Analysis of Cycling Safety in Cambridge Under the Cycling Safety Ordinance Year-3

April 14, 2023

Abstract

This analysis compares reported injury rates on three road segments before and after CSO installations and finds that: (1) substantially more cyclists' injuries occur on street segments with new separated bike lanes, and (2) substantially more motorist injuries occur where there are new separated bike lanes.

John Hanratty

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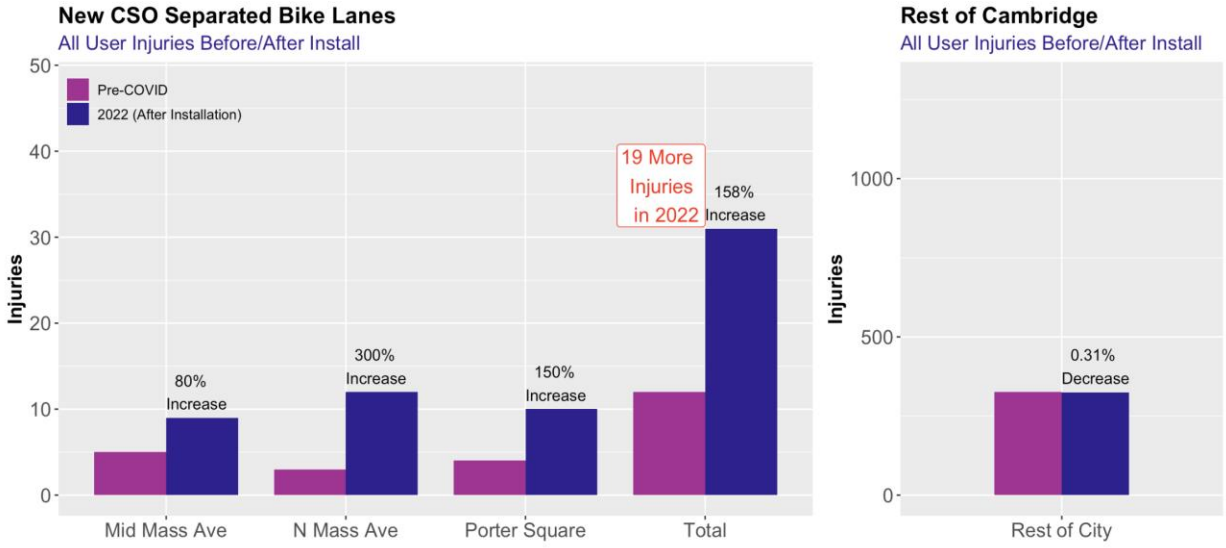
Summary

The Cambridge Cycling Safety Ordinance (CSO) just completed its third year of implementation. This paper measures the actual safety impact of CSO bike lanes. The ordinance requires the City Manager to install separated bike lanes on 22.6 miles of Cambridge's most utilized transportation arteries on a strict schedule over six years. The ordinance does not contain any safety requirements nor address safety impacts on any other modes of transportation, does not create a meaningful review process for this 'first of its kind" law and does not allow adjustment for impacts on roadway congestion, residential parking, or businesses.

This study compares injury rates in the road segments with new CSO separated bike lanes with (1) their pre-COVID levels, and (2) against the rest of Cambridge roads during the same period. The chart below summarizes the study's results showing that road user injuries skyrocketed after installation of separated bike lanes by 158% over pre-COVID rates. This increase occurred while the rest of the Cambridge saw a slight decrease from the pre-COVID level. In 2022, on the 1.3 miles of road where separated bike lanes were installed, 31 road users were injured, including those transported to a hospital, compared to the pre-COVID level of 12 injuries, an increase of 19 injuries.

Cyclist injuries on the 1.3 miles of road with new CSO separated bike lanes **grew from 5.4% to 18.9% of city-wide injuries**.



Injuries for all road users more than doubled after CSO bike lane installations.
(CSO Installations = Mid Mass Ave, North Mass Ave, Porter Square – 1.3 miles total)

The number of cyclists injured increased 260% over pre-COVID numbers, while the rest of the city was 11.5% lower. In 2022, after installation**, the injuries on new CSO separated bike lane sections grew from 5.4% to 18.9% of city-wide cyclist injuries**. This increase in injuries is especially troubling given the drop in bicycle traffic from pre-COVID to present as indicated by the Broadway Eco-Totem (see Appendix A).

This analysis compares reported injury rates on three road segments before and after CSO installations with roads in the rest of the city. The analysis uses the Cambridge Police Department Crash Database[1], which contains a comprehensive listing of crash reports from 2016 to the present. Note that crash reports focus on motor vehicles, thus most bike/bike, pedestrian/bike or bike/road hazards crashes are not reflected in the data. The installations comprise 1.3 miles of the 22.6 miles specified in the CSO on the road sections:

- Mass Ave between Harvard Square and City Hall,
- North Mass Ave near the Arlington border
- Porter Square in 2021 through mid-2022.

A map and links to site descriptions are included in the body of this paper. The segments are located miles apart with different configurations and traffic patterns. However, they mirror citywide roads and conditions except for one difference: new CSO bike lanes. This allows a comparison to the rest of the city as a control group that, overall, did not change. In addition, the 3 new bike lane road sections studied are statistically independent, so we multiply their probabilities. For example, if the odds are 1 in 20 years that the annual results on one section are caused by random factors (other than bike lanes), the odds that all three sections are caused by random events is 1 in 8000 years.

The findings are that:
(1) substantially more cyclists' injuries occur on street segments with new separated bike lanes, and
(2) substantially more motorist injuries occur where there are new separated bike lanes.

Relevant literature supports and interprets these results. This document provides the study's details with interpretation of the findings presented in the final section.

[1] Cambridge Open Data, Police Department Crash Data, (link)

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Acknowledgements

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John Hanratty

Background

Cambridge Streets

Cambridge is a global innovation and academic hub and a central city of the Greater Boston region with about 120,000 residents. The city reaps the cultural benefits of the diversity of ideas, backgrounds, and ethnicities but also from a commercial tax base that provides ample funds for social and equity programs for our residents. Our success depends on an interconnected regional workforce, supply chain, and infrastructure. Our transportation infrastructure carries employees, customers, goods, and services between our city and the rest of region and the world. Cambridge residents represent a fraction of our city's transportation users but depend on safe and efficient mobility to care for their families, support basic needs and pursue happiness. Non-residents use our transportation system to access our diverse businesses, restaurants, cultural scene, schools, and services. Our transportation system must also include parking for vehicles, bicycles, and micro-mobility devices. Maintaining an efficient transportation infrastructure requires a realistic data-driven strategy that serves all users.

Cycling Safety Ordinance

The Cycling Safety Ordinance (CSO) focuses on a small and specific component of the city's street system. The Cambridge City Council enacted the CSO [2] in 2019 and amended it in 2020. The CSO dictates the installation of 22.6 miles of "quick build" or permanent construction separated bike lanes (shown on right) on the city's busiest corridors by 2026. The ordinance mandates a strict timeline and a separated bike lane design with provisions to discourage the City Manager from changing the implementation. Despite the word "safety" in the CSO's title, it does not prescribe any safety requirements for infrastructure design nor does it set safety requirements for bicycles or any other user of the roads. Neither does it provide provisions to evaluate the safety impacts of this ordinance or adjust for consequences such as the impact on businesses, unsafe traffic patterns, or parking supply.

CSO Roadway Changes

This analysis compares the injuries on three new installations with streets in the rest of the city. Before the city installed CSO bike lanes, the three road sections studied had existing and well-used bike lanes alongside parked cars. Painted pavement and lines, visible to all traffic, designated the lanes. The new CSO separated bike lanes, located against the curb, have a 'quick build' configuration that uses paint, adds "flex-posts" and now precast concrete blocks to

[2] Cambridge Cycling Safety Ordinance (link)

separate them from other traffic. The design also specifies an additional buffer zone to protect bikers from 'dooring.' Installations may also include new bus lanes. The net result is fewer automobile travel lanes, removal of most (more than half) adjacent on-street parking, and expansion of commercial parking on to residential side streets. A bewildering array of signs and roadway markings designate time-of-day dependent bus lanes, loadings zones, parking time limits, pedestrian crossings, bike lane warnings, no left turns, no right turns, no turns on red, alternative parking, bus stops, and required lane changes. Intersections often contain new bike signals, in a variety of locations and configurations. The reconfigured automobile travel lanes zigzag unpredictably to accommodate the new configuration, often encouraging drivers to use bus and bike lanes to pass stopped traffic. For long stretches, motor vehicles cannot directly access the curb to drop people off and in doing so block the travel lane, backing up traffic. In certain stretches there is no ability to pull over to take a call, pick up coffee or easily allow for emergency vehicles to pass safely. When letting out passengers, motor vehicles now create a dooring hazard from the passenger side as people exit into adjacent bike lanes. Similarly, pedestrians must frequently cross unsignalized bike lanes when accessing plazas, bus stops or legally parked cars.

Literature Review

The City of Cambridge Bike Plan lays out a vision for separated bike lanes "to enable people of all ages and abilities to bicycle safely and comfortably throughout the city."[3] The Cambridge Cycling Safety Ordinance (CSO)[2], one component of the plan that dictates construction of separated bike lanes and has little or no provisions for improvement or correction.

Experience in other cities show that installation of bike lanes does not guarantee increased ridership. The City of Portland OR, for example, has implemented 77 miles of protected bike lanes since 2014 in a well-publicized bike lane installation program to increase bicycle use. To monitor bike traffic, the city installed 74 automated traffic counters and used volunteers to monitor bicycle traffic at 234 additional locations. "Instead of sharing a raw number from their 2022 count, Portland BOT has decided to compare the data of three, four-year time periods: 2013 to 2016, 2016 to 2019, and 2019 to 2022. Those three periods take us from our plateau (0.5% increase), the beginning of the downward decline (10% decrease citywide), and then the cliff of the final period when PBOT says bicycling dropped by 34.9% between 2019 and 2022." [4] Cambridge's Eco-Totem bike counter on Broadway reports a decline in ridership post-COVID compared to the 12 months immediately preceding COVID, recording an over 23% drop in bicycle counts from March-2019 through March 2020, compared to March-2022 through March 2023 (see Appendix A) .

[3] City of Cambridge Bicycle Safety Plan 2020, (link)

[4] City counts reveal data behind Portland's precipitous drop in cycling, BikePortland, March 2023 (link)

Separated bike lane designs like those dictated by the CSO are not without critics. Jan Heine in *Bicycle Quarterly* writes: "Any barrier that separates the cyclist visually from other traffic effectively hides the cyclist. This is counterproductive to safety. Moving cyclists out of the roadway altogether, on separate bike paths, is even more dangerous, because drivers don't look for (or cannot see) cyclists off to the side." [5] Wachtel and Lewiston (1994) point out that separation of bikes and cars leads to blind conflicts at intersections.[6] Additionally, the confined nature of separated lanes creates conflicts between users of different speeds as the lanes are frequently too narrow to allow for safe passage.

The Cambridge Bicycle Safety web site confirms that 60% of bicycle accidents occur at intersections and states: "crashes that do not occur at intersections are made either *physically impossible* or much less likely by the design of protected bike lanes." [7] This does not account for other auto and bike "co-mingling", such as driveways, loading zones, or disabled access. A paper by Forsyth & Krizek states that "that actual crash data fails to support statements that separated bicycle facilities are safer. This is because most collisions between motor vehicles and bicycles occur at intersections or when turning movements occur, not in the same direction. [8]

Research in 2019 on bicycle crashes in Denver, CO showed separated bike lanes were 3-4 times more dangerous than a bike lane facility shared with cars.[9]

John Forester, in *Effective Cycling*[10] (seventh edition), debunks the claim that bike lanes protect novice or incompetent cyclists. "The argument is that bikeways make cycling safe for incompetent people and that cycling on bikeways can be done safely with less skill than cycling on roads. Analysis of the skill elements required for a safe cycling trip (such as making safe lane changes) on normal roads and on bike-laned roads show that all the same elements are required for each trip." He continues "when cyclists act and are treated as drivers of vehicles, they make safer traffic movements with fewer conflicts with motor traffic than any bikeway design that has been proposed."

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[5] Jan Heine, Bicycle Quarterly, (link)

[6] Risk factors for bicycle-motor vehicle collisions at intersections. Wachtel, A., & Lewiston, D., 1994, *ITE Journal* (Institute of Transportation Engineers), 64(9), 30-35. (link)

[7] Cambridge Bicycle Safety FAQ, (link)

[8] Promoting walking and bicycling: assessing the evidence to assist planners. Built Environment, Forsyth & Krizek, 2010 (link)

[9] The Relationship Between Separated Bicycle Lanes and Bicycle Crashes in Denver, Colorado. Wonsun Chang, MCRP University of Nebraska, 2019 (link)

[10] *Effective Cycling,* seventh edition, John Forrester, MIT Press, 2012 (link)

Research Questions

Do more or fewer cyclist injuries occur after separated bike lanes are installed?

Separated lanes do not protect cyclists at intersections and traffic mixing points with other road users. Literature indicates that "separation" obscures bicycles when they exit the lanes to mix with other traffic. This analysis quantifies the net change in cyclist injuries after separated cycle lanes are installed in Cambridge.

Do more or fewer motorist and pedestrian injuries occur after separated bike lanes are installed?

The new separated bike lanes cause non-trivial road re-configuration that complicates traffic patterns and reduces margins of error for motorists and pedestrians. This analysis quantifies the net change in motorist and pedestrian injuries after separated cycle lanes are installed in Cambridge.

Methodology

Data Source

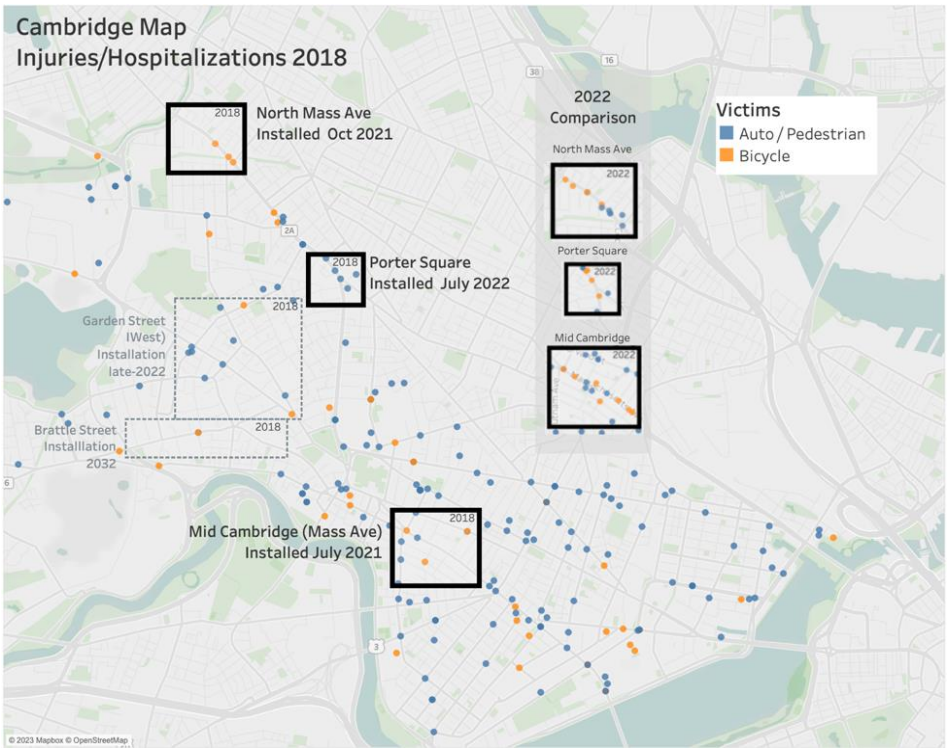
This study investigates the safety impact of the CSO by comparing crash injury data before and after quick build separated bike lane installations. The Cambridge Police Department Crash Database[1] is publicly available and contains a comprehensive list of police reports on motor vehicle accidents. The data consists of each reported incident's date/time and location with the number of motorists, cyclists, pedestrians, injuries, and EMT transports to a hospital. A limitation of Cambridge's traffic data collection is that it focuses on incidents involving motor vehicles. So, this analysis does not include data on injuries from bikes or scooters hitting bikes, scooters, pedestrians, or obstacles. That said, the Crash Database does provide a consistent measure of safety trends over time.

Installations Studied

This study focused on three CSO-dictated road sections along Massachusetts Avenue:

	Area	**Mass Ave Section**	**Installation**
info	Mid Cambridge. (MID)	Trowbridge to Inman	SEP-2021
info	North Mass Ave. (NMA)	Alewife Pkwy to Dudley	NOV-2021
info	Porter Square (PSQ)	Beech to Roseland	JUL-2022

The map below shows the location and extent of the installation areas. The links in the table above provide details on the new configurations on these road sections. The analysis of these areas tabulates the accidents that resulted in injuries, including those transported to a hospital, within about 150 feet of Mass Ave. This qualifier provides objective and conservative numbers but may undercount accidents on adjoining residential side streets resulting from parking removal or traffic diversion.



The three road sections represent an excellent sample to measure the safety impact of new separated bike lanes. The sections are more than a mile apart and have very different traffic patterns. Together, the road sections represent 1.3 miles of the 22.6 miles dictated by the CSO. The difference in location and configuration allows us to assume the sections are statistically independent. This greatly increases the probability that results seen on all three sections are credible and not caused by a random event. The analysis results should help predict the safety impact of the more extensive separated bike lane installations (e.g., MassAve4) planned for Mass Ave and other city streets.

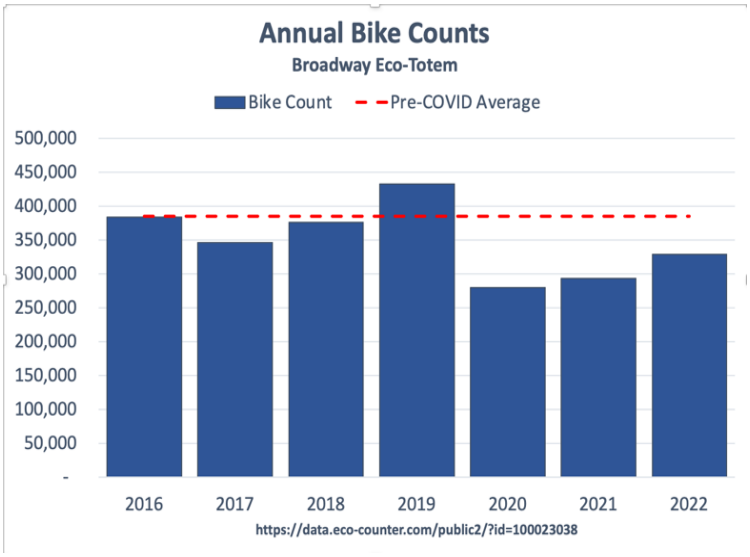
Data Comparison

This analysis compares the number of injuries on the three road sections with new bike lane installations versus the rest of the city. The rest of the citywide numbers act as a statistical control that have the same conditions (e.g., weather, enforcement, pandemics, work-from-home-trends) except for the CSO bike lane installations.

This analysis uses conservative criteria for data collection and measurement. Since the COVID pandemic distorts 2020/2021 numbers, the "before" comparison uses the 12 months before shutdowns started in April 2020 (April1, 2019 – March 31, 2020). Otherwise, comparison to COVID period levels would inflate increases because of the lower counts in 2020/2021.

Increases in bike traffic could cause increases in injuries. Our analysis accounts for traffic increases by comparing injury rates on the new road sections with the rest of the city. Higher bicycle or auto traffic volume would similarly affect roads across the city including the new sections. Since the new installation sections are miles apart, a traffic spike in one area becomes evident. So, the comparison minimizes effects of traffic changes on the results.

The city does not regularly measure traffic volumes to the street level or on major corridors. So, calculating crash rates vs. traffic volume is not possible. The automated bicycle counter on Broadway provides a proxy indicator for city wide bicycle traffic. The chart below shows the annual bicycle counts from this counter. 2022 bicycle traffic is substantially (23%) below pre-COVID counts (see Appendix A). Given this, 2022 increases in injuries are unlikely explained by traffic increases.



Note that Portland OR found the bike lane installations do not result in bike traffic increases.[4]

Given the cost, impact, and effort of bike lanes, one should reasonably expect fewer injuries with moderate ridership increases. The bicycle traffic numbers shown below come from the city's website[11]. However, the website does not describe the sample size, number of days, or collection process. Measurement of ridership at peak hours before and after installation indicates about a 10% increase in ridership during a few chosen days on North Mass Ave.

Even assuming this increase reflects other times, which is by no means certain, it does not explain the larger changes in injury numbers shown by the analysis.

AM Peak Hour	May 2019	May 2022	Percent Increase
Mass Ave	243	267	10%
Cedar Street	5	2	-2%
Linear Park	138	138	0%
PM Peak Hour	**May 2019**	**May 2022**	**Percent Increase**
Mass Ave	216	241	12%
Cedar Street	5	4	-20%
Linear Park	170	123	-28%

The increase in bike ridership on North Mass Ave is about 10%
Source: City of Cambridge website[11]

[11] City of Cambridge Website, Mass Ave - Dudley St to Alewife Brook Pkwy, (link)

Analysis Results

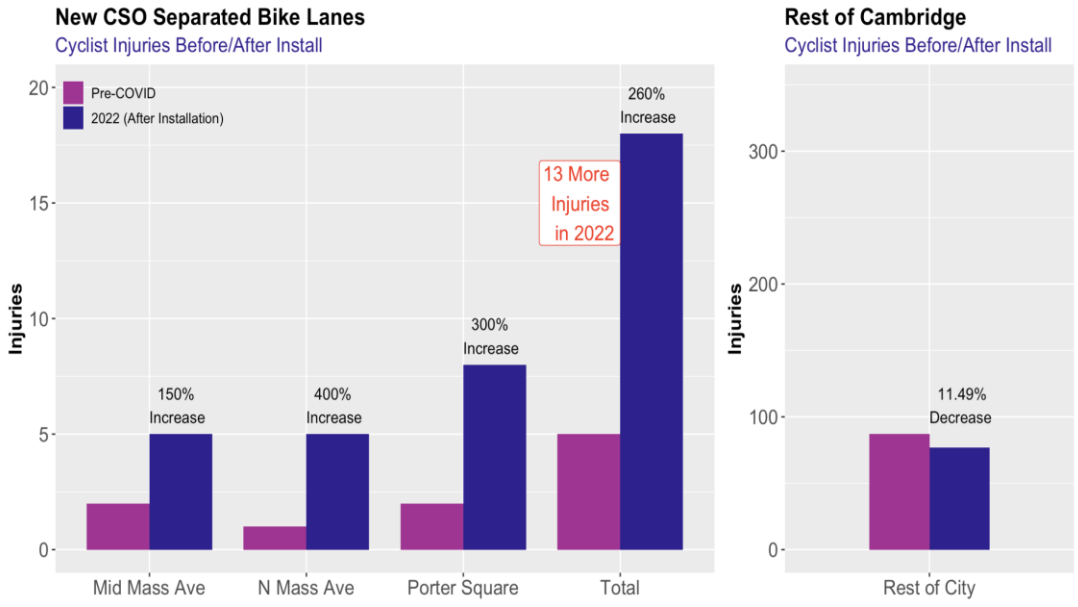
The analysis shows that cyclist and motorist injuries increased substantially on road segments after CSO separated bike lane installations. Although miles apart and having different traffic patterns, all three sections showed considerable injury increases. Mid Mass Ave and North Mass Ave installations occurred late in 2021, so users had time to 'get used to' the new configurations. Porter Square was installed in Mid-2022, so the increase represents only a partial year of bike lanes. The chart below shows in 2022 that 13 more cyclists were injured in 2022 compared to the pre-COVID numbers. One could extrapolate that 226 more cyclist will be injured annually after installing the entire 22.6 miles of the CSO-mandated bike lanes.

Cyclist Injuries

The charts below show the number of cyclist injuries, including EMT transports to a hospital, associated with motor vehicle collisions: (1) in the road sections with new quick-build bike lanes and (2) in the rest of Cambridge. The pink bars show the pre-COVID level of injuries from April 2019 through March 2020. Bike lane installations occurred in September 2021, November 2021, and July-2022, so some effects showed in 2021, but the bulk appeared in 2022.

In 2022, cyclist injuries on new separated bike sections grew from 5.4% pre-COVID to 18.9% of city-wide injuries.

Compared to Pre-COVID numbers, the **sections with new bike lanes had more than double the injuries (260% higher)**, while the rest of the city was 11.5% lower. The "Rest of Cambridge" is a control with no road changes for comparison that accounts for macro issues (e.g., weather, new laws, enforcement, and home offices)**.** In 2022, after installation**,** the injuries on new bike sections grew from 5.4% to 18.9% of city-wide cyclist injuries.

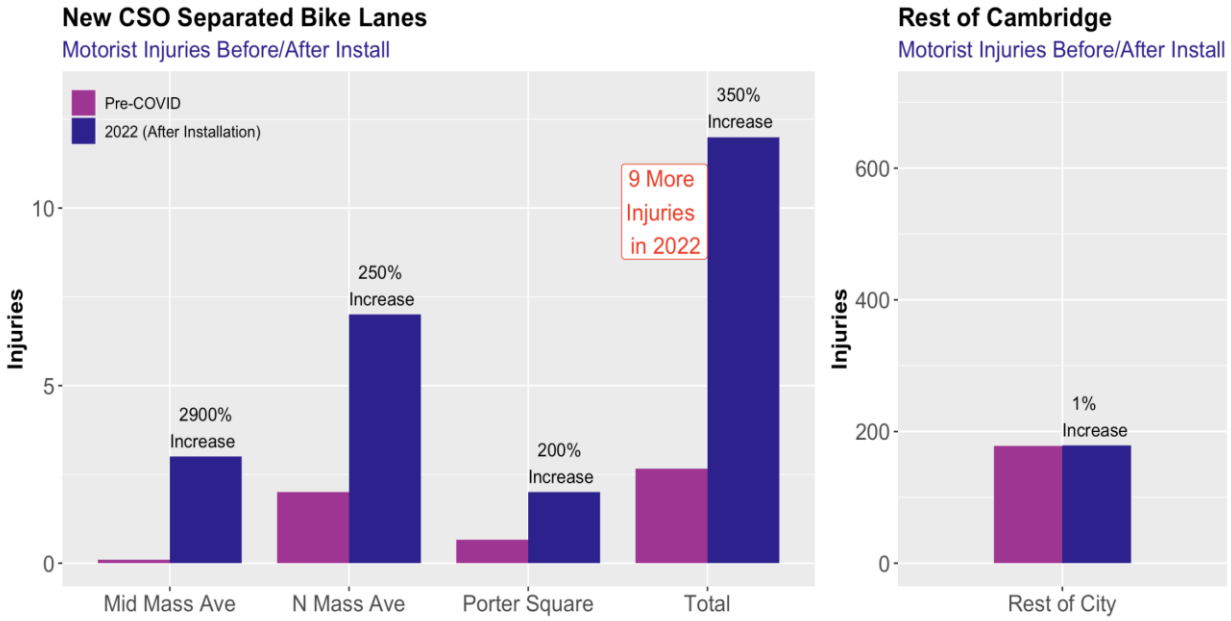


Motorist Injuries

The separated bike lanes changed the dynamics of the road affecting all users, especially for cars and trucks. The charts below show that **motorist injuries more than tripled pre-COVID levels (350% more)** after the bike lane installations compared with a 1% decrease for the rest of the city**.**

In 2022, motorist injuries on new separated bike sections grew from 1.5% pre-COVID to 6.3% of city-wide injuries.

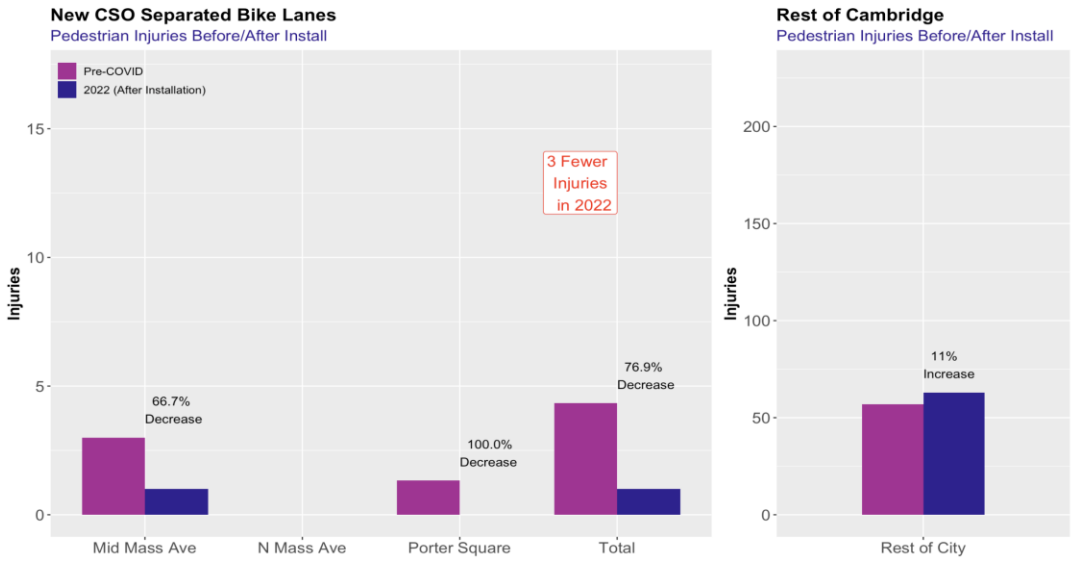
This growth equates to nine more motorists injured in 2022 on the 1.3 miles of road with the new installations compared to the pre-COVID level. The huge increase compared with city-wide numbers could indicate that the new configurations create situations where law-abiding drivers are put at risk by those who do not comply with the new designs. The main difference from city-wide conditions were new bike lanes. In 2022 after installation, injuries on new bike sections grew from 1.5% to 6.3% of city-wide motorist injuries.



Pedestrian Injuries

Unlike cyclists and motorists, pedestrians had fewer injuries in 2022 in the new installation areas with 77% fewer victims than the pre-COVID average. However, citywide, pedestrian injuries increased by 11%. One possible explanation for the large fall is that there are now fewer pedestrians. For example, businesses submitted multiple petitions to the city reporting lower customer traffic and revenues after bike lane installations.

Another possible explanation is that the new bike lanes create a bike/pedestrian conflict zone before pedestrians reach the motor vehicle zone. Without non-motor vehicle data, there is no way to know if there was an increase in bike/pedestrian collisions.



Conclusion

The goal of this paper was to measure the safety record of the CSO. The available data show that motorist and cyclist injuries more than doubled from previous levels in areas where CSO-prescribed bike lanes were installed. This result is found on three road segments that are miles apart and have different traffic patterns. The increase in motorist and cyclist injuries far exceeds the experience of the rest of the city which had a slight decrease in injuries. This result indicates that CSO implementation at more locations will also likely cause more injuries or worse. A thoughtful evaluation and adjustment of the CSO mandates is needed.

The following section presents thoughts and opinions on strategies to improve road safety for cyclists and others.

Policy implications

Cyclists should be safe. So should pedestrians, motorists, skateboarders, scooter riders, and e-bikers. Some of the following observations might help spur thinking about better policies.

- The data indicates that CSO separated bike lanes with posts and buffer zones alone have *not* improved bicycle safety in Cambridge. Motorists bear responsibility for road safety, but this is not enough. Cyclists, skateboarders, scooter riders, and pedestrians must learn to

assume responsibility for their own safety. Bike lanes will never completely protect experienced cyclists, much less inexperienced ones. Potholes, ice, snow, road hazards and equipment failures continue to pose risks to cyclists and those risks are often increased by the installation of separated lanes. Motorists and other users have been trained in 'defensive driving' for years. An unsafe cyclist will defeat any safety measure that the city can implement. The city can help with training, awareness campaigns, enforcement, and requirements. Safety is everybody's responsibility.

- The increase in injuries after installing CSO bike lanes indicates flaws in assumptions, design, and implementation. Bicycle advocacy groups have promoted separated bike lanes to make cycling comfortable and safe for cyclists of all abilities. The findings of this analysis and other research indicate that comfort and cycling safety are contradictory goals. Neither cyclists nor motorists should be 'comfortable' because 'comfort' is apt to create a false sense of safety. Both the CSO's design and its assumptions need re-consideration.

- Cambridge's businesses, schools, and citizens of all ages, ethnicity, and income levels depend on a connected street system. The CSO focuses exclusively on cycling but impacts everyone else. Cambridge is densely populated with a complex transportation system and many users. It is estimated that half the traffic on our streets originates from outside the city. Every resident depends in some way on this traffic that brings employees, students, goods, services, and customers. Cambridge and the larger region need an efficient, integrated regional transportation system that serves all users well. The City's current strategy of installing separated bike lanes creates congestion through reducing travel lanes which conflicts with this important need.

- The only metric defined in the CSO, bike lane mileage, is an inadequate and misleading standard for a project of this size, complexity, and impact. Meaningful goals, measurement, budget responsibility, and accountability are all essential. The best strategy is to define goals for success across all stakeholders and measure them. Currently, measurement and evaluation are, at best, afterthoughts and fail to cover all road users and stakeholders. Credible safety plans must include education, awareness, enforcement, equipment requirements, and certifications.

- Automobile congestion hurts everyone. Automobile injuries occur three times more frequently than biking or pedestrian injuries. Single-vehicle accident injuries have doubled in the past five years, while multi-car, cyclist, and pedestrian injuries have increased by about 10%. Distracted driving might explain some of the increase. Confusing street configurations and signage contribute to the problem. Narrower, zigzag streets reduce margin for error. That a significant amount of traffic is from out-of-town exacerbates this obstacle course's safety impact.

- The number of pedestrians injured by cars in the study areas fell from about three to one annually (does not include pedestrian-bike encounters). The sample size is small, but businesses along these sections sent multiple petitions to the City Council, reporting a

substantial drop in walk-in customers because of the loss of parking and sidewalk access by cars. Fewer pedestrians could explain a decline in accidents. Another explanation is that the city is not collecting the right data to actually track this correctly.

Limitations

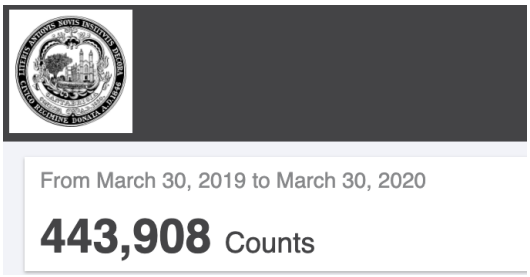
- The COVID pandemic drove 2020 and 2021 statistics down to uncharacteristic levels. This aberration makes comparing previous years more difficult and introduces data variability that affects statistical confidence intervals and significance measures. A "before" installation reference point is required to compare new and rest-of-the-city installations. We could have chosen any previous year or even zero as the reference. We considered an average several years before 2019 but found the data less complete in earlier years. The analysis addressed this by estimating a pre-COVID injury level based on the 12 months preceding the pandemic lockdown on April 1, 2020.

- The CPD Crash Database includes only incidents that involve a motorist. Incidents between cyclists, pedestrians, or other micro-mobility riders are not included. This limitation potentially creates an undercounting of injuries caused by new bike lane installations and encourages a dangerous and misleading over-emphasis on the existing motor vehicles/bike collision data. The results without this data are compelling and instructive but likely under-reports injuries.

- Data availability limited the scope of the analysis. There is no reliable data on pedestrian, bike, and micro-mobility device incidents that do not also involve a motor vehicle. The city does not regularly collect traffic counts for automobiles, bikes, or other road users. The bicycle counts the city does undertake are generally done during more popular biking months and have been postponed when scheduled for days when weather made bicycling less popular. As a result, the data used to support the CSO is biased. The effort and cost of collecting comprehensive data street by street are prohibitive. Therefore, it is not possible to calculate incident rates per user or to verify traffic changes. Ultimately, these data might help answer important policy questions (e.g., Is bike lane traffic increasing? What is the growth of micro-mobility device use?).

Appendix A: Eco-Totem Counter

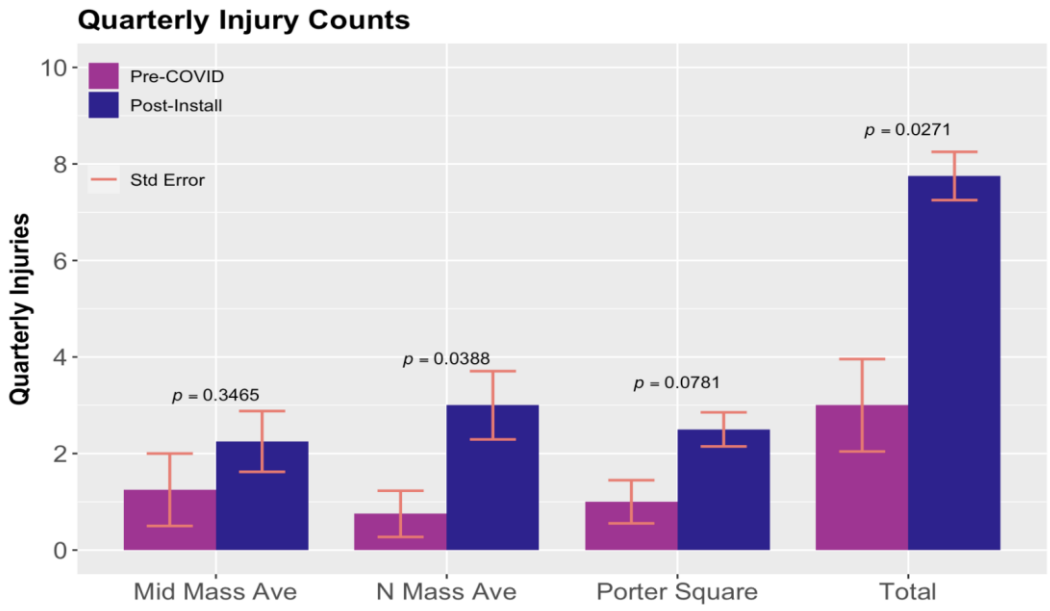
THE Eco-Totem automated counter on Broadway provide bicycle counts from 2015 to present. It shows 23% lower bike traffic in the last 12 months compared with the same timeframe before COVID.



Appendix B: Statistical Significance Study

Independent Statistical Assessment by Serenus Hua, PhD

In all three neighborhoods where separated bike lanes were installed (Mid Mass Ave, North Mass Ave, and Porter Square), both the number of serious accidents (resulting in injury or hospitalization, as reported by the Cambridge Police Department) as well as the number of people hurt in such accidents have increased dramatically following installation of separated bike lanes.



Taking all three neighborhoods in aggregate, we observe a combined 150% increase in the rate of people getting hurt following separated bike lane installation, corresponding to ~20 additional people hurt per year. In comparison, the rest of Cambridge (excluding these three neighborhoods) has experienced a 1.4% increase in the rate of people getting hurt over those same time periods.

To establish the statistical significance of these changes, two-tailed homoscedastic T-tests were performed using quarterly injury/hospitalization totals from before and after the separated bike lane installations. The increase in quarterly injuries/hospitalizations was found to be significant at a 95% confidence level (p=0.0272). In lay terms, that means the approximate likelihood that the increased injuries are the result of random chance is ~1 in 37.

Results for individual neighborhoods varied. For instance, the magnitude of the increase in people getting hurt was as low as 80% (for Mid Mass Ave) and as high as 450% (for North Mass Ave). The likelihood that the observed increases were the result of random chance also varied - for example, in North Mass Ave, T-tests showed the increase to be statistically significant at a 95% confidence level (p=0.0388), i.e., an approximate 1 in 26 likelihood of being due to randomness; however, in Porter Square, the likelihood increased to 1 in 13. These

neighborhood variations may be due to location-specific differences in the real-world safety of the newly installed bike lanes; or, they may be attributed to other factors such as seasonality (e.g., summer vs winter), differential police presence, period of time observed (e.g., only two quarters of post-change data are available for Porter Square), etc. As is, the data implies that some bike lane locations (and designs) impact safety more severely than others, but additional neighborhood-specific investigation is certainly warranted.