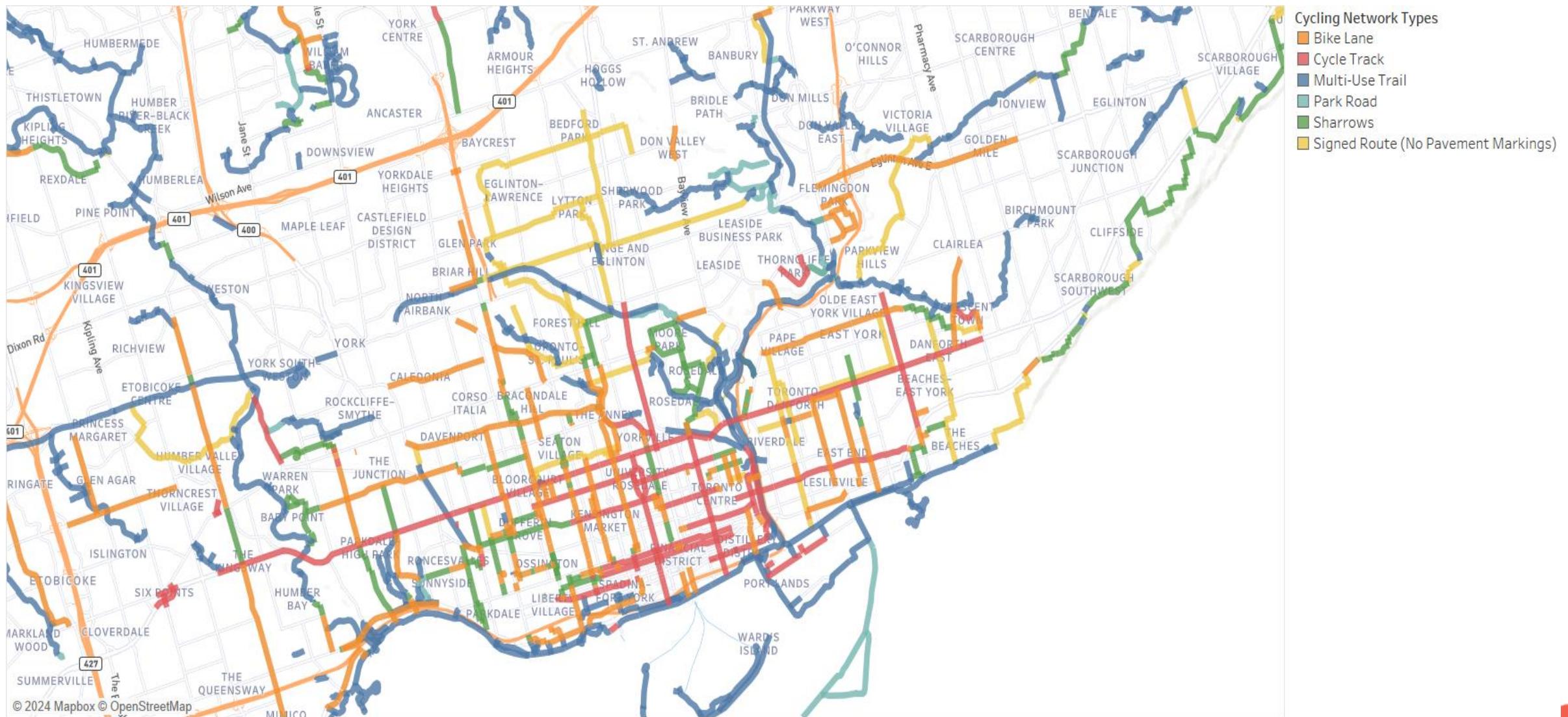
| No | Street1             | Street2           |
|----|---------------------|-------------------|
| 1  | Spadina Ave         | Fort York BLVD    |
| 2  | Eastern Ave         | Gilead PL         |
| 3  | DonValley Parkway N | Leaside BDGE      |
| 4  | Yonge ST            | Erskine Ave       |
| 5  | Old weston Rd       | Rogers Rd         |
| 6  | Queen St E          | Victoria Park Ave |
| 7  | DonValley Parkway S | York mills Ramp   |
| 8  | Don Mills Rd        | Kern Rd           |
| 9  | Lawrence Ave E      | Townley Ave       |
| 10 | St Clair Ave E      | No Bonnington Ave |
|    | ...                 | ...               |

# Why do collisions happen?



Connectivity between cycling networks

# Types of Cycling Network



# Most cycling collisions happen on the Cycle Track

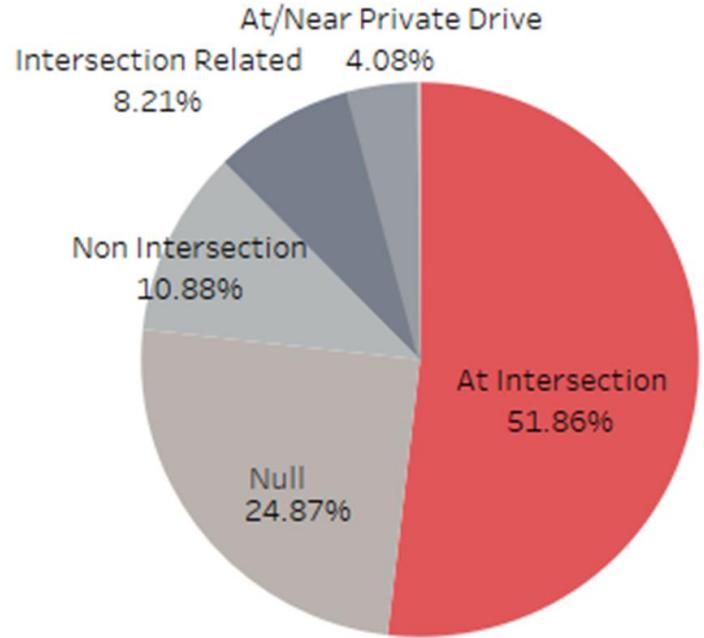
Cycling Networks and Bicycle collisions



Bicycle collisions mainly occurred horizontally in a series aligned with **Cycle Track, and Streetcar Networks**

# Lack of an integrated cycling network

- Cycling collisions frequently occur at intersections



# Lack of an integrated cycling network

- Cycling networks shows a lack of connection



## Vertical Tracks

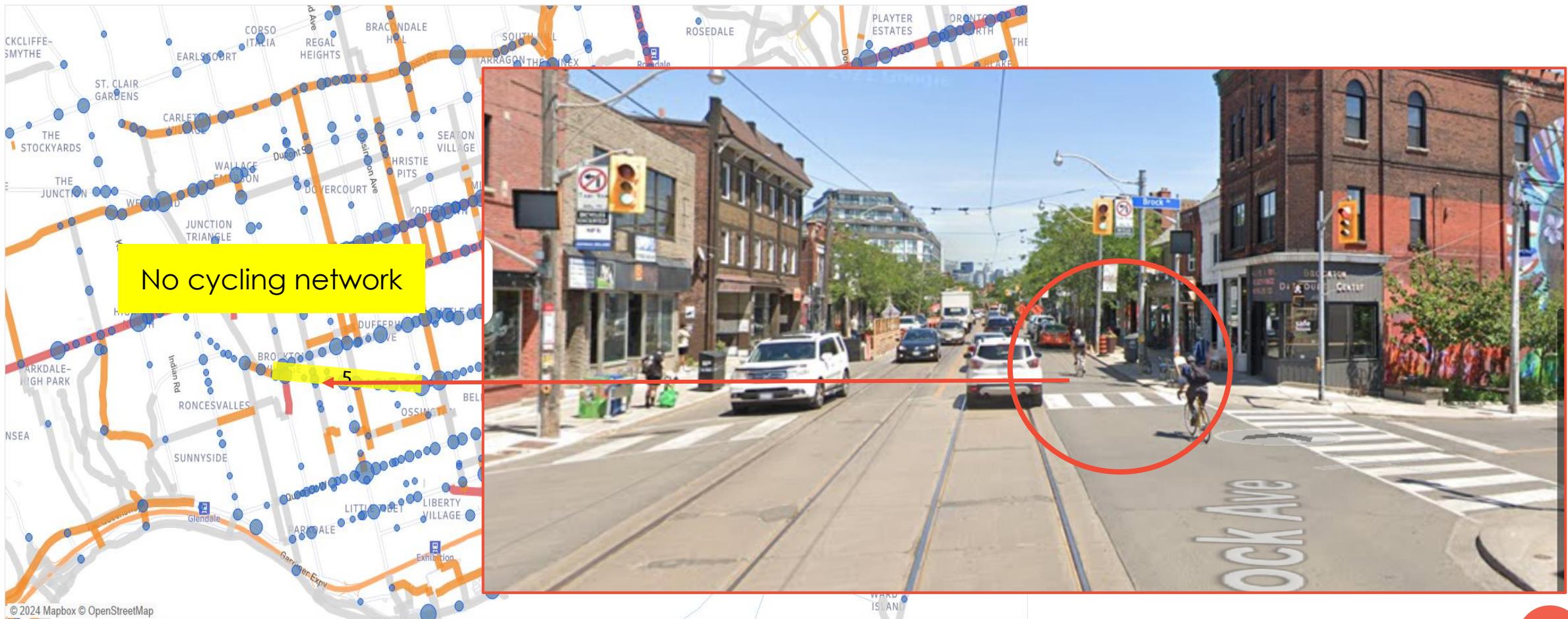
1. Bloor St W - King St W Bathurst St
2. Bloor St W - King St W Spadina Ave
3. Charles St E-Adeleide St E Yonge St
4. Bloor St W-Adeleide St E Church St

## Horizontal Tracks

5. Lansdowne Ave-Shabourne St Dundas St W
6. Dufferine St-University Ave Queen St W
7. Dufferine St-John St King St W

# Lack of an integrated cycling network

- Cycling networks shows a lack of connection



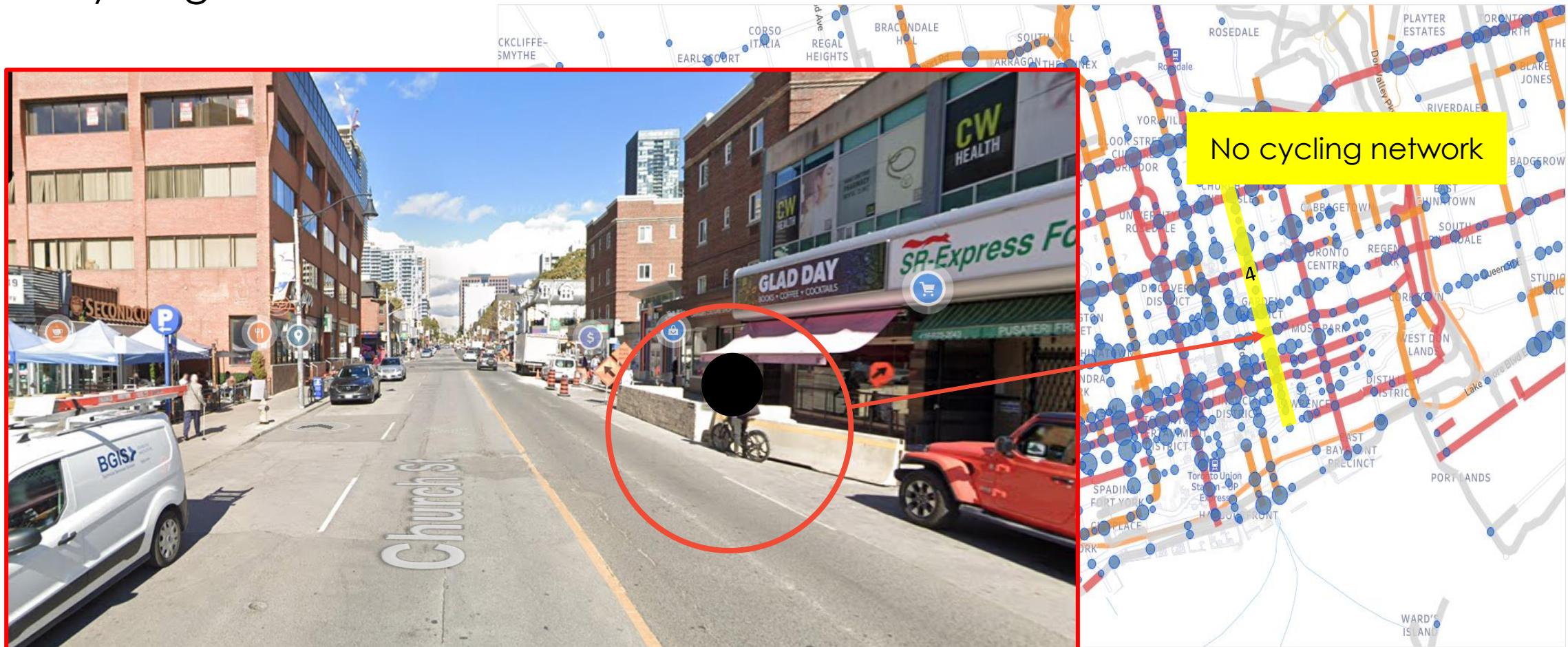
# Lack of an integrated cycling network

- Cycling networks shows a lack of connection



# Lack of an integrated cycling network

- Cycling networks shows a lack of connection



# Key Findings

**Downtown** is the busiest area where bicycle collisions usually take place

- Bicycle collisions frequently occurred on Spadina Ave, College St, University Ave

**Factors influencing bicycle collisions in downtown areas**

## 1) Traffic control

- The primary reason for bicycle collisions is lack of control

## 2) Connectivity between cycling networks

- Bicycle collisions mainly occurred horizontally aligned with Cycle Track
- The vertical and horizontal tracks are not well intersected

# Recommendations

## Vision Zero Road Safety Plan

- Our recommendations build on existing safety initiatives:
  - Cycling network implementation, cycling safety and education, and traffic control



**1. Improve cycling networks integration**



**2. Implement more robust traffic control**



**3. Improve Information Sharing**

# Recommendations

## 1. Improve cycling infrastructure - Integration

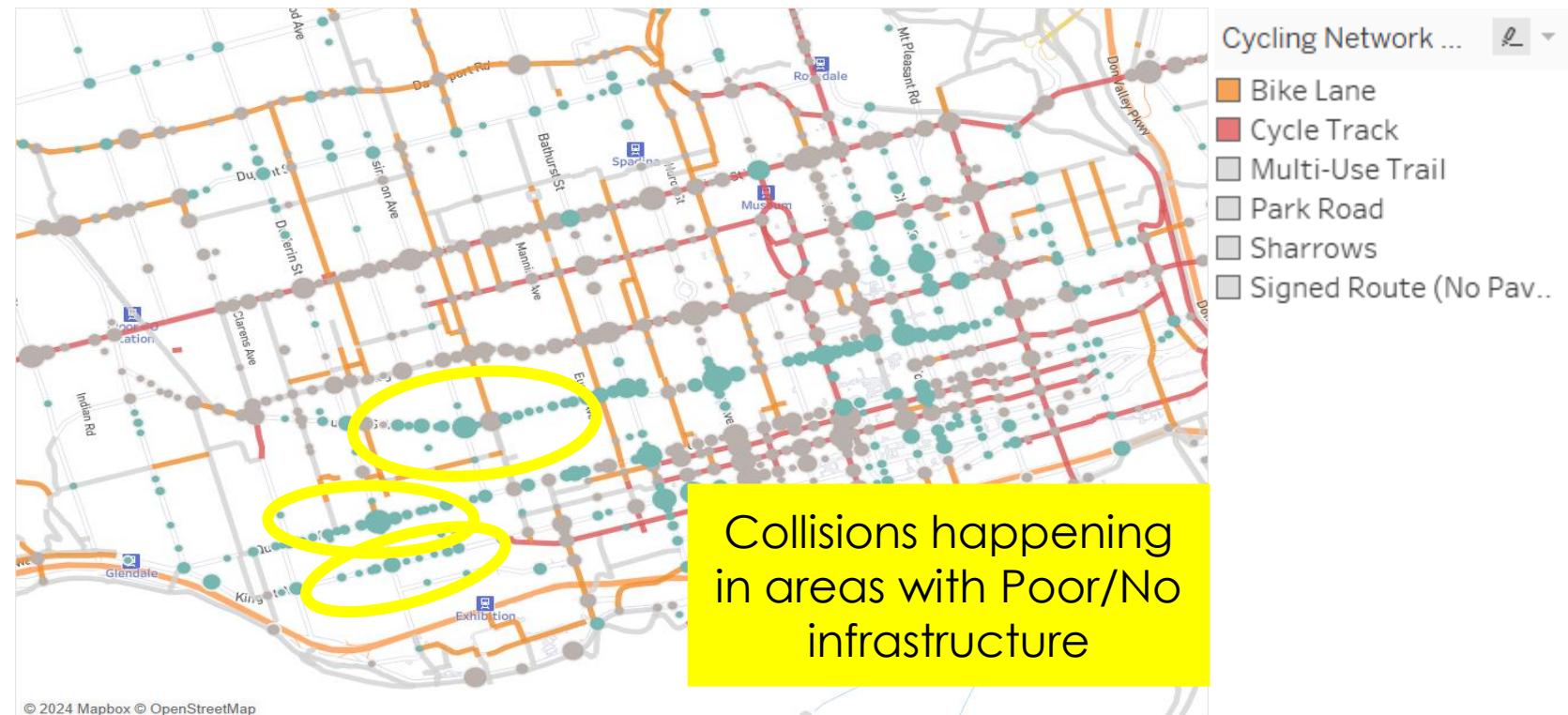
Improve cyclist safety with seamless integration between cycling lanes

### Missing Vertical Tracks

|                            |             |
|----------------------------|-------------|
| Bloor St W - King St W     | Bathurst St |
| Bloor St W - King St W     | Spadina Ave |
| Charles St E-Adeleide St E | Yonge St    |
| Bloor St W-Adeleide St E   | Church St   |

### Missing Horizontal Tracks

|                             |             |
|-----------------------------|-------------|
| Lansdowne Ave-Shabourne St  | Dundas St W |
| Dufferine St-University Ave | Queen St W  |
| Dufferine St-John St        | King St W   |



# Recommendations

## 1. Improve cycling infrastructure - Integration

Improve cyclist safety with seamless integration between cycling lanes

### Missing Vertical Tracks

Bloor St W - King St W      Bathurst St

Bloor St W - King St W      Spadina Ave

Charles St E-Adeleide St E      Yonge St

Bloor St W-Adeleide St E      Church St

### Missing Horizontal Tracks

Lansdowne Ave-Shabourne St      Dundas St W

Dufferine St-University Ave      Queen St W

Dufferine St-John St      King St W

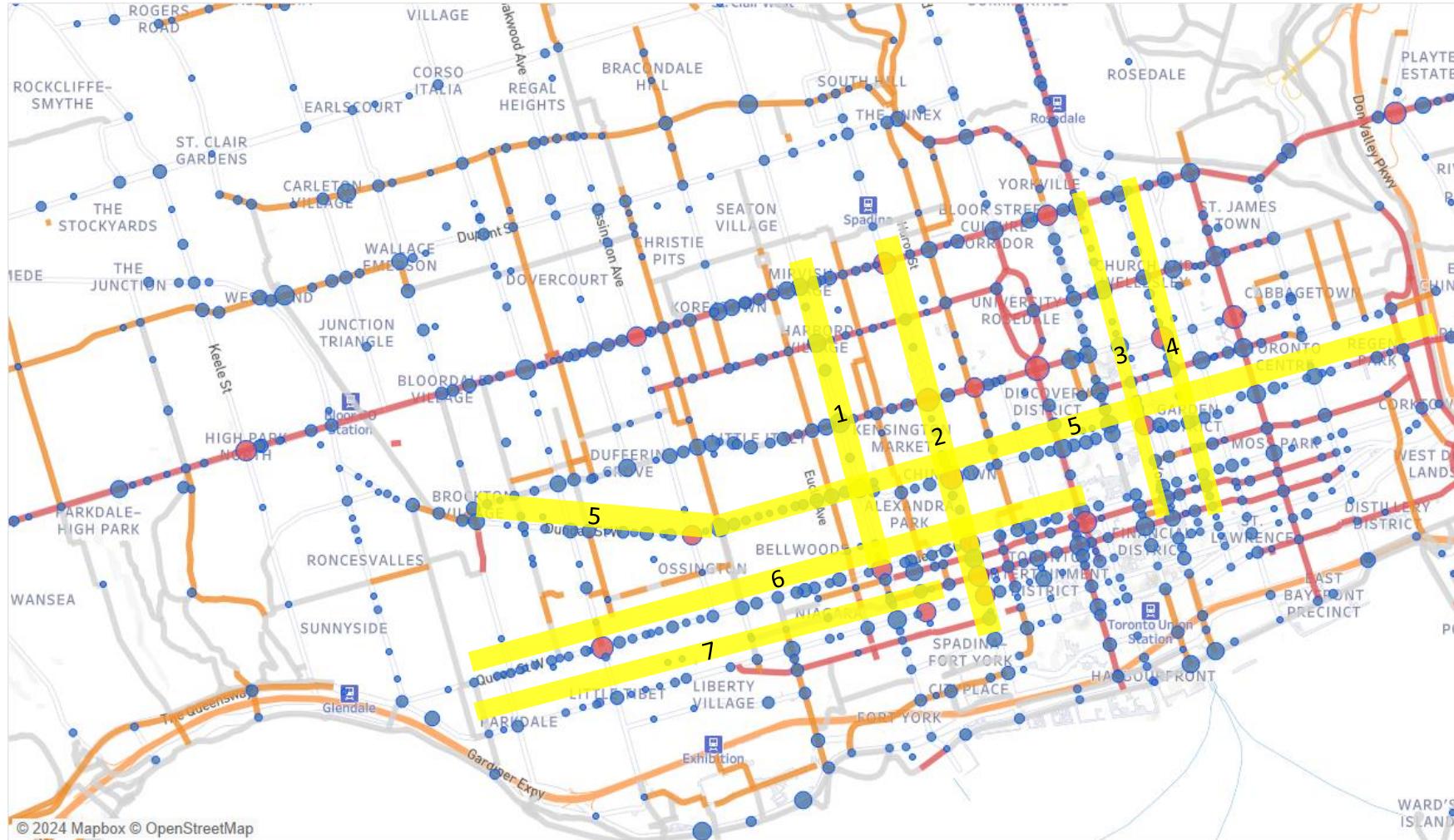


# Proposed Cycling Network



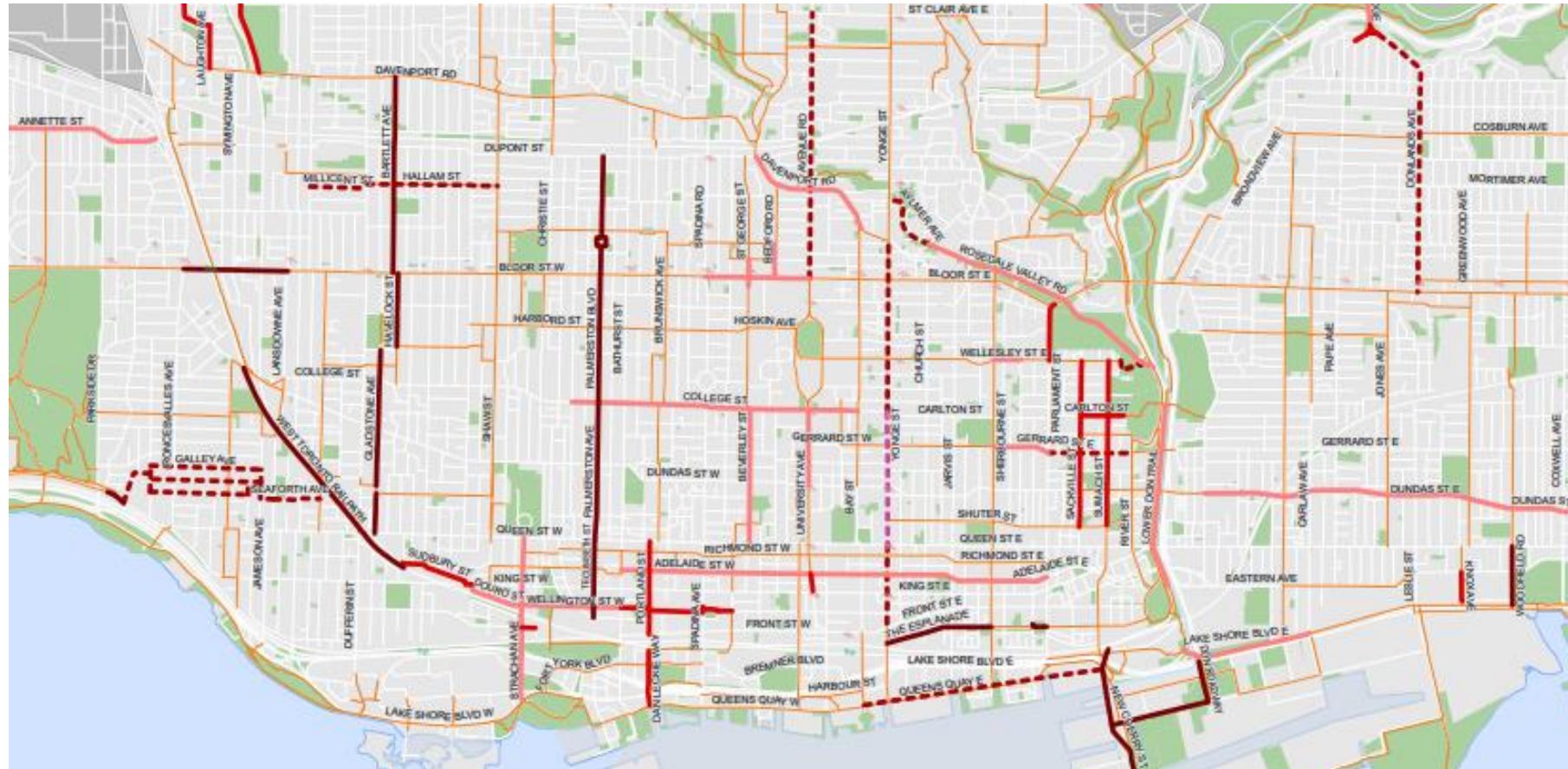
# Why did we propose the following routes?

**Criteria:** the roads suggested had **over 20 bicycle collisions in last 5 years**



# Toronto Near Term Implementation Plan

## 2022-2024 Implementation Plan for Toronto - East York

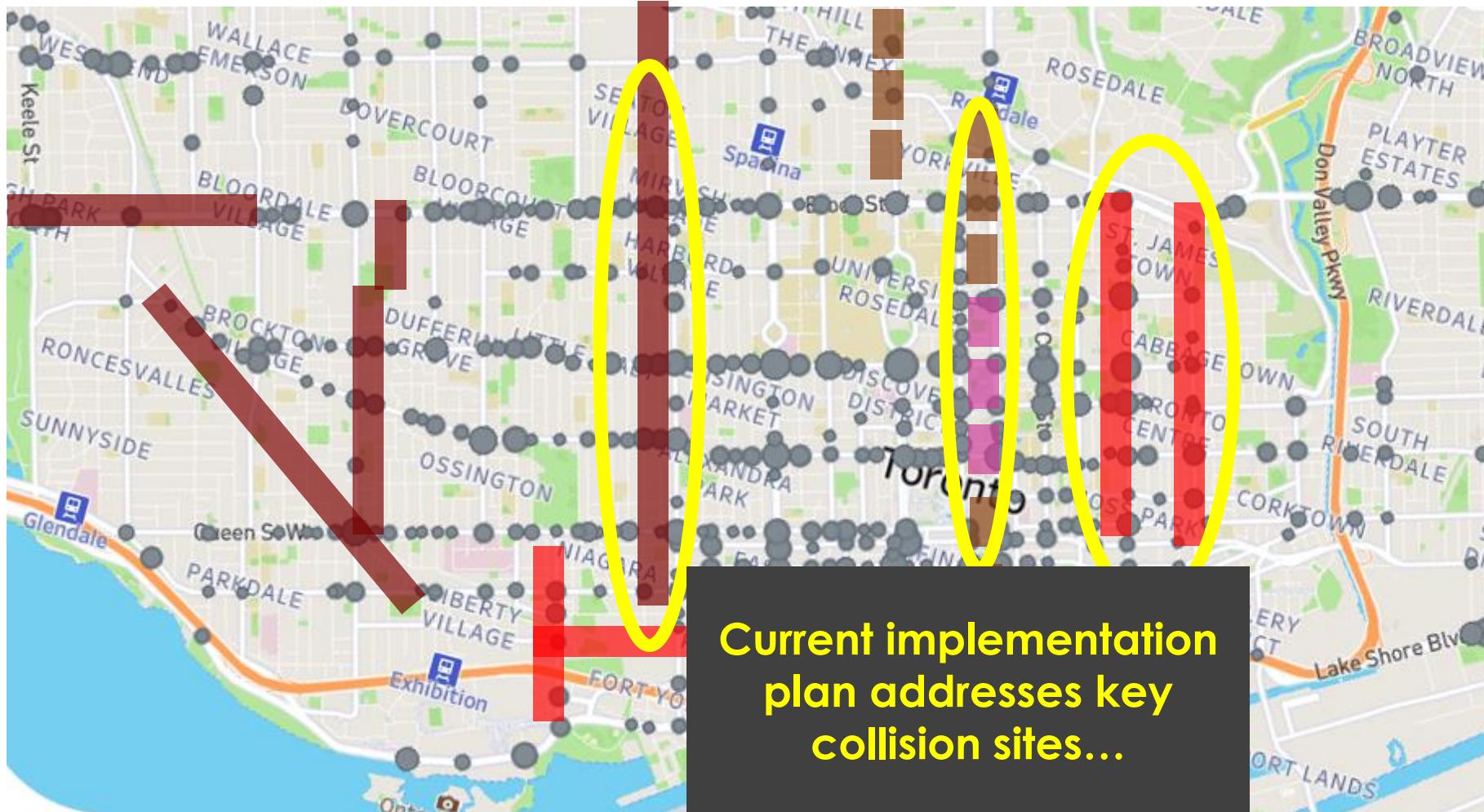


### Legend

#### Programmed Cycling Projects

- Underway
- New
- Renew
- Study
- Approved for Future Implementation

# Toronto Near Term Implementation Plan

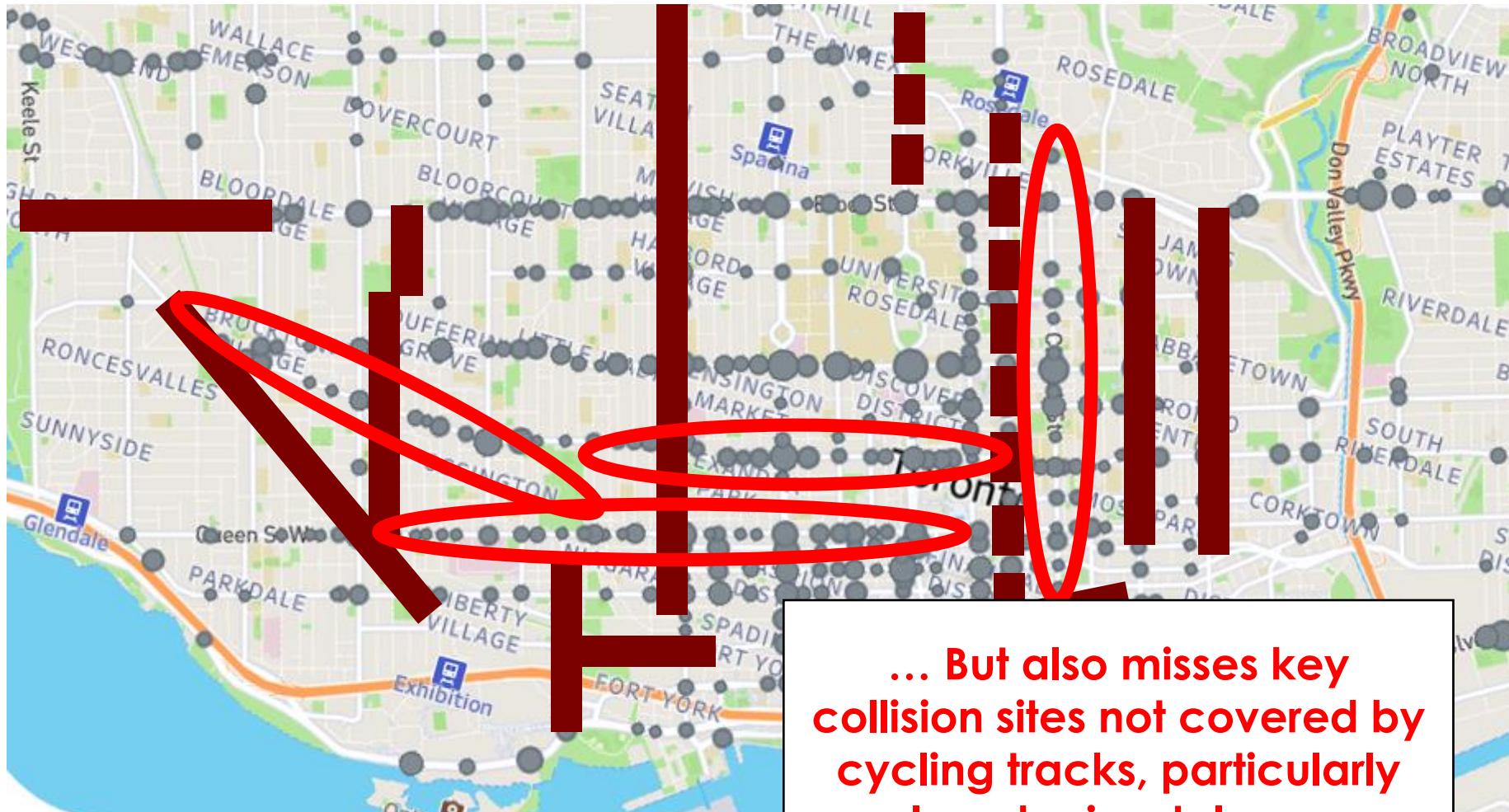


## Legend

### Programmed Cycling Projects

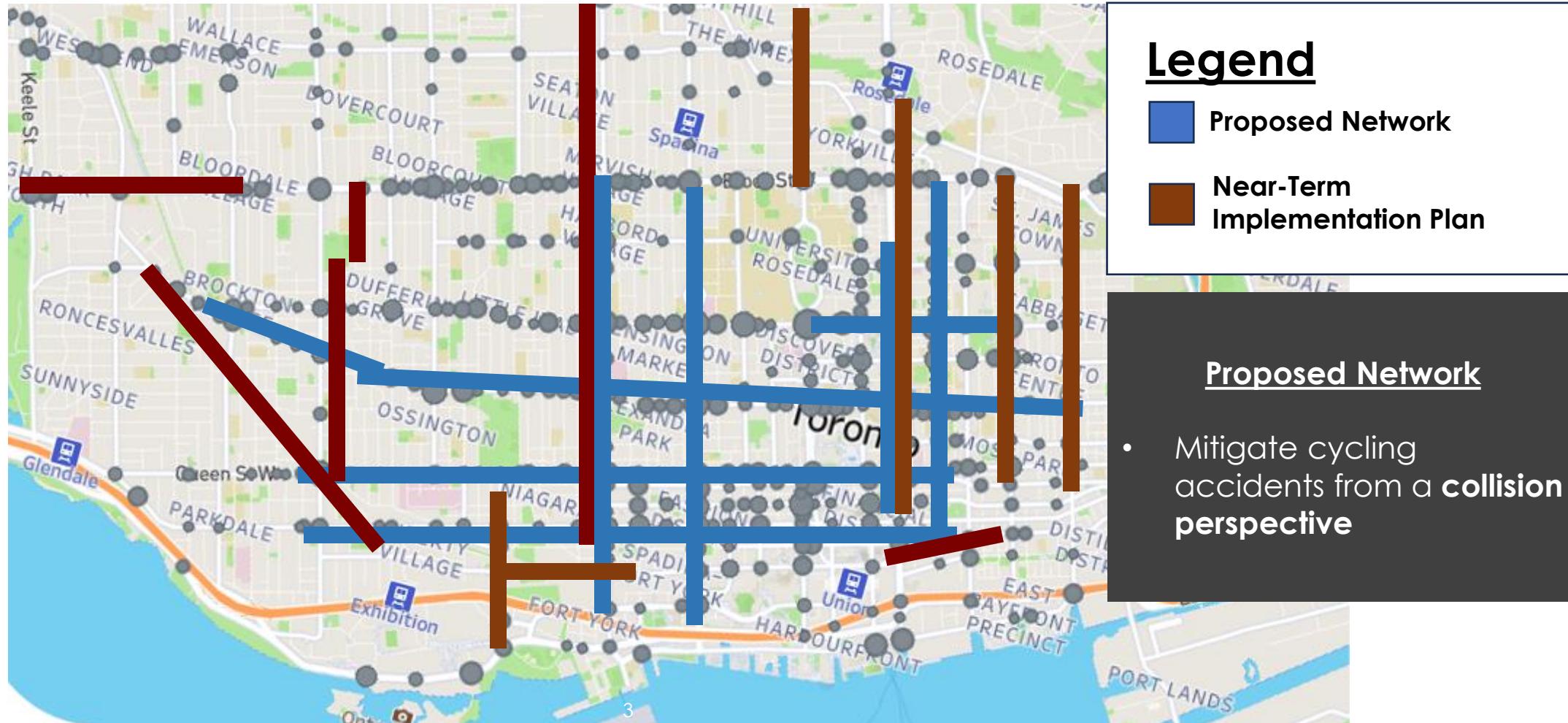
- Underway
- New
- Renew
- Study
- Approved for Future Implementation

# Toronto Near Term Implementation Plan

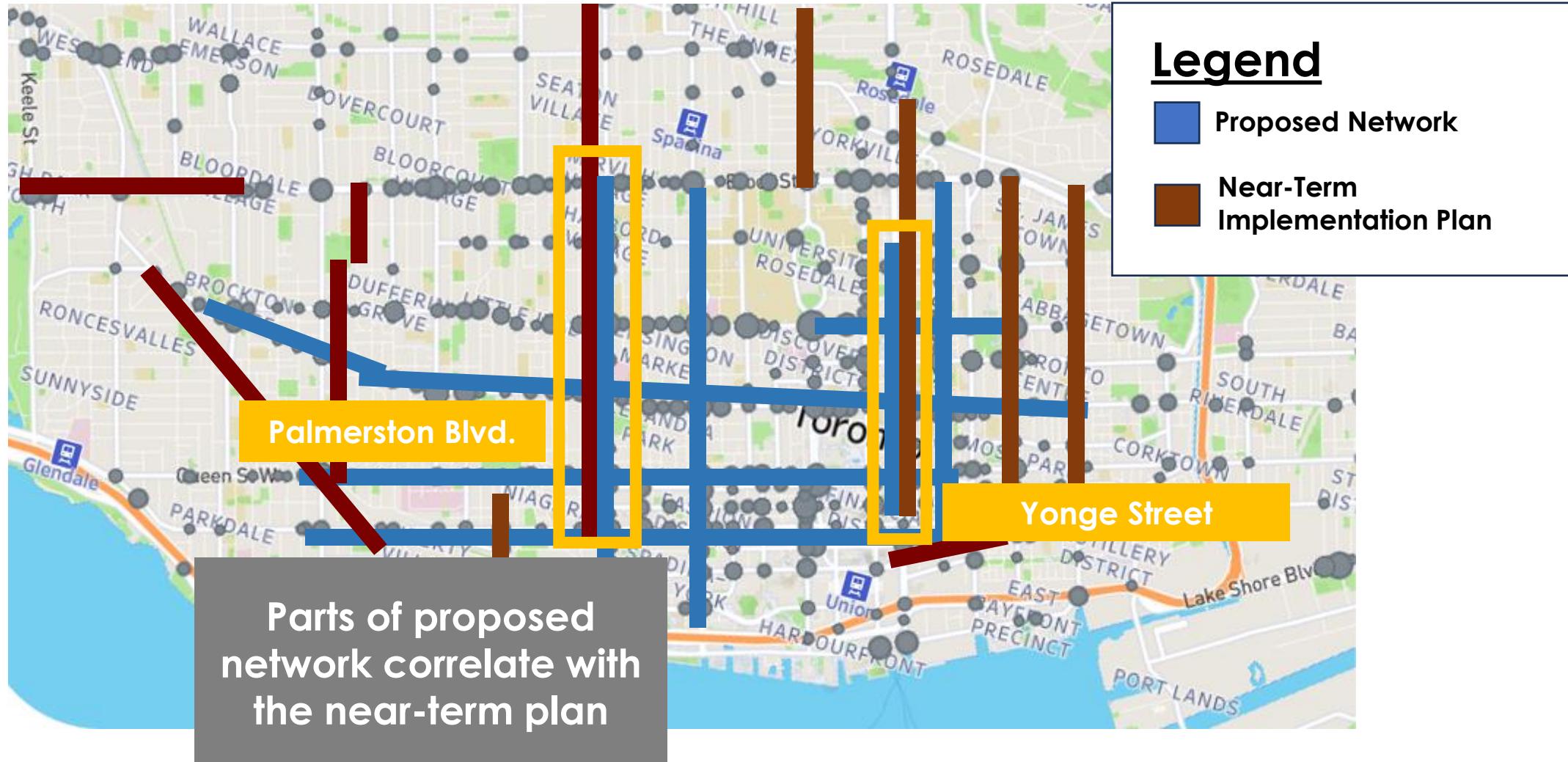


... But also misses key  
collision sites not covered by  
cycling tracks, particularly  
along horizontal areas

# Proposed Network & 2022-2024 Implementation Plan



# Proposed Network & 2022-2024 Implementation Plan



# Map of Proposed Cycling Network by Analysis Scores

The categories (Top, High, Medium, Low) are based on the cycling impact analysis



## Score

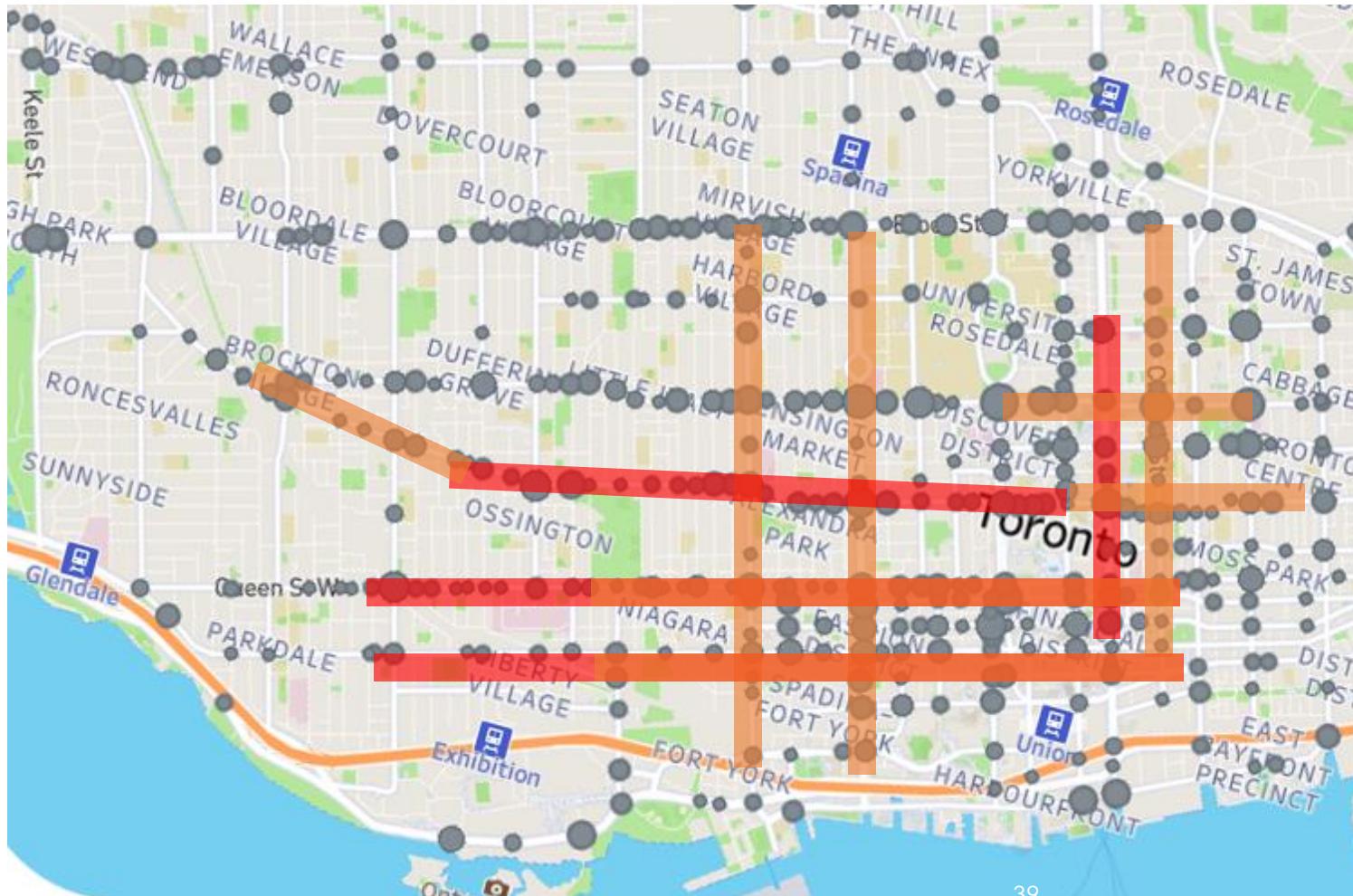
### Context 1

- 36 - 44
- 25 - 35
- 15 - 24
- 1 - 14

\*Cycling impact analysis includes current and potential cycling demand, trip generators, transit access, connectivity, coverage, barriers, safety, and Neighbourhood Improvement Areas.

# Strong correlation with Cycling Analysis Scores

Our proposed cycling network is largely made up of High to Top analysis scores



## Score

### Context 1

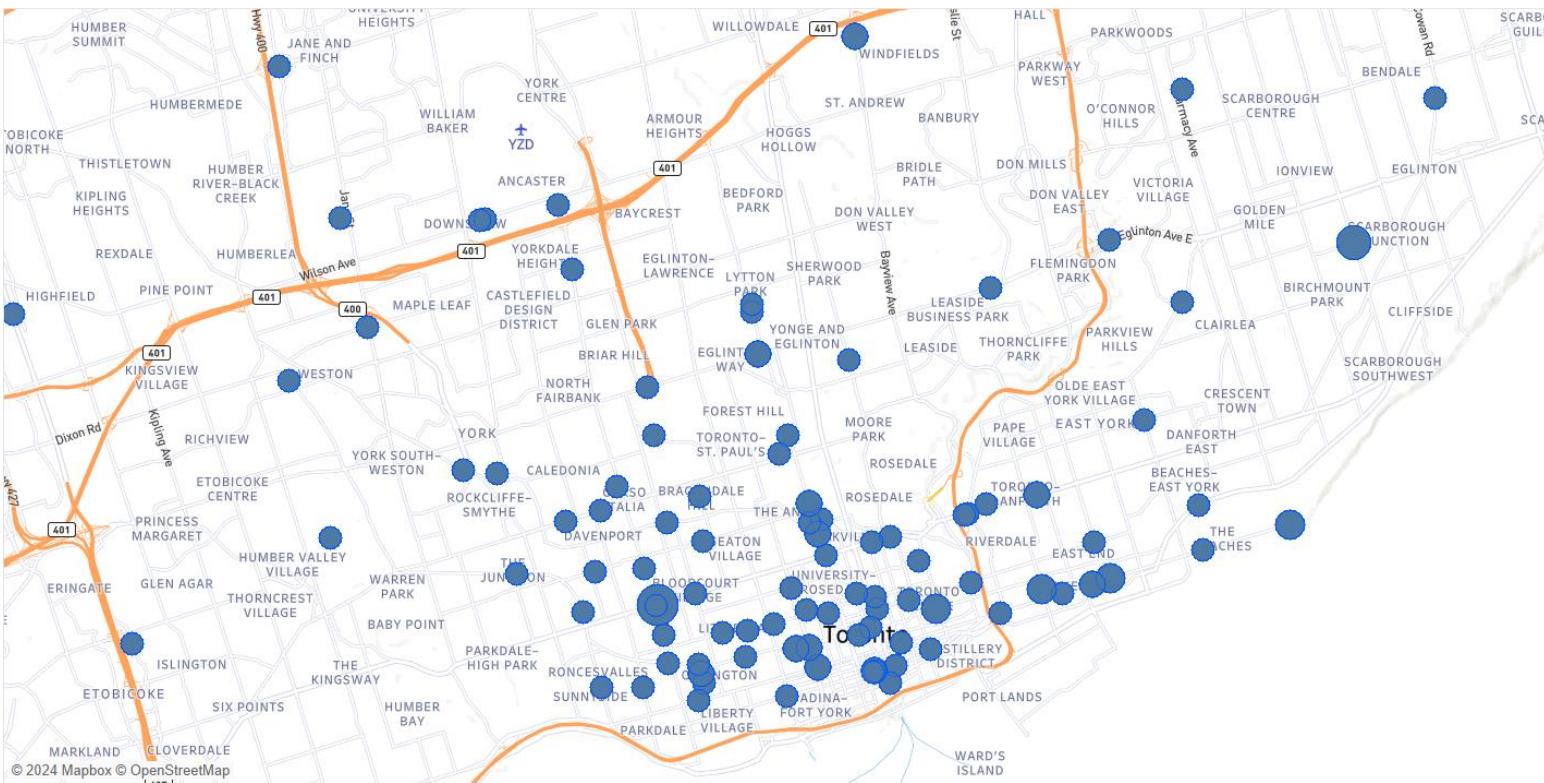
- 36 - 44
- 25 - 35
- 15 - 24
- 1 - 14

High cycling impact  
analysis scores  
reinforce strong need  
for infrastructure

# Recommendations

## 2. Improve Traffic Controls

Increase traffic control in areas with high numbers of “no traffic control” collisions



### 1. Add current bike signages



### 2. Design and add new signage



# Recommendations

## 3. Improve Information Sharing

- Instead of route efficiency, apps should **recommend the safest routes** based on traffic collision data and cycling track type
- Cycling apps should also **advise cyclists to bike or not** based on factors like weather, air quality, temperature and humidity.

### Cycling Conditions



Not Optimal



#### Weather

Cloudy



#### Temperature

Freezing -13C



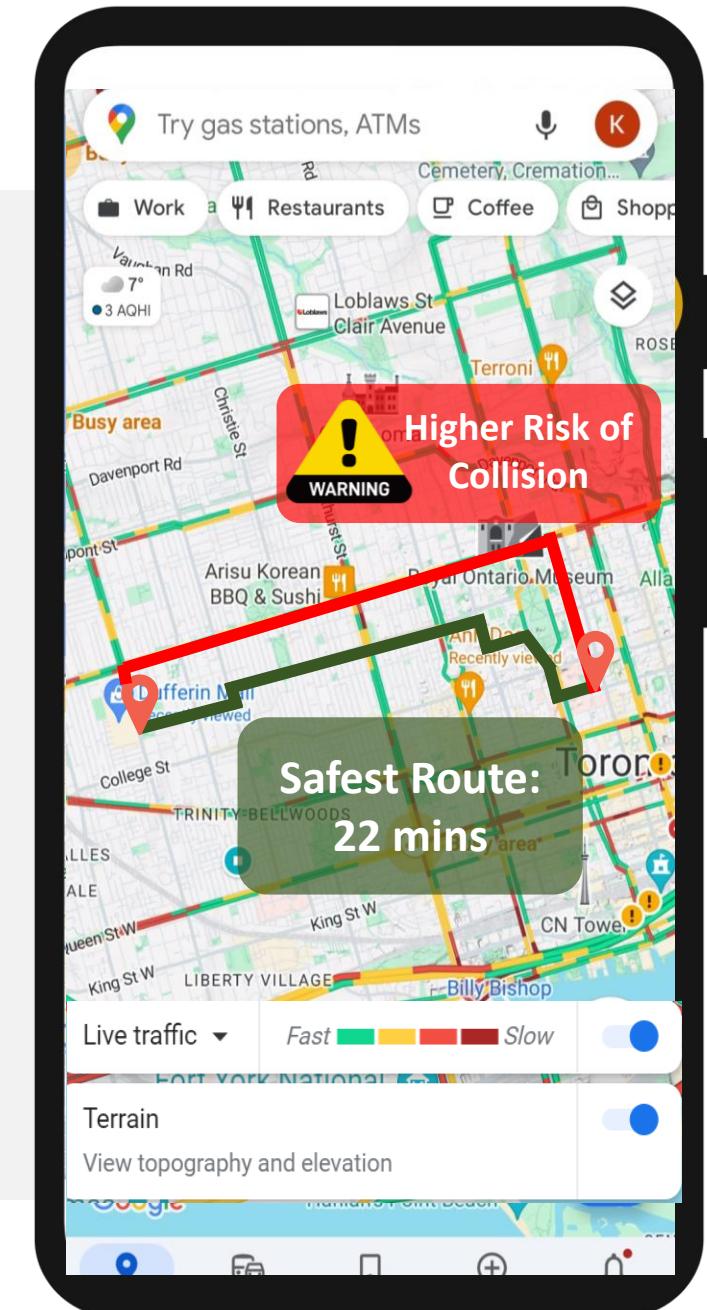
#### Humidity

High, slippery road



#### Air Quality

Poor AQI

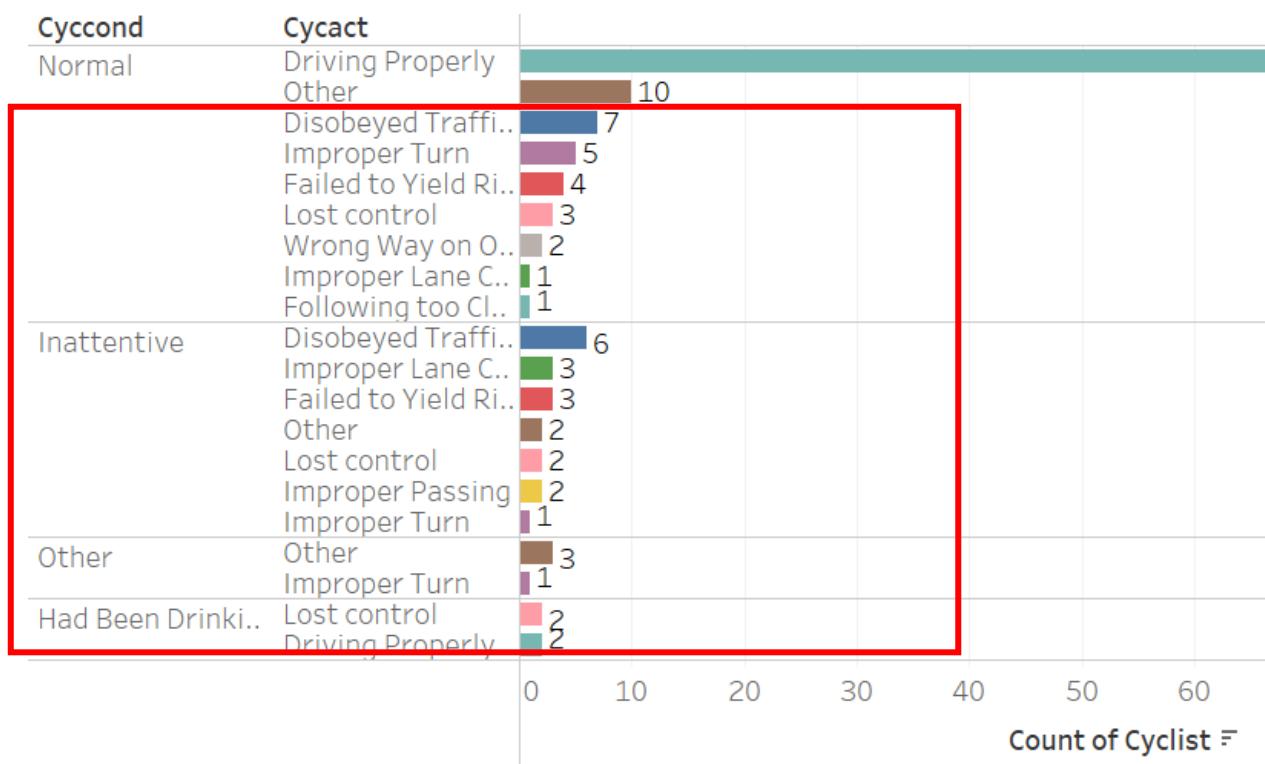


# Recommendations

- Promote and Educate cyclists and vehicle users on Cycling Safety**

Reducing the number of collision other than cyclists who are driving properly

Reasons for Collisions and Conditions of Cyclists



- Emphasize the importance of obey traffic rules by fear appeal (social media)
- Current signages and new signage (social media, in proposed app)
- Promote **Defensive Riding**  
E.g. maintaining a safe distance from other vehicles and cyclists so that road users can react quickly if necessary (social media)
- Proper actions to take before turning (in proposed app)





THANK  
YOU

# Q&A Resources

## Background

Why Study Cyclists?

When do collisions occur?

Why do collisions occur?

Lack of traffic control

Lack of integration

## Proposed Recommendations

1. Integration of Network

2. Improve Traffic Control

3. Information Sharing