



# Bicycling in Cambridge

Data Report 2023

Photo credits: City of Cambridge, Toole Design, Eno Adoghe, Kyle Klein, and Petru Sofio

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DESIGN

# Key Takeaways

1. People are bicycling more and more in Cambridge. Bluebikes data, which represents ridership throughout every day (not just during commute hours), reached the highest number of trips in 2022. The percentage of Cambridge residents bicycling to work is at an all-time high of 9%, and 9.5% of commuters to Kendall Square go by bike. The number of child cyclists has also increased, which relates to the city-wide goal of creating a bike network for all ages.
2. Bicycle crash rates and the number of serious injuries continue to decline, which relates to the City's Vision Zero goal. In addition, the number of people bicycling on sidewalks has decreased which relates to the City's goal of increased safety and comfort for people walking.
3. The COVID-19 Pandemic changed travel patterns for all transportation types worldwide. Although the total count of people bicycling in our citywide program overall was somewhat lower than 2019, increases were measured at some of the intersections counted. Along with other metrics such as cited above, these data indicate that while ridership has rebounded since 2020, the extent to which the pandemic changed travel patterns, or changing street design impacted route choice, remains uncertain. There are also substantial numbers of people using other micromobility devices such as scooters, which indicate that more people are using active travel options even though these numbers are not reflected in the counts of people bicycling. In addition, roadway construction (such as Inman Square and Broadway) adds uncertainty to some of the bicycle volume counts.

## Introduction

The City of Cambridge regularly gathers and shares information about conditions in the city. In this report we share some of the key information regarding bicycling in Cambridge that informs our work and measures the progress we are making towards our goals as articulated in the [2020 Bicycle Plan Update](#). These include:

- Make a significant shift towards bicycling as a sustainable transportation mode;
- Create a transportation system that is safe for and accessible to users of all ages, abilities, and identities; and
- Innovate and be an early adopter of best practices in bicycle infrastructure.<sup>1</sup>

This report highlights progress since publication of the [2020 Bicycle Plan Update](#). Since then, the City of Cambridge ("the City") has installed miles of new bicycle facilities to increase connections in the network of high comfort routes. Policies and legislation including the 2016 Vision Zero Policy, 2016 Complete Streets Policy, 2019 Cambridge Cycling Safety Ordinance, and others continue to guide improvements throughout the city. The City has collected new data to provide an updated assessment of bicycle use and safety. This report explores how these changes have impacted the number of people bicycling in the city, including the various ways this question can be quantified, as well as measuring the safety of people who are bicycling on city streets.

We have also seen the impacts of the COVID-19 Pandemic on bicycle travel, which impacted travel patterns worldwide starting in early 2020. Travel on all modes decreased as many people stayed home, and trips people did take occurred at different times and for different reasons.<sup>i</sup> <sup>ii</sup> While the Public Health Emergency ended in May of 2023, travel patterns have yet to return to their pre-2020 patterns, and the exact impacts of these changes have yet to be fully understood. Because of that uncertainty, charts in this report indicate the start of the COVID-19 Pandemic in early 2020 by a vertical line.

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<sup>1</sup> See Chapter 1 "People, Policies, and Goals" of the 2020 Cambridge Bicycle Plan Update for more information on bicycle-related goals and the policy context: <https://www.cambridgema.gov/-/media/Files/CDD/Transportation/Bike/bikeplan/2020/finalchaptersjune2021/1peoplepoliciesandgoals20210618.pdf>



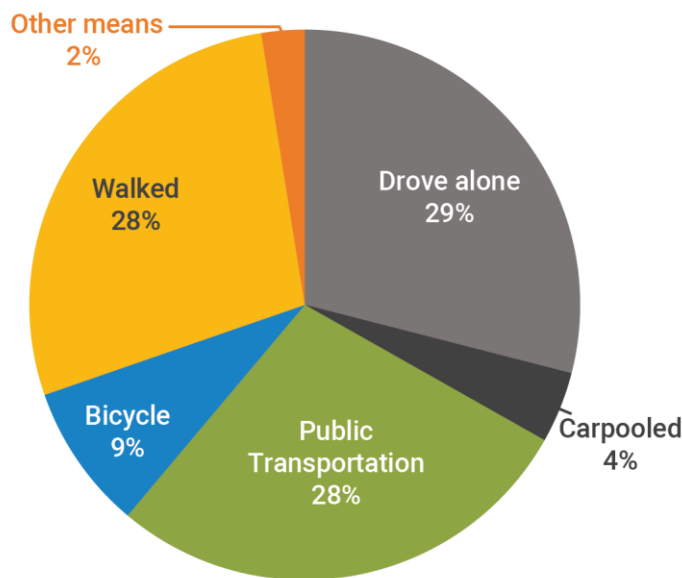
# How Much Are People Biking in Cambridge?

Cambridge has among the highest rates of walking and bicycling in the United States; over a third of Cambridge residents walk or bicycle to work (see Figure 1). Commute trips tend to be the focus of transportation analysis and surveys, yet they represent less than 20% of all trips taken. Other trip purposes – shopping, leisure, personal business, and recreation – constitute approximately 80% of trips.<sup>2</sup>

The shift to remote work due to the COVID-19 Pandemic resulted in a significant decrease in commuting by all modes, including by bicycle, walking, public transit, and car. Although that trend has started to reverse, most U.S. cities still experience commuting volumes below pre-pandemic levels, with nearly 30% of work in the country continuing to be performed at home as of February 2023.<sup>iii</sup>

The U.S. Census Bureau provides data on how employed residents, age 16 and over, commute to work. Of those commuters who continue to commute to work by any mode, the share of people who ride bicycles have steadily increased among Cambridge residents.<sup>3</sup> The percent of commuters biking rose from 7.6% in 2007-2011 to 9.4% in 2017-2021, an increase of 23%.<sup>4</sup>

Car ownership per household in Cambridge has steadily declined since 2000. According to the 2017-2021 U.S. Census, data indicates that 33% of all Cambridge households have no vehicles available at home, and nearly 50% of multi-person households have only one car available. Eleven percent of the population in Cambridge are between the ages of 10 and 18, a demographic that relies more on walking, biking, and public transit for travel instead of driving.



The share of commuters riding bicycles to work has increased by **23%** between 2007-2011 and 2017-2021

Figure 1: Work Commute Mode Split for Cambridge Residents age 16+ Who Do Not Work from Home (2017-2021 ACS 5-year Estimates)

<sup>2</sup> <https://www.transportation.gov/mission/health/commute-mode-share#aboutthedata>

<sup>3</sup> This does not include those who work from home, which has reached over 20% of the employed population in the most recent 5-year estimates

<sup>4</sup> American Community Survey (ACS) 5-year estimates represent data collected over a 5-year period. The 2017-2021 estimate is the most recent available. These multiyear estimates increase the statistical reliability of the data compared to 1-year estimates.

Similarly, surveys of visitors to Cambridge’s commercial districts show that a significant portion – up to 25% – travel by bicycle. Figure 2 shows the share of visitors who arrive by bicycle in the four most recent business district surveys.<sup>5</sup>

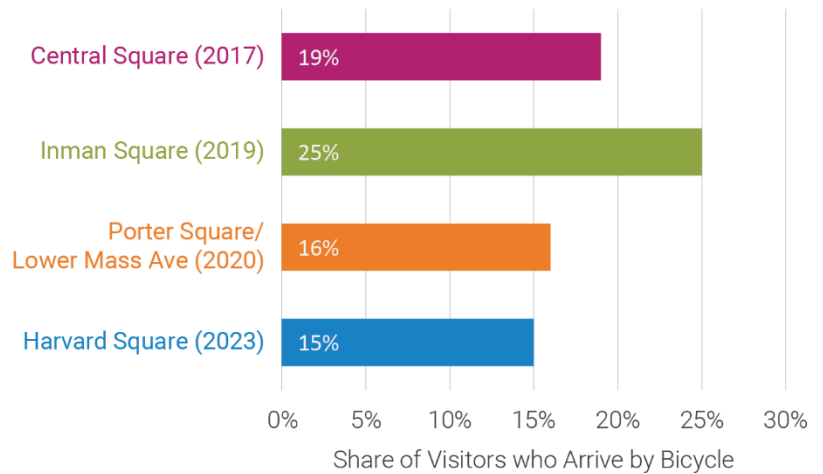


Figure 2: Percent of Business District Visitors Who Travel by Bicycle.

While the impacts of the COVID-19 Pandemic on travel are yet to be fully understood, some evidence suggests bicycling usage remained strong through the height of the pandemic. The Cambridge Redevelopment Authority (CRA) regularly tracks travel patterns in Kendall Square as part of the Kendall Square Urban Redevelopment Plan. The CRA has published a more detailed look into the travel patterns of Kendall Square in the [Kendall Square Mobility Data Report \(2022\)](#), available online, which includes a [chapter on bicycling and bikeshare trends](#).

In 2022, their first year tracking data since the COVID-19 Pandemic disrupted data collection, the CRA found that the commuting landscape had changed since 2019. While the number of people commuting overall fell across all modes, the share of people driving alone, which had been declining through 2019, had increased by 22% while transit commute trips fell by nearly 29%. The share of commuters biking had the steepest increase of 34% to make up 9.5% of trips in 2022, while the share of walking trips also increased by about 15%.<sup>6</sup> Figure 3 shows the changes in the commute mode share to Kendall Square between 2018 and 2022.

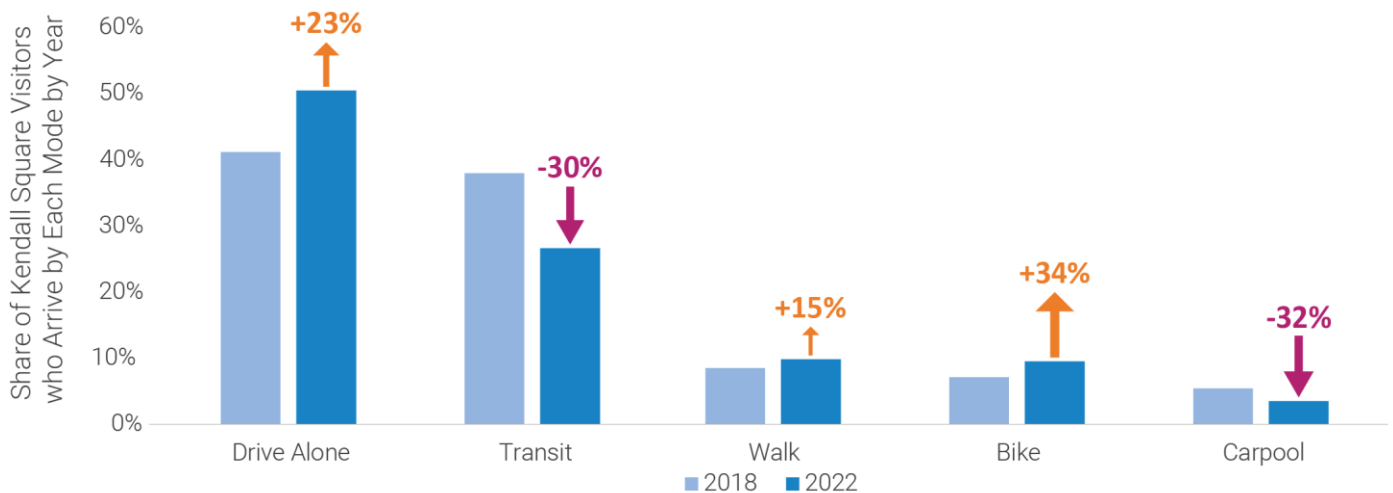


Figure 3: The Change in Commute Modes to Kendall Square Between 2018 And 2022

<sup>5</sup> Surveys in different locales are not undertaken simultaneously: [Central Square](#) in 2017, [Inman Square](#) in 2019, [Porter Square and Lower Mass Ave](#) (between Rindge and Chauncy Streets along Massachusetts Avenue) in 2020, and [Harvard Square](#) in 2023.

<sup>6</sup> <https://static1.squarespace.com/static/51f173a6e4b04fc573b07c0c/t/648cd40525e2d1335181ea6d/1686950917594/2022+Annual+Transportation+Report+Board+Memo.pdf>

# Bicycle Counts

Cambridge gathers regular information on the number of people bicycling in three primary ways:

1. Regular counts of people bicycling on roadways at 16 consistent intersections during traditional peak commute times;
2. Automated continuous counters; and
3. Bluebikes ridership data.

These are supplemented with additional counts that may occur in connection with private development projects or specific roadway projects.

## Counts of People Bicycling on Roadways

Cambridge regularly conducts bicycle counts at 16 consistent intersection locations throughout the city:

- Anderson Bridge & JFK St & Memorial Dr
- Bow St & Massachusetts Ave
- Brattle St & Mason St
- Brattle St & Sparks St
- Broadway & Hampshire St
- Brookline St & Granite St
- Cambridge St & Hampshire St
- Cedar St & Massachusetts Ave
- Chilton St & Huron Ave
- Concord Ave & Fresh Pond Pkwy & New St
- Concord Ave & Garden St
- Massachusetts Ave & Memorial Dr
- Massachusetts Ave & Sidney St
- Massachusetts Ave & Somerville Ave
- Memorial Dr & Western Ave & Western Avenue Bridge
- Putnam Ave & River St

These counts capture morning and evening trips during traditional commuting times and have been collected on September weekdays (Tuesday-Thursday) annually from 2002-2006, every other year from 2008 to 2016, in 2019 and in 2022.<sup>7</sup>

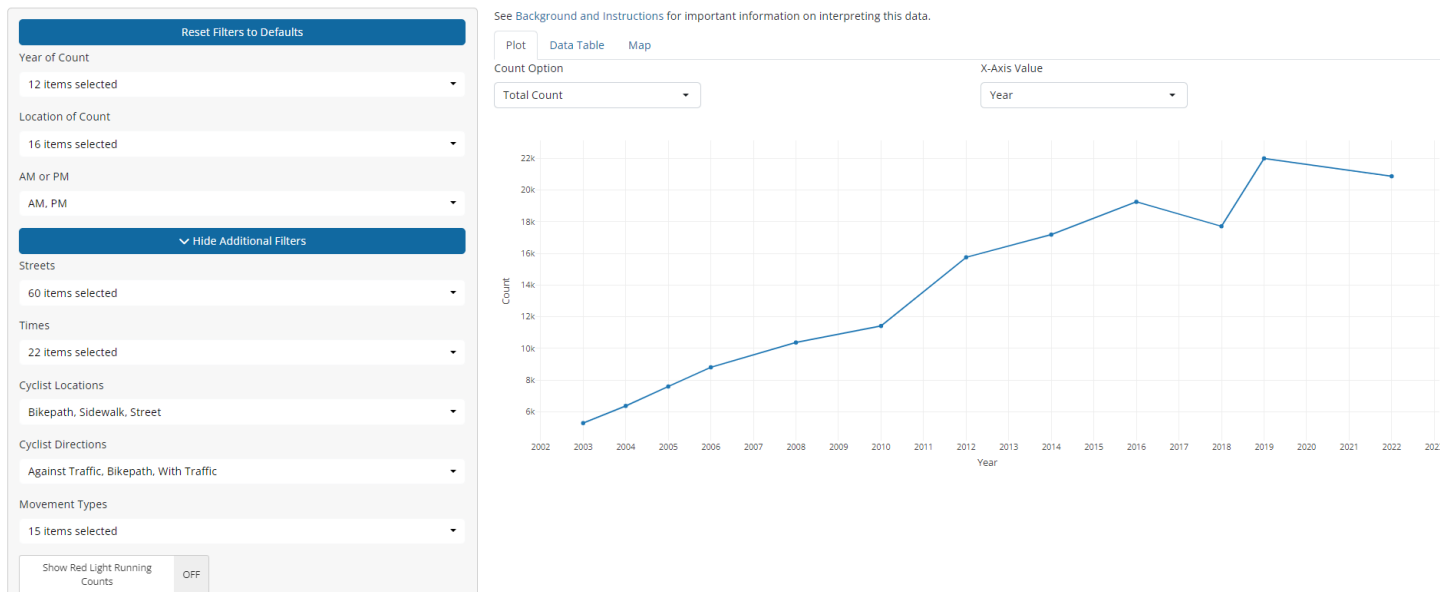
It is important to note that these counts are conducted during peak commuter times, so they do not represent all trips that are taken by bicycle. We use these times since it is a standard metric for measuring trips and traffic and is also consistent over time.

The number of people bicycling passing through the intersections are counted and tallied in 15-minute increments. This is typically done for a period of two (2) hours during the morning commute travel time and again two (2) hours in the afternoon commute travel time.<sup>8</sup> The City has published a [bicycle count data portal](#) where visitors can view, analyze, and download the count data.

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<sup>7</sup> The major reconstruction of the intersection at Inman Square (Cambridge St & Hampshire St in the count data) led to technical challenges in producing an accurate count in 2022. The City conducted supplemental counts in 2023 at this intersection. The data from this supplemental count for Cambridge St. and Hampshire St. is included with 2022 data to maintain continuity of the set of 16 intersections counted 2003-2022.

<sup>8</sup> Traffic counts include two and a half hours in the afternoon, but only two hours are included here for consistency.



A screenshot of the City's Bicycle Count Data Portal. Users can view the data over time using various filters (left)

The total number of people bicycling counted at all locations during the data collection times each year is shown in Figure 4.<sup>9</sup> The graph shows a steady upward trend in bicycling over the years. In total, bicycling increased fourfold between 2002 and 2022. Bicycle counts reached their peak in 2019, with nearly 20,000 people on bikes counted.

In 2022, the first citywide count year after the COVID-19 Pandemic, the number of people counted bicycling citywide represented the second-highest ever count year after 2019. This decrease in ridership, however, was not consistent across each of the 16 count locations. Four intersections<sup>10</sup> had growth in the number of bicycle riders while another two locations<sup>11</sup> had effectively the same count totals between 2022 and 2019. This could, for example, reflect changing route choices, the impact of new bicycling infrastructure, and/or other metrics indicate ridership has rebounded since 2020.

The map in Figure 5 shows the change in riders between 2014 and 2022.

<sup>9</sup> Data for Cambridge Street & Hampshire Street is used from a September 2023 count, as major intersection reconstruction posed technical challenges for counting bicycles in 2022.

<sup>10</sup> Mass. Ave. & Somerville Ave; Anderson Bridge & JFK St. & Memorial Dr.; Bow St. & Mass. Ave.; and Concord Ave & Fresh Pond Pkwy & New St. are the four intersections where counts of people riding bikes grew between 2019 and 2022.

<sup>11</sup> Broadway & Hampshire St. and Cedar St & Mass. Ave. locations had decreases in the count of people riding bikes of less than 1.2% and 0.5%, respectively, between 2019 and 2022.

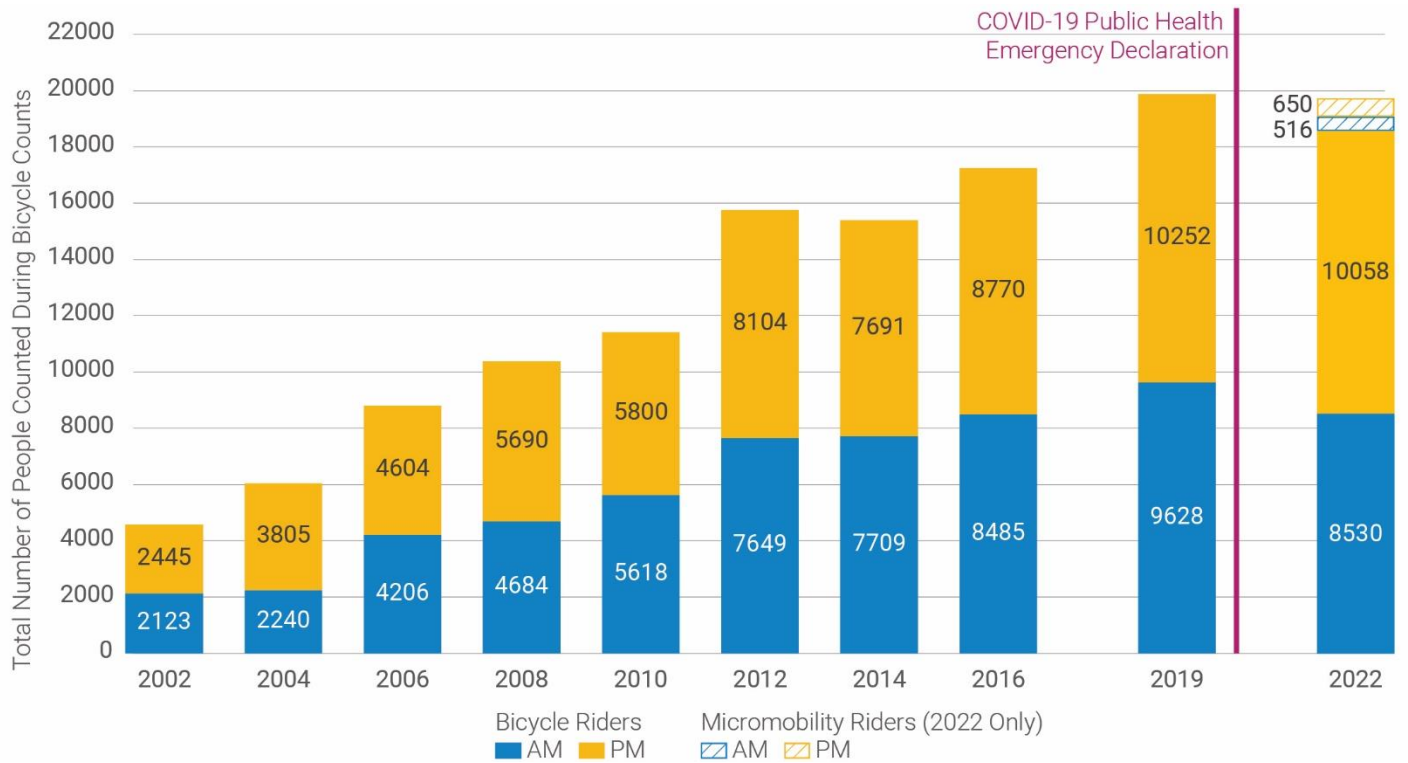
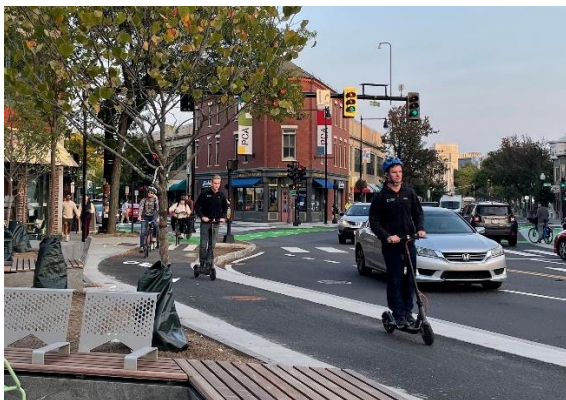


Figure 4: Cambridge Bicycle Count, 2002-2022, Combined AM and PM Two-Hour Peak Counts<sup>12</sup>

## Micromobility Devices<sup>13</sup>

The City recognizes the recent emergence of scooters, one-wheels, and other wheeled micromobility devices and included them in the 2022 counts. Over 850 people using scooters and other micromobility devices were counted in addition to bicycles during the 2022 count program. Figure 4 shows both the volume of bicyclists counted and the volume of micromobility users counted in 2022.<sup>14</sup> Additionally, in 2023, 285 people were using micromobility devices at the intersection of Massachusetts Avenue and Vassar Street which is approximately 8% of those counts on bikes and micromobility devices.



People riding scooters in the bicycle lanes in Inman Square

<sup>12</sup> From 2002-2016, counts were conducted every two years. Between 2016 and 2022, counts were conducted every three years, so there is additional space to represent this extra year.

<sup>13</sup> Micromobility refers to a range of small, lightweight vehicles operating at speeds typically below 15-20 mph and driven by users personally. Micromobility devices include bicycles, scooters, skateboards, and one-wheels and may be human-powered or electric.

<sup>14</sup> Data for Cambridge Street & Hampshire Street is used from a September 2023 count, as major intersection reconstruction posed technical challenges for counting bicycles in 2022.



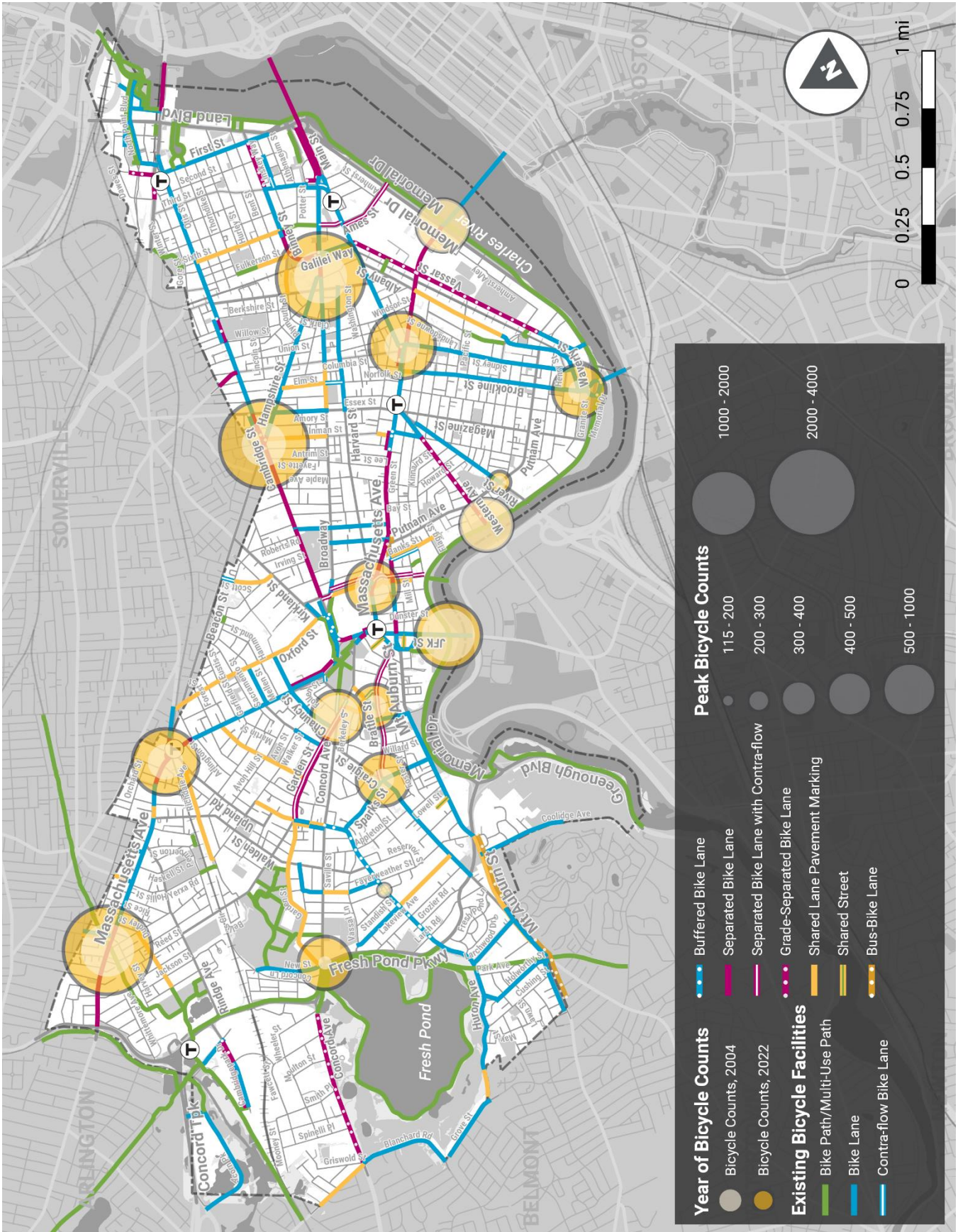


Figure 5: Location of Bicycle Count Intersections, the Number of People Bicycling Counted (2004 and 2022), and Existing Bicycle Facilities

## Child Cyclists

One important trend in Cambridge is the increasing amount of bicycling by children. Between 2014 and 2022, the count of children on bikes at the regular counting locations – including those riding their own bikes or in trailers, on bike seats, or in cargo bikes – has increased by a factor of about 3.5.<sup>15</sup>



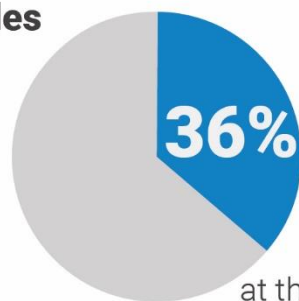
Children riding their bikes in the separated bike lane on Broadway at Third Street

Between 2014 and 2022  
there was a  
**3.5x**  
increase in  
**children counted  
on bicycles**

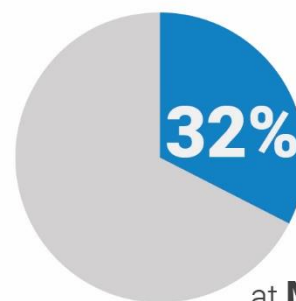
## Additional Counts Examples

The City conducts additional counts at various times and sites in order to provide further information on a specific area or to evaluate localized trends. During recent project-specific counts at Broadway and Hampshire Street in April 2023, for example, people on bicycles account for about 36% of all traffic at peak travel times. At times, bicycle riders even made up a majority of traffic making certain turns. People on bicycles accounted for as much as 80% of all traffic turning from Hampshire Street to Broadway eastbound in the morning peak period.

**people on bicycles  
make up:**



of all vehicles  
at the intersection of  
**Broadway and Hampshire St**



of all vehicles  
at **Mid Mass. Ave.**  
(Mass. Ave. and Sellers St.)

Counts were also taken for all vehicles along Massachusetts Avenue between Harvard Square and Central Square in September of 2023 (at Mass. Ave./Sellers Street). These data show that bicycles represent about one-third of all vehicular traffic there.

<sup>15</sup> As part of the regular intersection count program described in the “Counts of People Bicycling on Roadways” section of this report, the number of children on bicycles increased from 186 in 2014 to 641 in 2022.

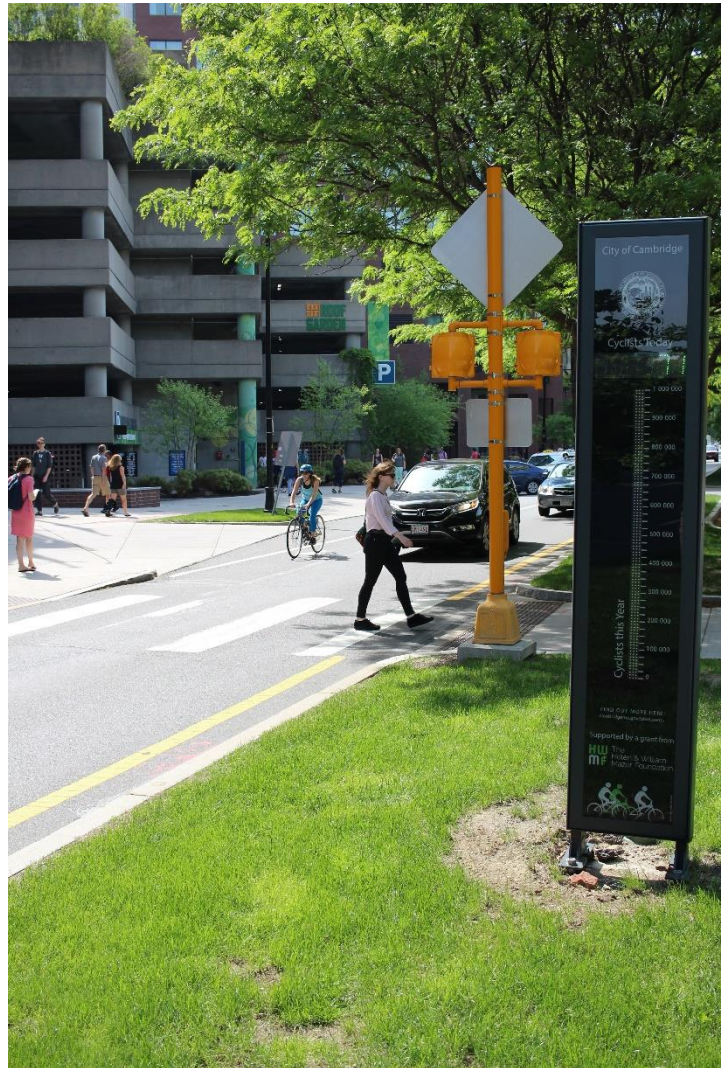


## Automated Counting and New Data Sources

In 2015, Cambridge installed a permanent automated bicycle counter called the “Eco-Totem”<sup>2</sup> in Kendall Square funded by a grant from the Helen & William Mazer Foundation. The Eco-Totem uses detectors installed under the roadway to count people biking. A key feature of the counter is that it displays how many people have passed the counter in real time (on the above-ground monitor). The data is available online through the [Public Eco-Totem site](#) and through the City’s [Open Data Portal](#). Nearly three million trips have been captured at this location since its installation.

The Eco-Totem records each counted bicyclist with a date/time stamp, and does so 24 hours a day, 7 days per week, all year long. This allows for analysis of daily, weekly, monthly, and seasonal patterns. In addition, the Eco-Totem records current weather data to look at the correlation between weather and bicycling. The Eco-Totem and associated data can be used in many ways:

- To publicly show how many people are bicycling and make a statement that “people who ride bikes count.”
- The 24/7 data can be used to analyze daily, weekly, monthly, and seasonal patterns. This can help extrapolate data from other counts.
- The data assist with crash rate analyses.<sup>16</sup>
- Data can be regularly uploaded to the online Open Data Portal.



*The display on the Eco-Totem device on Broadway*

<sup>16</sup> See the Measuring Safety section for more information.

The Broadway Eco-Totem relies on a loop detector in the bike lane, so it misses any cyclists riding outside the bike lane or on the sidewalk. Figure 6 shows the riders captured by this detector from its installation in 2015 through April 2023.

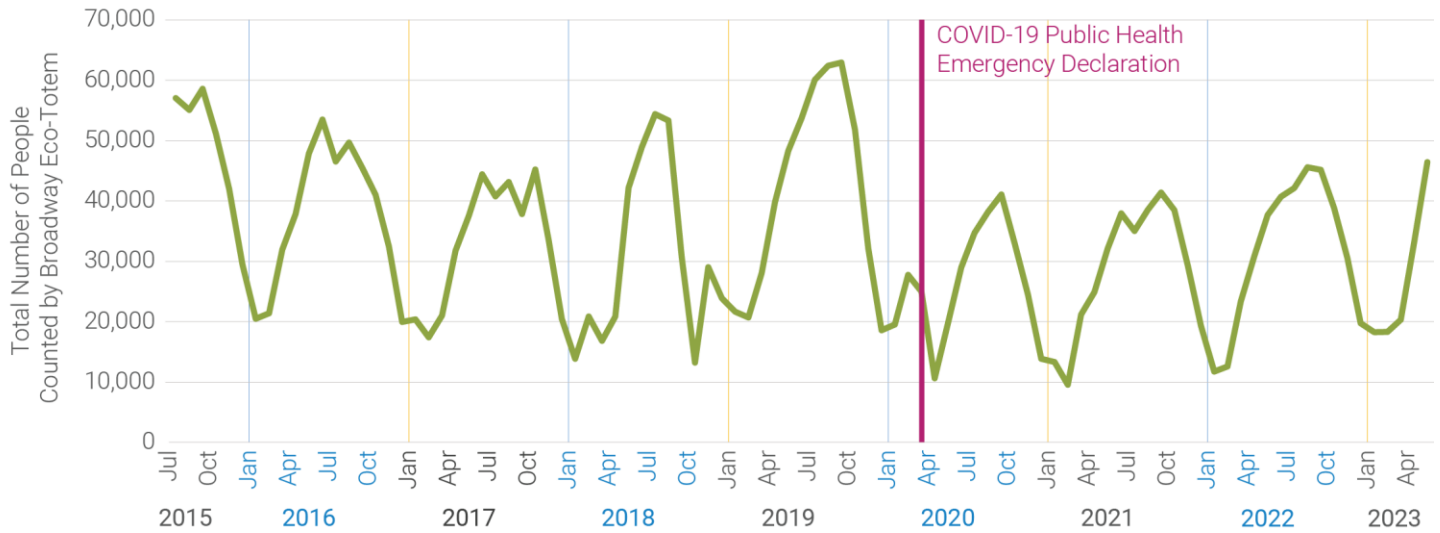


Figure 6: Monthly Bicycle Riders Counted by Eco-Totem on Broadway in Kendall Square, July 2015 - May 2023<sup>17</sup>

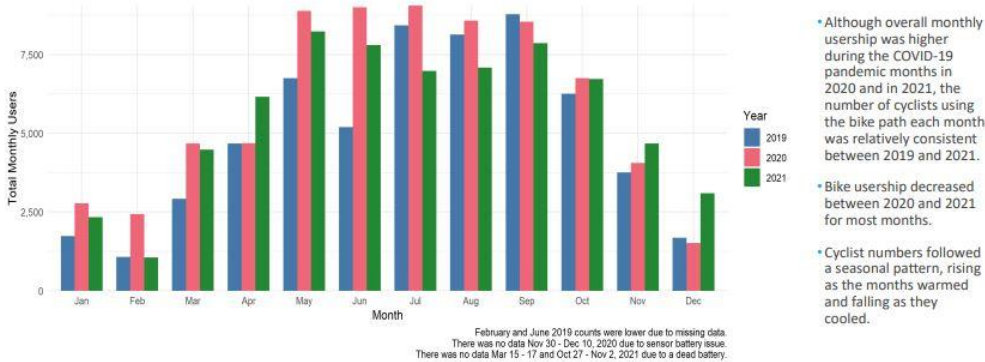
In the Spring of 2023, the Metropolitan Area Planning Council (MAPC) installed a counter located on the multi-use path in North Point/Cambridge Crossing running along Morgan Ave that connects to the Somerville Community Path Extension. This counter uses infrared sensors to count path users in each direction but does not distinguish between people walking and those biking. While it has only been in operation for limited time, tracking at this location shows how ridership is supported by nearby walking and bicycling facilities. Two weeks after the Community Path opened on June 10, the number of people walking and biking had more than doubled compared to when the counter was installed.

The Cambridge Water Department maintains a user counting program with seven automatic user count stations on the multiuse paths around the Fresh Pond Reservation. Some of the sensors have the ability to differentiate between people walking and people bicycling. Quality checks have indicated that the sensors are undercounting users, so the counts available are conservative estimates of the number of people. In 2020, several months saw over 8,000 people bicycling along the path, as shown in Figure 7. A description of the program along with a detailed data report is available at: <https://www.cambridgema.gov/Water/Programs/censusprogram>.

<sup>17</sup> The count of people bicycling is adjusted by a factor of 1.167 to account for people who travel in the general travel lane or on the sidewalk and do not cycle over the ground loop detector. This factor was derived based on comparisons with counts using pneumatic tube technology and manual counts.



## Results Bike Path Total Monthly Cyclists 2019 - 2021



- Although overall monthly usership was higher during the COVID-19 pandemic months in 2020 and in 2021, the number of cyclists using the bike path each month was relatively consistent between 2019 and 2021.
- Bike usership decreased between 2020 and 2021 for most months.
- Cyclist numbers followed a seasonal pattern, rising as the months warmed and falling as they cooled.



Figure 7: Sample chart from the Fresh Pond Reservation users count data

Cambridge is working on opportunities for additional permanent counters in different locations to gain supplementary information and enable more robust data analyses. The City installed automatic counting devices at 16 signalized intersections between 2020 and 2023. These devices by MioVision use imaging to capture the motion of people walking, people on bikes, and vehicles passing through the intersection without recording or storing any video files. While the City is already using this data for real-time traffic information, the efficacy of these devices for tracking people walking and biking over time is still being evaluated as they are still considered to be operating in “beta” mode for capturing walking and bicycling trips.

With the rise of smartphones, many new services enable anonymous location tracking of large numbers of people as they move through the city. The City is evaluating how data from these services may be used to track trends in bicycling riding.



A child rides on a child seat on the back of a bicycle

## Bluebikes

The region's bikeshare system, Bluebikes, has expanded steadily since its introduction in 2011. Usage has increased, especially in the warmer months between April and October, as shown in Figure 8. After a dip in ridership in 2020 following the COVID-19 Pandemic, Bluebikes trips rebounded in 2021 to break previous ridership records and reached their highest-ever levels in 2022. Trips by Bluebike has been particularly strong in Cambridge, with 1.8 million trips starting or ending in Cambridge in 2022. Bluebikes has served over 20 million trips to date.

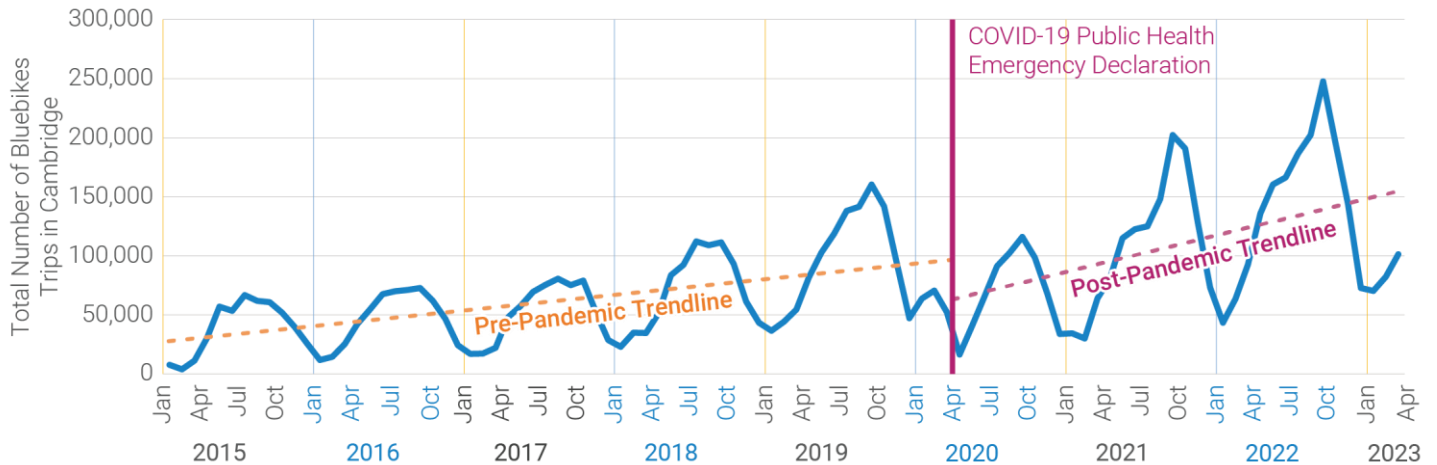


Figure 8: Monthly Bluebikes Trips in Cambridge, January 2015 - May 2023



A person rides a Bluebike in Inman Square in Cambridge



Bluebikes docked at a station in Cambridge

## Factors Impacting Bike Counts

Construction projects can have significant negative impacts on bike trips. Even though the end result of construction projects is usually better infrastructure and safer streets, the process of getting there can be months or even years of disruptive, stressful travel.

Pavement quality, noise, and exposure to construction are all factors people consider when choosing routes; pre-existing facilities may also be removed during a major construction period (for example, bicycle lanes may be removed temporarily and the resulting conditions may be narrow travel lanes that require people to share with general traffic). During construction periods, some people may alter their route significantly, or they may choose another mode of transportation. When construction activities conclude, ridership numbers can be expected to rebound, especially if improvements have been made to the bicycling infrastructure. The effects of construction on individual count locations have been documented in Cambridge several times since bicycle count collection began. The 2015 Cambridge Bicycle Plan discussed the impact that intersection construction had on bike counts at eight locations. After construction was complete, ridership rebounded at those locations.

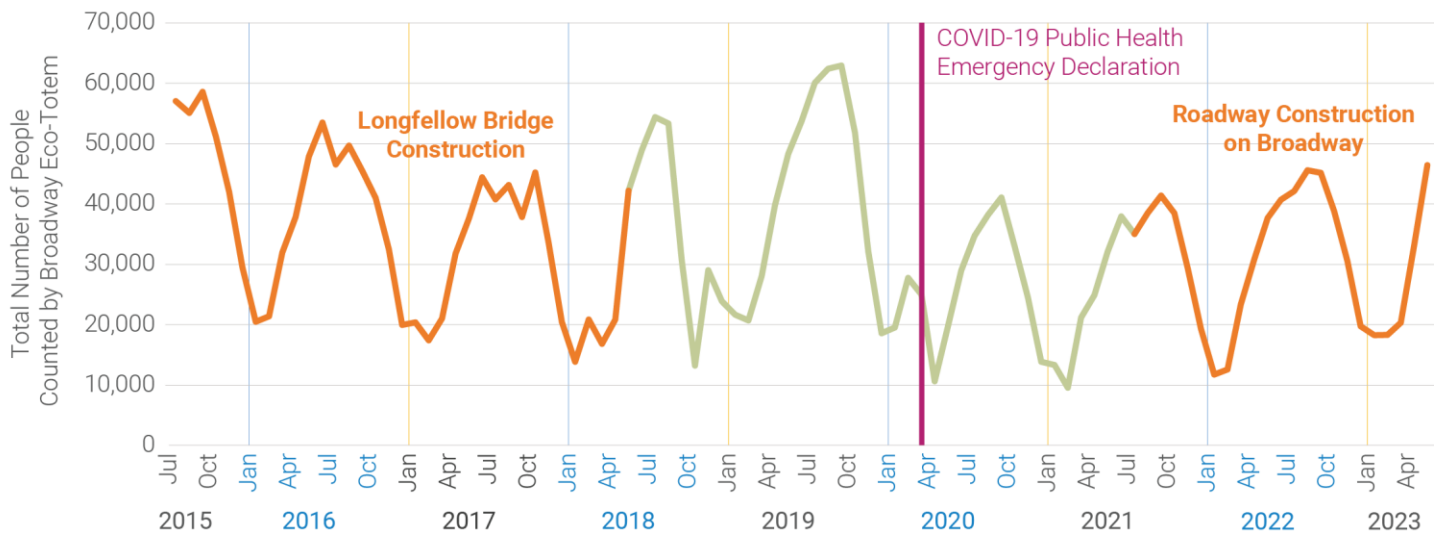


Figure 9: Impact of Nearby Construction Projects on Monthly Bicycle Riders Counted by Eco-Totem on Broadway in Kendall Square, July 2015 - May 2023<sup>18</sup>

Similarly, Eco-Totem bike counts in Kendall Square dropped significantly while the Longfellow Bridge was under construction in 2017 and 2018. Once construction was complete, ridership increased and reached record levels the next month. Ridership has been impacted since late summer 2021 in Kendall Square with ongoing construction on Broadway between Galileo Galilei Way and Ames Street. This project included detours for westbound bicycle riders into a shared vehicle travel lane. Figure 9 shows where these construction projects impacted ridership at the Broadway Eco-Totem location.

<sup>18</sup> The count of people bicycling is adjusted by a factor of 1.167 to account for people who travel in the general travel lane or on the sidewalk and do not cycle over the ground loop detector. This factor was derived based on comparisons with counts using pneumatic tube technology and manual counts.

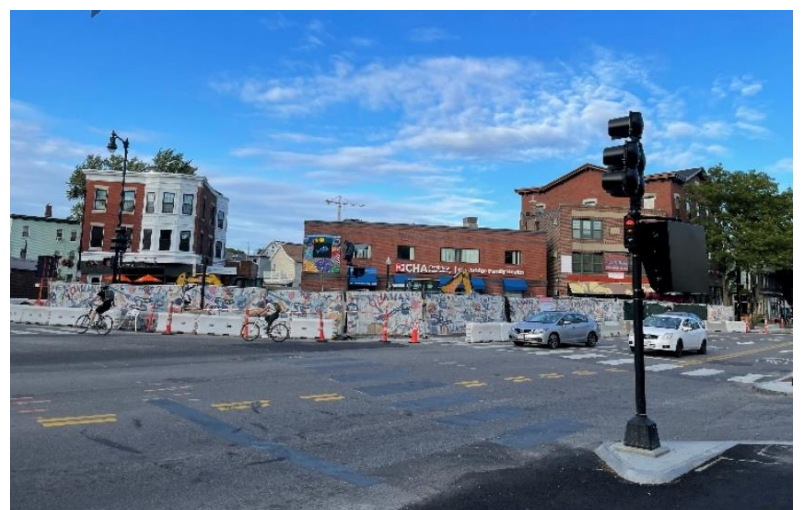




*Two photos showing the extent of the construction on the westbound side of Broadway near Ames Street.*

Construction can also impact the regular intersection traffic count program. Inman Square – the intersection of Cambridge Street, Hampshire Street, Inman Street, Antrim Street, and Springfield Street – is one of the 16 intersections where the City has conducted bicycle counts since 2002. This intersection has also been under major reconstruction to realign the skewed intersection since late fall 2019. Bicycle, pedestrian, and vehicle movements have included various configurations to accommodate the construction of this new alignment, which posed technical challenges for counting bicycles in 2022, so the intersection was counted in September 2023 instead.

In 2022, the Hampshire/Broadway corridor – which sees some of the highest number of people bicycling in the state – was interrupted with major infrastructure in two locations. In addition to affecting the ability to count in the Inman Square area, this likely impacted the overall numbers along the entire corridor, including at the Hampshire/Broadway intersection.



*Two photos showing the extent of reconstruction in Inman Square*



# Bicycle Infrastructure



Examples of Separated Bike Lanes in Cambridge. Broadway (left) features a one-way bike lane separated by a planted curb. Brattle Street (right) features a two-way bike lane separated by flex posts and vehicle parking.

Separated bike lanes are dedicated spaces along roadways for people riding bikes, using micromobility devices like e-scooters, or other mobility devices like motorized wheelchairs. They are physically separated from vehicle traffic and the sidewalk with materials such as flex posts, or raised to a different height.

The City has greatly increased bicycle facility lane miles over the past several decades. From 2004 to 2022, the total miles of bicycle facilities have more than doubled. Significantly, bicycle facilities that are physically separated from motor vehicles have increased by 80%. In the same time frame, the number of people riding bikes counted in the intersection count program nearly tripled. Figure 10 shows how both bicycle facility miles and bicycle ridership increased over these years. Of note, it also shows that there has been a significant increase in the amount of separated bike lanes installed on streets that previously had striped bike lanes.

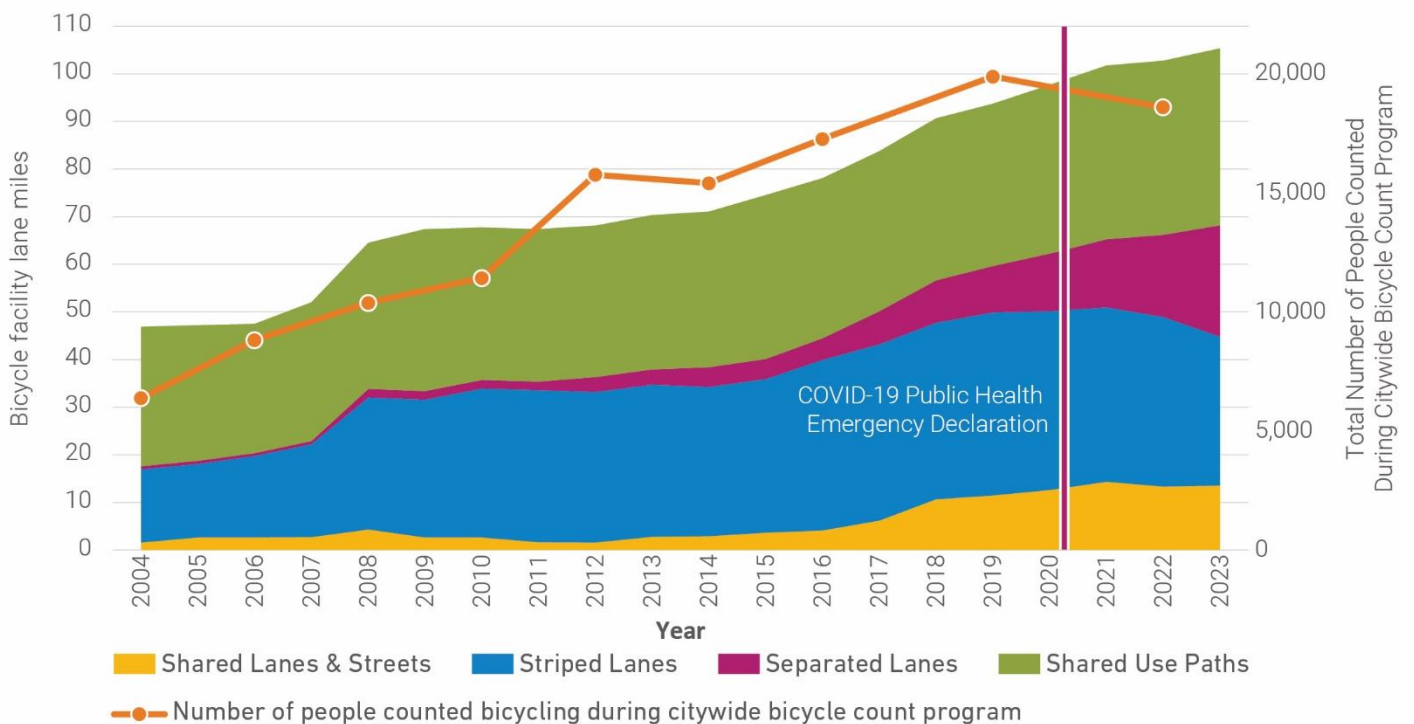


Figure 10: Relationship Between Bicycle Facility Miles and Number of People Counted Bicycling (2004 – 2022)

## Infrastructure Evaluations

The City often undertakes analyses of its infrastructure projects to understand and evaluate the changes that occur after construction. Some projects have extensive changes, of which the bicycle elements are just one part, such as the reconstruction of Western Avenue. Others may be “Quick Build,” or have limited amounts of construction, but still may have significant positive impacts. The full benefits of creating a network of bicycle facilities that enable people of all ages and abilities to choose to bicycle will be most fully realized once the network is more seamlessly connected. That being said, snapshots in the more immediate term can also demonstrate the value of improvements.

### Western Avenue: Full Construction Project

Western Avenue, a one-way street connecting Central Square to Boston’s Allston neighborhood completed in 2016, features grade-separated bike lanes as well as new sidewalks, improved bus stop amenities, pedestrian crossing enhancements, and an expanded public park. Bicycle ridership on Western Avenue at Memorial Drive is 2.4 times higher in 2022 than it was in 2010, the first year of counts before construction started in 2012. The [project’s post-construction report](#) contains further details on the project.



*A person rides their bike past a bus stop on the Western Avenue separated bike lane.*



## Changes on Massachusetts Avenue (Mass. Ave.)

[South Mass. Ave. \(Memorial Drive to Sydney Street\)](#) and a portion [of North Mass. Ave. \(Dudley Street to Alewife Brook Parkway\)](#) are examples of changes done specifically to create separated bike lanes, bus lanes, and safer pedestrian crossing facilities.

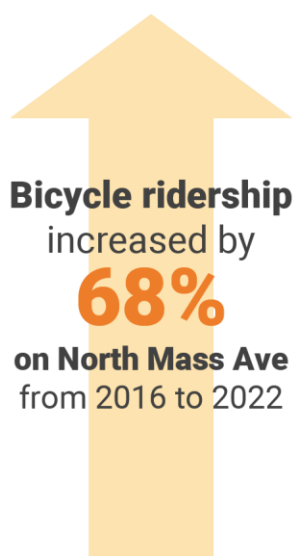
### Mass. Ave. Dudley Street to Alewife Brook Parkway

[Separated bike lanes and bus lanes were installed on Mass. Ave. between Dudley Street and Alewife Brook Parkway in late 2021.](#)<sup>19</sup> There was a 68% increase in bicycle ridership along this corridor between 2016 and 2022, while the number of people riding bikes on the sidewalk decreased by 80% in the same time period. While bicycle ridership on the corridor remained relatively consistent between 2019 and 2022 with less than 1% growth, it tracks stronger than the citywide decline in ridership of 8%.

Due to small sample sizes and randomness of traffic crashes, a minimum of three years of data are needed to assess the safety impacts of corridor projects.<sup>20</sup> The City is therefore tracking crashes that have occurred on the corridor since the bike lane implementation to report on the trends once at least three years of data are available.



*A separated bike lane next to a shared bus and right turn lane on Mass. Ave.*



<sup>19</sup> For more information about the ongoing project to continue constructing separated bicycle lanes on Mass. Ave., please visit <https://www.cambridgema.gov/Departments/publicworks/cityprojects/2021/massave4massavepartialconstruction>

<sup>20</sup> For example, the Highway Safety Manual requires 3 to 5 years of crash data for use in safety evaluations <https://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/sec6.cfm>

## South Mass. Ave.

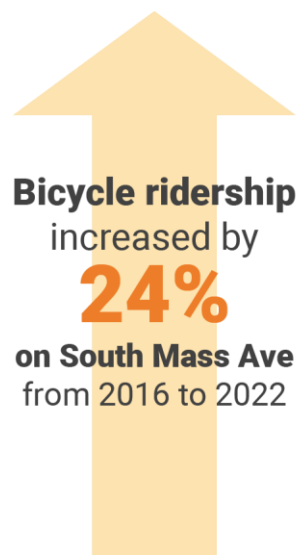


People riding bikes in the separated bike lane that was installed as part of the South Mass. Ave. project; the image also shows the pedestrian island and rapid flash beacon (RRFB) installed to improve the crossing.

[Separated bike lanes and bus lanes were installed on Mass. Ave. between Memorial Drive and Sydney Street in 2019](#) (and additional improvements were made in Spring 2022). Analysis of bicycle counts pre- and post-implementation shows that between 2016 and 2022, 24% more people ride along the corridor while the number of people riding bikes on the sidewalk decreased by 82%.

In the four years before the installation of separated bike lanes (2015-2018) nine (9) bicycle-involved crashes were reported, while only two (2) were reported in the following four years (2019-2022).

The City will continue to track the rate of crashes along this corridor.





At the intersection of Mass. Ave. and Vassar Street, the City started counting bicycles in 2010. While this means the intersection is not included along with the citywide counts that started in 2002, the trends at this intersection, where the separated bike lanes on South Mass. Ave. and Vassar Street meet, show a dramatic increase in the number of people bicycling. Additionally, a significant number of people on micromobility devices like electric scooters were counted in the most recent counts in 2023.

Figure 11 shows the AM and PM two-hour peak counts at this intersection from 2010 to 2023. Note that the intersection was under construction in 2016 with police officers closing travel lanes and redirecting traffic, which likely explains the dip in riders counted that year.

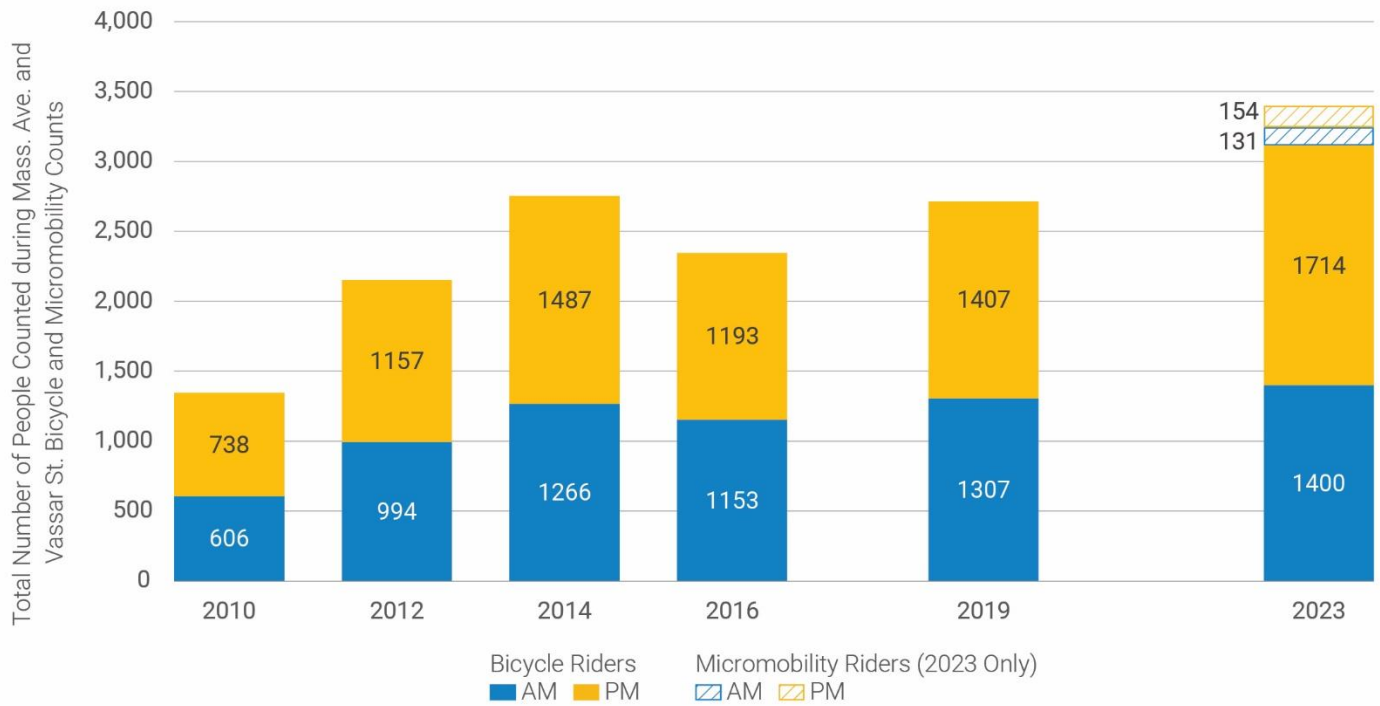


Figure 11: Mass. Ave and Vassar St. Combined AM and PM Two-Hour Peak Counts (2010 – 2023)



People riding bikes on South Mass. Ave. at the intersection with Vassar Street



## New Connections

In 2020, the City installed new bicycle connections along [the corridor from Memorial Drive, along DeWolfe Street, Bow Street, and Quincy Street to Memorial Hall](#). This enabled people traveling by bike to travel in a fully separated contraflow bike lane. The value of this connection is demonstrated in the high number of people cycling counted using the contraflow lane. During the 2022 traffic counts at the intersection of Bow Street and Mass. Ave., there were **430 cyclists** using the contraflow lane out of a total of **976 cyclists** in the intersection.



*Cyclists using the contraflow bike lanes on DeWolfe St at Mt Auburn (above) and the bi-directional separated bike lane on DeWolfe at Memorial Drive (below)*



# Measuring Safety

Crash rates are a critical concept in traffic safety. A crash rate is the total number of crashes per total miles traveled. It can be misleading to look only at the number of crashes without also considering how many people are traveling (in the case of this data report, bicycling). If the number of bicyclists increases faster than the number of crashes, then that means the crash rate is lower, and safety is improving. While everyone wants to reduce the number of crashes, the context of the crash rate is vital to get an accurate understanding of bicycle safety.

$$\text{Crash rate} = \frac{\text{Number of crashes involving a bicyclist in a year}}{\text{Amount of bicycling in Cambridge in a year}}$$

A second important issue is that crashes involving a bicyclist or pedestrian are not all equal. Crashes that involve serious injury or death are of course far more tragic than crashes with minimal or no injury. This is why the City adopted a [Vision Zero Policy](#) in 2016. [Vision Zero](#) is a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, and equitable mobility for all. The U.S. Department of Transportation adopted the Safe Systems Approach in 2022. This states that streets should be designed “to be forgiving of inevitable human mistakes, so that serious injury outcomes are unlikely to occur.”<sup>21</sup> As safer street designs are implemented across Cambridge and to track progress on our Vision Zero Goals, we look to understand the trend over time of serious injuries versus minor or no injuries.

In communities including but not limited to Cambridge, it is a challenge to obtain complete data on the number of crashes, the severity of crashes, and the amount of bicycling occurring. The following Bicycle Crash Data section details how crash data is collected and reported, and outlines methods to estimate how much bicycling is occurring in Cambridge. In measuring our progress on crash reductions – specifically the crash rate trend over time as well as the crash effects – the most important aspect of the analysis is to do it as consistently as possible.

As discussed in the Bicycle Infrastructure section, the number of people riding bikes in Cambridge has increased dramatically as more bicycle infrastructure has been built over the years. By measuring crash rates instead of the total number of crashes, we can control for this increase in ridership to evaluate the safety impact that each rider will experience.

## Bicycle Crash Data

Determining the crash rates of motor vehicles with bicyclists and pedestrians is challenging for a variety of reasons. In the U.S., bicycle crashes tend to be under-reported because of the typically flawed design of reporting systems. In Massachusetts, crash reports are not required unless the crash results in over \$1,000 in property damage or a serious injury or fatality.<sup>22</sup> Often, there is lack of clarity on the police reporting form to clarify that the “vehicle hit” was actually a person walking or bicycling. Because the cost of repairing or replacing a bicycle after a crash may not meet the minimum property damage threshold, many bicycle-involved crashes may go unreported altogether.

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<sup>21</sup> <https://www.transportation.gov/NRSS/SafeSystem>

<sup>22</sup> <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXIV/Chapter90/Section26>



Since regular bicycle counts started in 2002, Cambridge has improved practices for how the Cambridge Police Department (CPD) collect data about bicycle crashes. Even with this increased vigilance in reporting, not all crashes are reported. The reported crashes tend to be ones that are more severe, and those that involve a motor vehicle. In addition, Cambridge’s data collection policies only apply to crashes on streets under the jurisdiction of CPD. Some major Cambridge roads, like Memorial Drive and Alewife Brook Parkway, are under Commonwealth of Massachusetts jurisdiction and therefore are reported by the State Police which follow different reporting policies and procedures.

The crash data collected in Cambridge is much more comprehensive than the data collected in many other municipalities. It includes any time any kind of incident that is reported to the police. Unfortunately, most places do not collect comprehensive bicycle crash data, and do not collect records where no injury occurred. This makes any comparisons between communities difficult.

Figure 12 shows the frequency of reported crashes according to location; this is a sum of all bicycle crashes<sup>23</sup> over the five-year period from 2018-2022. One crash is represented by a light blue color; places with multiple crashes are darker blue, and yellow/orange highlights where crashes were most frequent. Crashes tended to be more frequent in areas with high bicycle activity. Locations where off-street paths and separated bike lanes meet the street network, like Broadway at Gallileo Galilei Way, Charles River Dam Road near North Point Park, and points along Mass. Ave. have higher numbers of reported crashes, shown in yellow on the map. Most crashes tend to concentrate along major roads, which is where nearly all of the blue or yellow regions of the map are located.



*People riding bikes and jogging on a shared use path*

<sup>23</sup> Crashes that note cyclist involvement in the non-motorist description or events fields of the Police Department Crash Data are included in this analysis: <https://data.cambridgema.gov/Public-Safety/Police-Department-Crash-Data-Updated/gb5w-yva3>



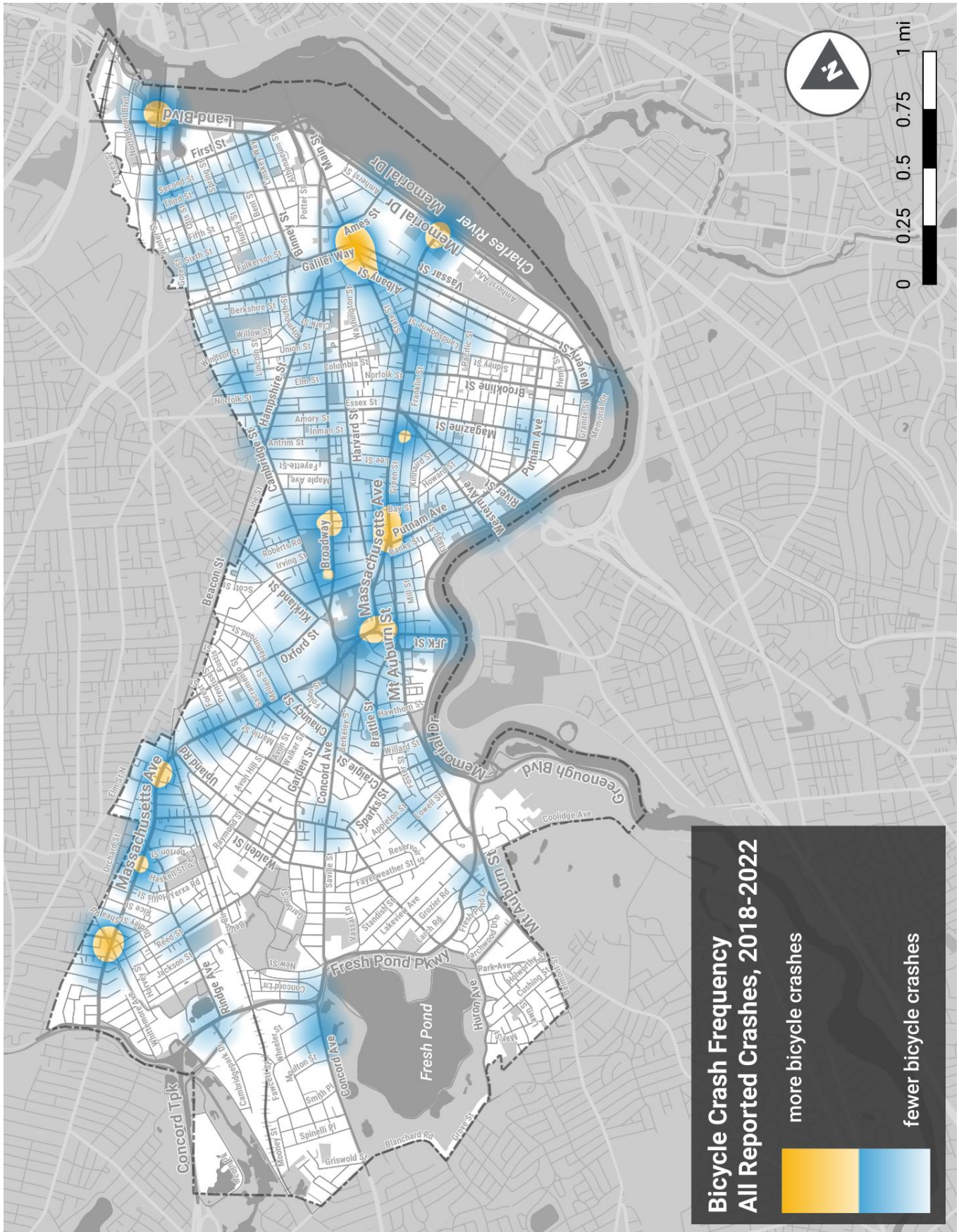


Figure 12: Location and Frequency of Reported Bicycle Crashes, 2018 – 2022

## Crash Rates

In order to match annual crash numbers with annual count numbers, we have extrapolated the biennial count data to annual counts using the Eco-Totem permanent bike count station as a reference, using national analysis standards. The Federal Highway Administration Vehicle Miles Travelled formula was applied to the annual counts to attain citywide Bicycle Miles Travelled (BMT). Bicycle Miles Traveled (BMT) is an adaptation of the traditional traffic planning tool Vehicle Miles Traveled (VMT). It is an estimate of overall usage during a specific timeframe and is useful for calculating exposure to crashes. The BMT along these corridors is derived by applying national standards for estimating usage to the bicycle counts recorded throughout the city.

As shown in Figure 13, BMT has grown from 3.7 million in 2004 to 12.3 million in 2022, an increase of 233% over 18 years. This is based on counts at 16 locations as described in the previous section on the bicycle counting program.

Over the same period, reported crashes involving a bicycle increased for several years, reaching a peak in 2012, and seeing a declining trend since then.

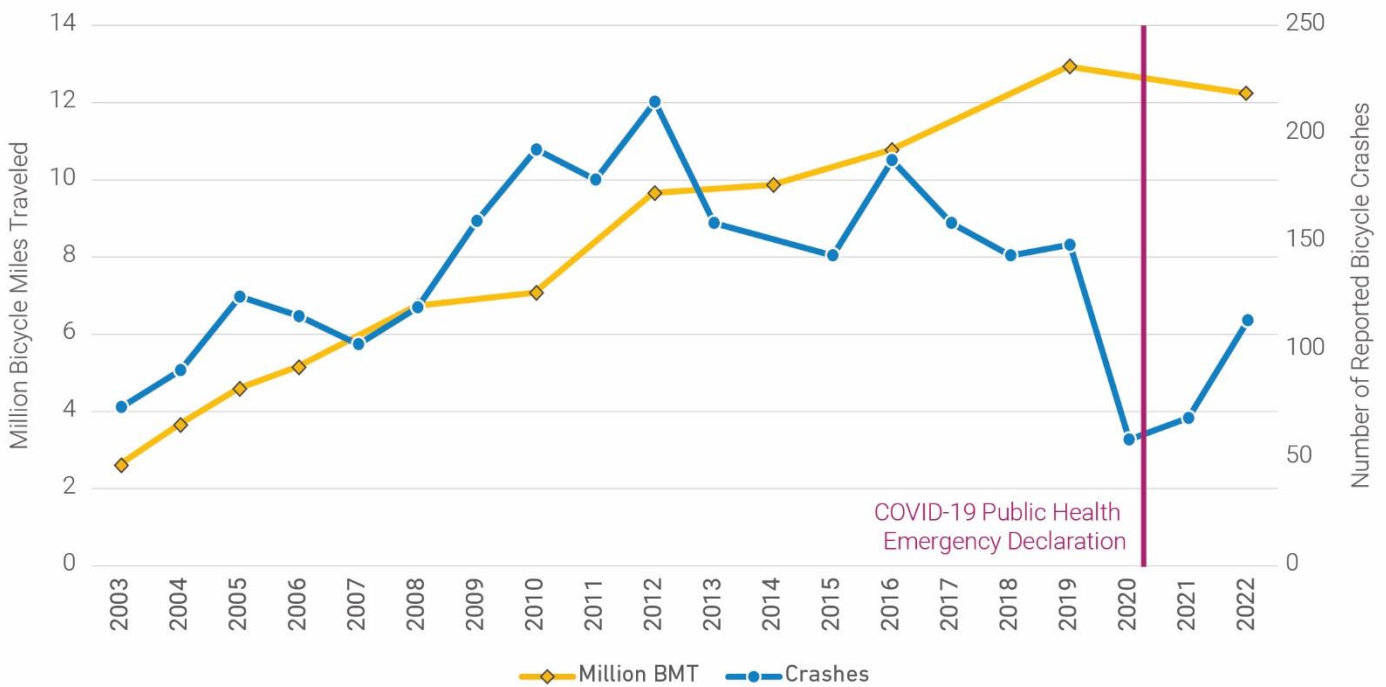
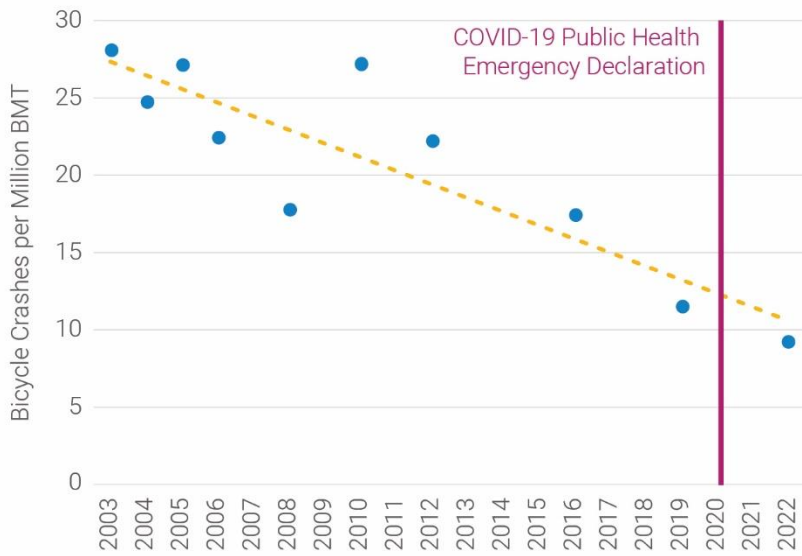


Figure 13: Million Bicycle Miles Traveled (BMT) and Number of Reported Bicycle Crashes (2004 - 2022)





While total crashes trended higher from a starting point of 2003, bicycle ridership has increased more steeply in the same timeframe. The crash rate, or the number of crashes per million bicycle miles traveled (BMT), has steadily decreased between 2003 and 2022, and 2022 was the lowest crash rate measured in that time period. The best way to describe the relative change in the level of safety of traveling by bicycle is with a crash rate, as a rate accounts for changes in volume of use. With this data, a rate can be shown: the number of crashes divided by the BMT for each year. As shown in Figure 14, the crash rate has declined from 28 crashes per million BMT in 2003 to 9.3 crashes per million BMT in 2022, a decrease of 67%.

Figure 14: Bicycle Crash Rate (2003 - 2022)

## Injury Severity

The severity of the injury in each crash is recorded for crashes in Cambridge. Crashes with injuries in 2015-2020 decreased significantly in comparison to crashes with injuries in 2004-2012. The proportion of crashes that did **not** result in any injury was nearly three times (177%) higher in 2004-2012, while those resulting in incapacitating injuries decreased by 84% from 2004-2012 to 2015-2020. Figure 15 shows the change in the injury severity as a proportion of total bicycle crashes.

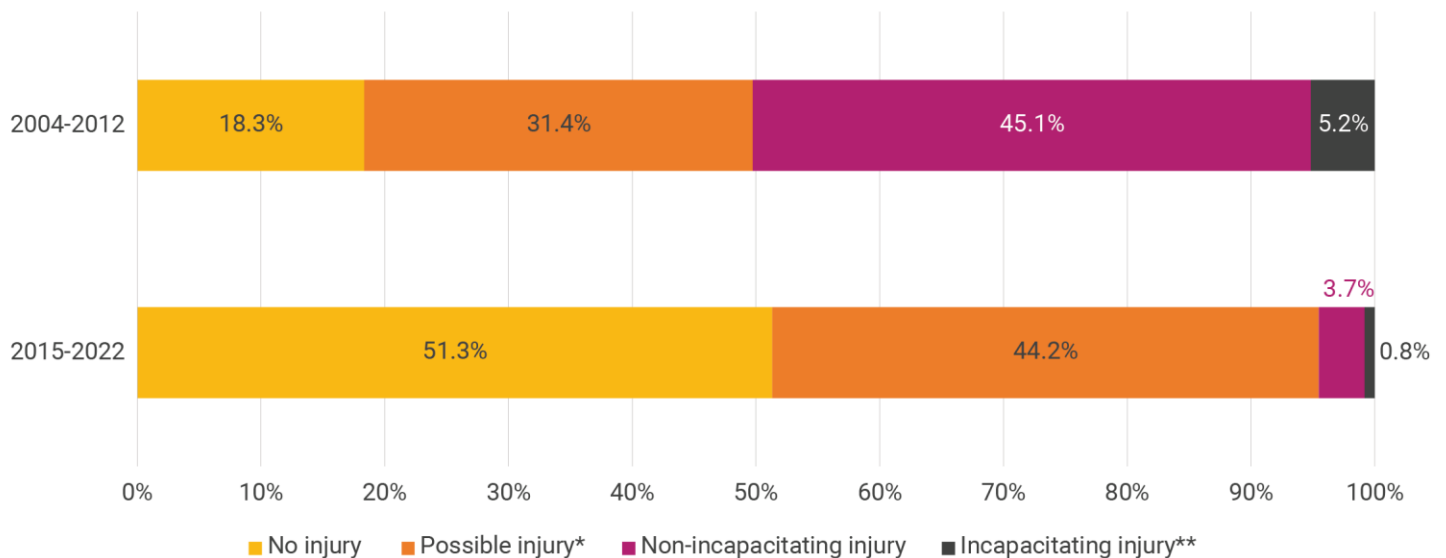


Figure 15: Injury Severity for People Bicycling in Crashes (2004-2012 and 2015-2022)<sup>24</sup>

\* The "Possible injury" category includes injuries that were unreported by people bicycling. This includes the following observations: no apparent injury, possible non-fatal injury, suspected minor injury, suspected serious injury, and unknown.

\*\* The "Incapacitating injury" category includes incapacitating non-fatal injuries and fatal injuries.

<sup>24</sup> 2013 and 2014 crash data are not included as these years are not available on the Open Data Portal.

# End Notes

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<sup>i</sup> Barrero, Jose Maria, Nicholas Bloom, and Steven J. Davis, 2021. “Why working from home will stick,” National Bureau of Economic Research Working Paper 28731.

<sup>ii</sup> ITF (2023), Shaping Post-Covid Mobility in Cities: Summary and Conclusions, ITF Roundtable Reports, No. 190, OECD Publishing, Paris <https://www.itf-oecd.org/sites/default/files/docs/shaping-post-covid-mobility-cities.pdf>

<sup>iii</sup> Barrero, et. Al. “Why working from home will stick.”