

CHAPTER 3

INFORMATION AND REPORTING

INTRODUCTION

The City regularly gathers information about conditions in the city, the needs and preferences of the community, and the effects of its programs and activities. This information is gleaned in a variety of ways, including through direct contact with the people who live, work and visit here, by providing opportunities through online and virtual mechanisms, through analysis of on-the-street activities, and by undertaking evaluations of programs and projects.

In this Chapter we share some of the key information that helps to inform our work as well as assess its impact.



SURVEYS ON BICYCLING

Community preferences and priorities provide important information for planning in our city. The specific input activities undertaken for the Bicycle Plan are described in Chapter 1. We review here several surveys on bicycling habits, preferences, and comfort levels, including three surveys specifically for the Plan and a more general survey undertaken by the City on a broad range of topics.

The Cambridge Community Survey (2014) was conducted for the 2015 Cambridge Bicycle Plan. The online survey collected 733 responses. The Community Needs Survey (2020) was conducted for the Bicycle Plan Update. The survey was conducted online and in-person at outreach events across the city and collected 305 responses. The Visual Preference Survey (2019) was conducted in-person, with approximately 200 people participating. The Resident Telephone and Online Survey (2020) provides a snapshot of public sentiment toward various issues and public services. Typically conducted by phone every two years, the 2020 survey also reached people online and had 2,951 responses. For more information on the surveys conducted, and how they related to the Plan update process, see Chapter 1.

While a variety of important information can be taken from the results, the biggest takeaway is that people who bicycle in Cambridge would like to see more separated bicycle facilities and bicycle-friendly street designs. This applies whether the respondent rides frequently or rarely.

The surveys gathered information on:

- + **Top issues that the City should focus more attention on.**
- + **Comfort level with bicycling on various street and bicycle facility types (sample photographs were shown for each condition).**
- + **Comfort level allowing children to ride on different street and bicycle facility types.**
- + **Preferred bicycle facility type.**
- + **Frequency that people rode their bikes.**
- + **Ability to get around the city by bicycle and desire to bike more.**
- + **Barriers to biking and what the City could do to help.**

More details on survey results can be found in Appendices A and B.

WHAT ISSUES SHOULD THE CITY FOCUS ON?

In Cambridge’s 2020 Resident Telephone and Online Survey (a survey that is conducted biennially), people were asked what two or three issues the City should focus more attention on. The list included a variety of topics related to housing, transportation, public safety, and more. Infrastructure ranked 2nd out of 17 topics and was selected by 18% of respondents. The bicycle-related issues topic ranked 7th and was selected by 10% of respondents.¹

WHAT ARE PEOPLE’S PERCEPTIONS ABOUT THE ABILITY TO GET AROUND THE CITY BY BICYCLE?

People’s perceptions about the ability to get around the city by bicycle have been steadily improving. Seventy-four percent (74%) of survey respondents rated their ability as “good” or “excellent” in 2020, compared with 72% in 2018 and 70% in 2016.¹

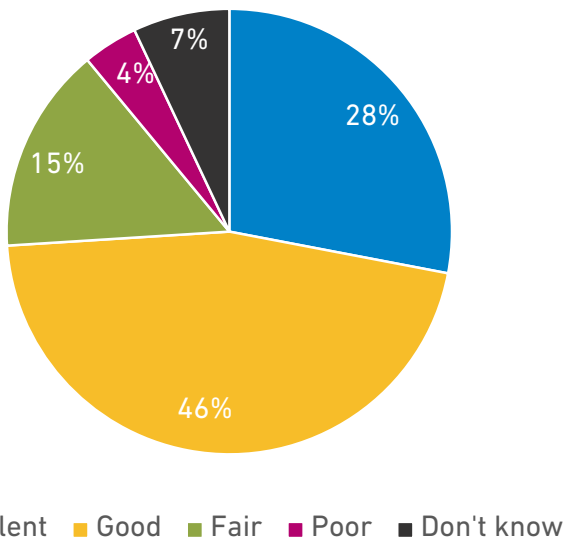


Figure 3.1: Ability to get around town by bicycle (Resident Telephone and Online Survey, 2020)

HOW OFTEN ARE PEOPLE RIDING THEIR BIKES?

The number of new people riding in the city has been increasing. The percent of survey respondents who rode at least once during the year and the percent that biked at least twice per month increased from 2018 to 2020. In addition, the percent of people who have never ridden a bike in the city decreased over the same period.¹

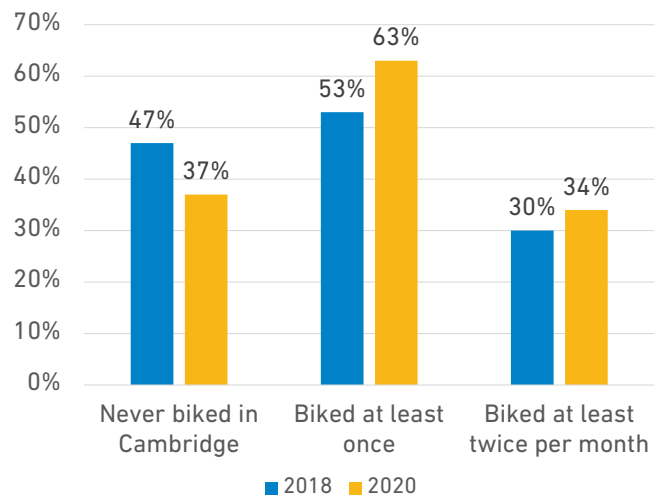


Figure 3.2: How often do you bike in Cambridge? (Resident Telephone and Online Survey, 2020)

WOULD PEOPLE LIKE TO BIKE MORE IN CAMBRIDGE?

People also want to bike more in Cambridge, regardless of whether they have ridden recently or not. In the Community Needs Survey (2020), 85% of survey respondents who rode in the past year, and 53% of those who did not ride in the past year, said they wanted to bike more in Cambridge.²

Would you like to bike more in Cambridge?

YES!

85%

of people that have biked in Cambridge in the last year want to bike more

53%

of people that have not biked in Cambridge in the last year want to bike more

WHAT BARRIERS TO BIKING DO PEOPLE FACE?

When asked to select from a list of barriers to biking, the most common response by far was “I don’t feel safe riding on Cambridge Streets” (89%). Women were more likely to select this barrier than men (94% of women compared to 83% of men).^{2,3}

Other barriers people identified included not having a storage space at work or home (13%), not owning a bike (11%), not knowing how to use Bluebikes (8%), and not knowing how to bike (1%). While these barriers are relatively less common, some people are more impacted by them than others. For example, men were more likely (21%) to identify a lack of storage space at work or home than women.²

Barriers: Which of the following apply to you?

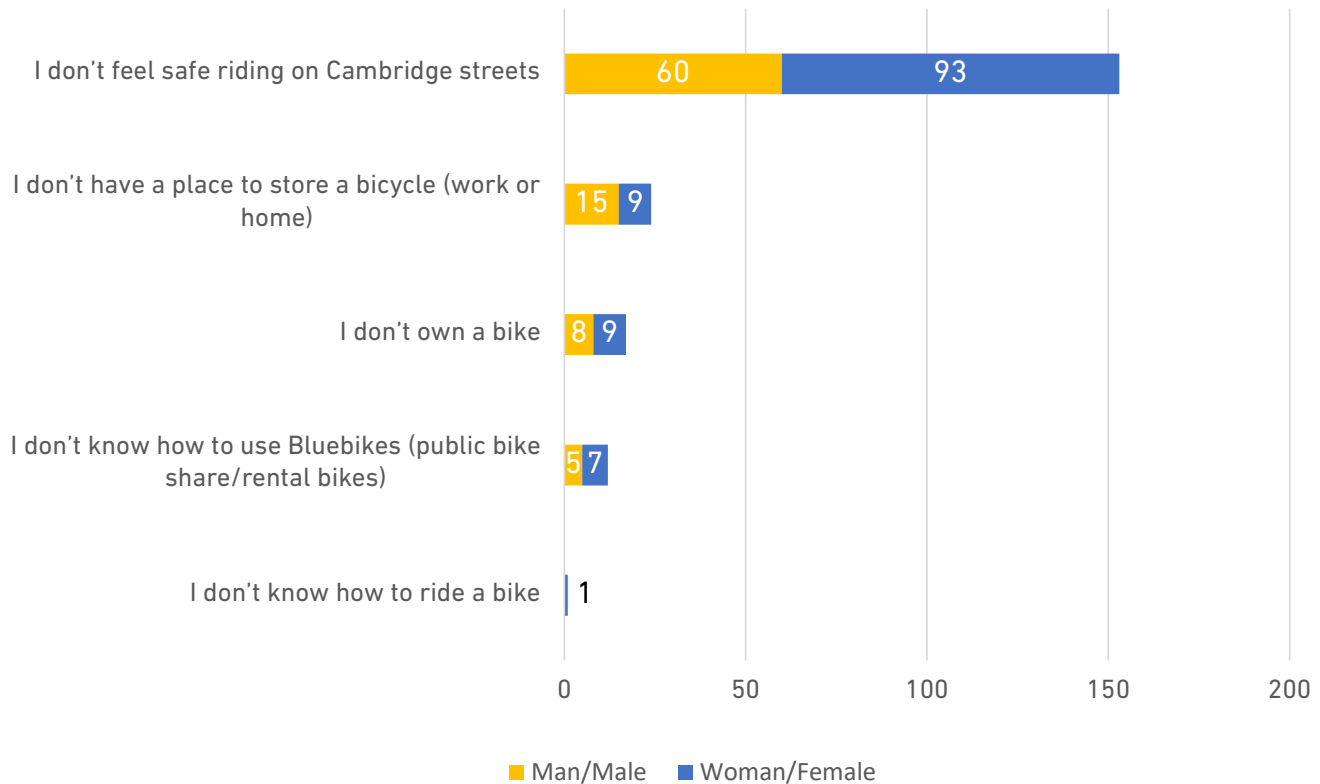


Figure 3.3: Survey participant reported barriers (Community Needs Survey, 2020)

Further evidencing why safety is a barrier to biking, many people stated feeling unsafe around motor vehicles (87%) and some feel there aren't good connections to where they want to go (48%). People were also concerned with dark streets at night (14%), personal safety/crime (10%), and being harassed by officials (4%). Women were more likely than men to be concerned about motor vehicle speed and unsafe driving, amount of traffic, and inadequate street lighting.²

While most questions in this survey were multiple choice, respondents were also given the opportunity to provide open responses. In response to an open question about what prevents people from biking as much as they would like to, over half of the responses (51%) were tied to the lack of safety around motor vehicles (lack of safe spaces/separation for bikes, dangerous intersections, bad/aggressive drivers, vehicle speeds, cars in bike lanes, dooring, and large trucks). Other barriers to biking include the lack of a connected network (11%), dangerous intersections (4.5%), and bad weather/winter (4.5%).²

Safety: Which of the following concerns apply to you?

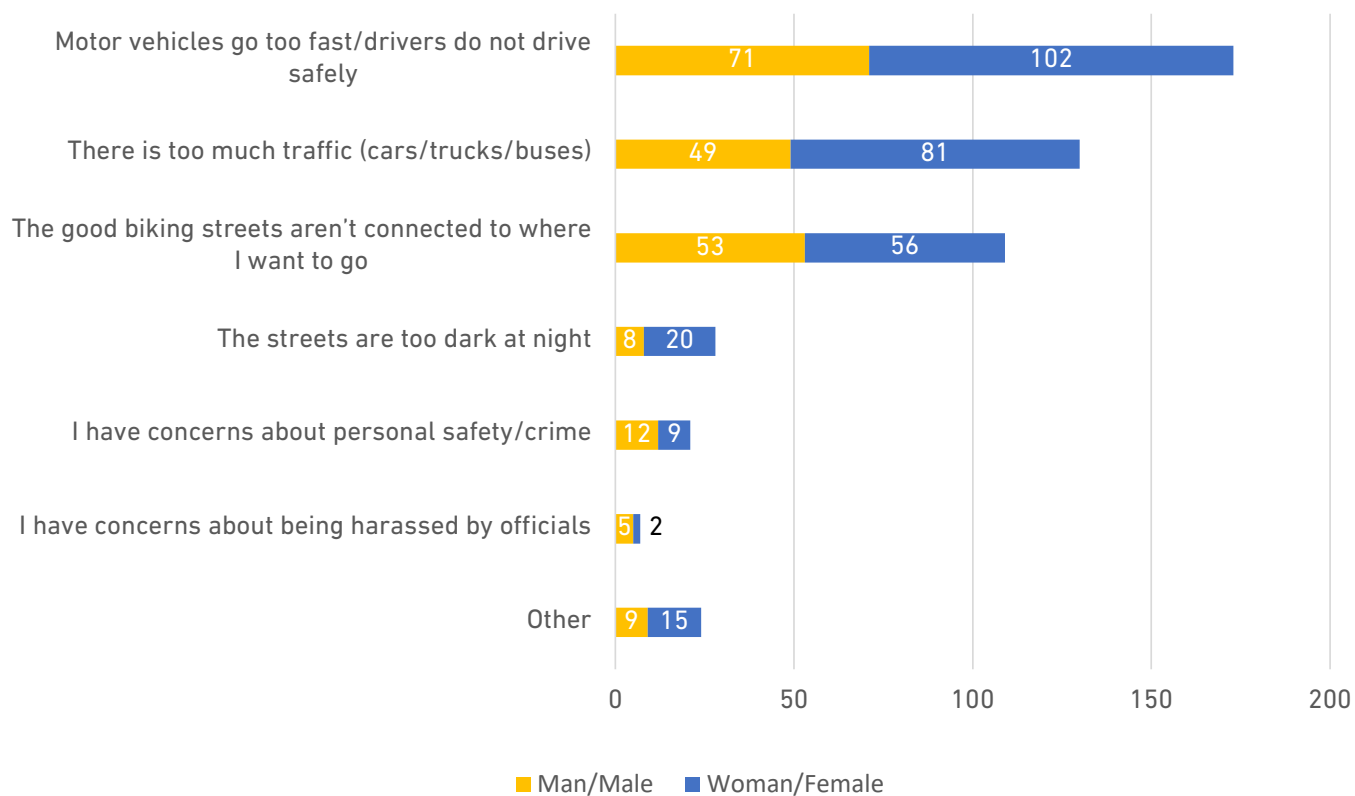


Figure 3.4: Survey participant reported safety concerns (Community Needs Survey, 2020)

WHAT CAN THE CITY DO TO HELP PEOPLE BIKE MORE?

The lack of feeling safe around motor vehicles is reflected in the answers to an open question on what the City can do to help people bike more. The top response was “to provide more protected/ separated bike lanes and paths” (29% of 413 responses). Nearly half of responses (48%) were tied to having more or better street infrastructure (e.g., contraflow lanes, bike signals, bike boxes, safer intersections, path lighting). Other requests include enforcement for drivers (6%), enforcement for cyclists (5%), bike parking (3%), and driver education (3%).²

This next section explores how people feel on various types of streets and with different bicycle infrastructure.

One of the great things that Cambridge is doing, they're starting to install these [separated] bike lanes, which make a complete difference. First of all, I'm shielded by people who are parked so that a motorist who might be under the influence or just reckless or not thinking cannot reach me.

–Cambridge conversations participant

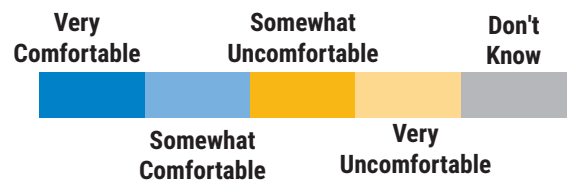


HOW DO PEOPLE FEEL BICYCLING ON COMMERCIAL (MAJOR) STREETS?

In the Cambridge Community Survey (2014), people were asked to rank how comfortable they would feel riding a bicycle on a busy commercial street based on facility type, including no accommodations at all, shared lane markings, a standard bike lane, a buffered bike lane, a separated bike lane, or raised cycle track. Protected bike lanes and raised cycle tracks are both separated bike lanes, but were presented as different facility types for this exercise. Survey responses are shown by all respondents and broken out by concerned respondents (those who reported that they bike only some places or are not comfortable biking in the city).⁴

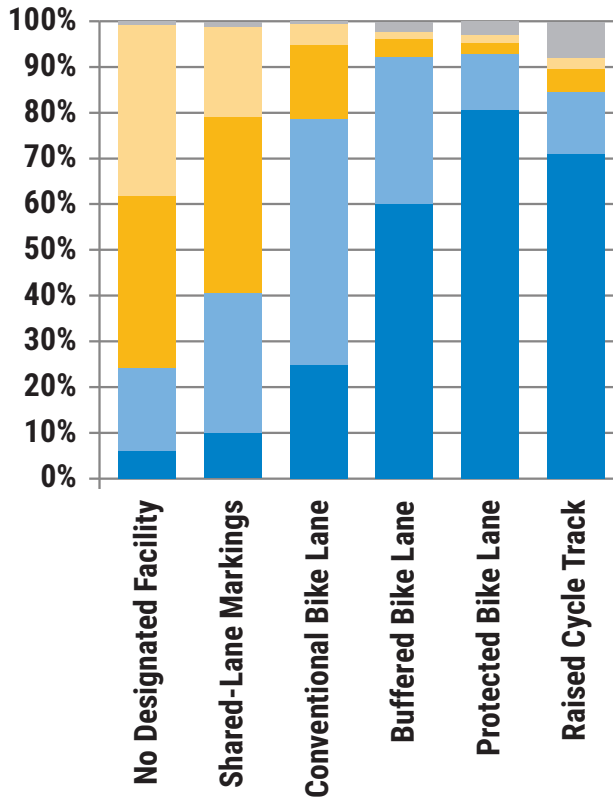
81% of all respondents and 68% of concerned respondents feel “very comfortable” on separated bicycle facilities.

Only 25% of all respondents and 4% of concerned respondents in Cambridge feel “very comfortable” using conventional bicycle lanes.



ALL RESPONDENTS

How comfortable do you feel with these bicycle facilities on busy, commercial streets?



CONCERNED BICYCLISTS

How comfortable do you feel with these bicycle facilities on busy, commercial streets?

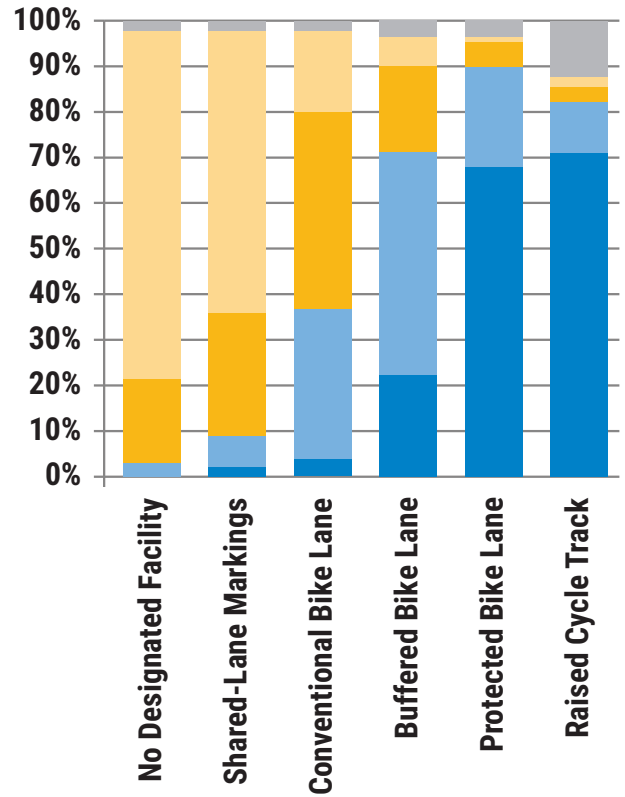
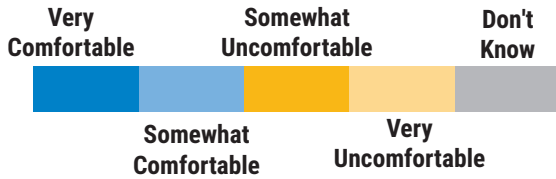


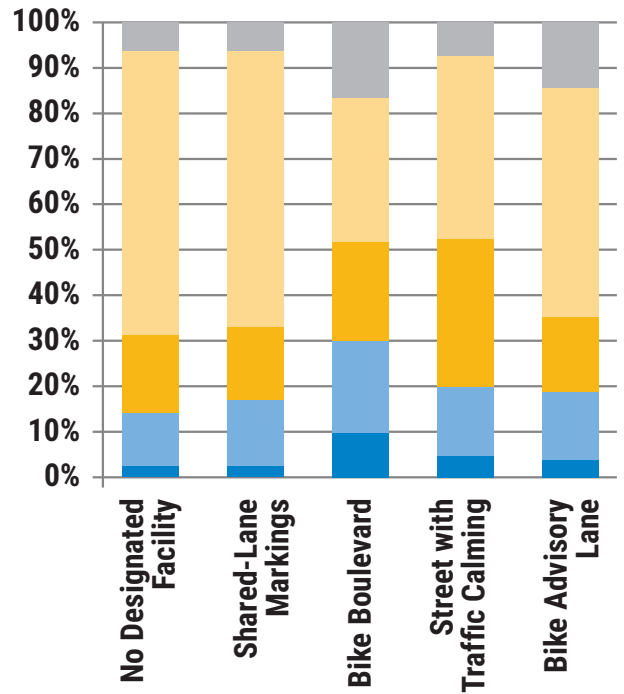
Figure 3.5: Level of comfort using bicycle facilities on commercial (major) streets. (Cambridge Community Survey, 2014).

HOW DO PEOPLE FEEL BICYCLING WITH CHILDREN?

Respondents were asked about their comfort levels for children traveling on streets, either with an adult or on their own.⁴



How comfortable do you feel about your children on these bicycle facilities on non-commercial streets, **WITHOUT** an adult?



How comfortable do you feel about your children on these bicycle facilities on non-commercial streets, along **WITH** an adult?

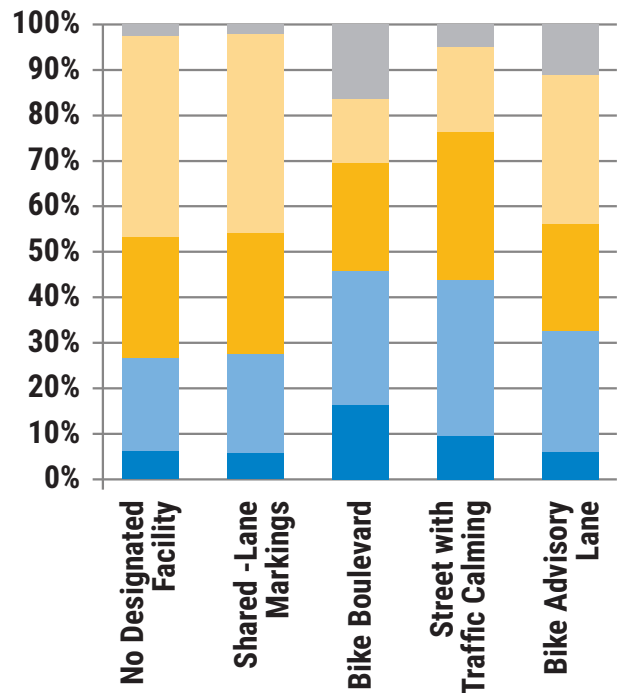


Figure 3.6: Level of comfort biking with children on non-commercial streets. (Cambridge Community Survey, 2014).

HOW DO PEOPLE FEEL BICYCLING ON NON-COMMERCIAL STREETS?

People were also asked about other street design treatments that would be relevant for non-commercial streets, such as traffic calming, bicycle priority lanes, and bicycle boulevards. There was somewhat more uncertainty about some of these, primarily because of the lack of familiarity; while traffic calming is extensive in Cambridge, at the time the survey was taken, there were not yet bicycle boulevards or bicycle priority lanes in the city.⁴



I am a nurse and I visit seven homes a day, sometimes riding twenty five miles. I ride because there is often no parking.

-Ashlie Taylor, Nurse and home healthcare supervisor

BICYCLE FACILITIES ON NON-COMMERCIAL STREETS



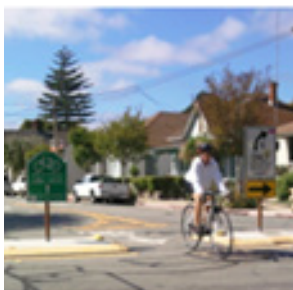
Street with shared lane markings



Street with shared lane markings



Bicycle boulevard



Bicycle boulevard



Street with traffic calming



Street with traffic calming

Examples of bicycle facilities on non-commercial streets shown to survey respondents. See Chapter 4 for details on various facility types.

Traffic calming can improve the bicycling experience by slowing vehicular speeds and making sharing the road more comfortable.

WHAT TYPES OF BIKE FACILITIES DO PEOPLE WANT TO SEE?

Survey respondents were asked to rate the importance of various bicycle facility options that they would like to see implemented in Cambridge.⁴

Protected bicycle lanes received the highest rating, with 92% of respondents saying that implementing them in Cambridge was important, and two-thirds saying it was "very important."



Concord Ave. separated bike lane



Vassar St. separated bike lane



Norfolk St. contra-flow bike lane

What design features would you like to see implemented?

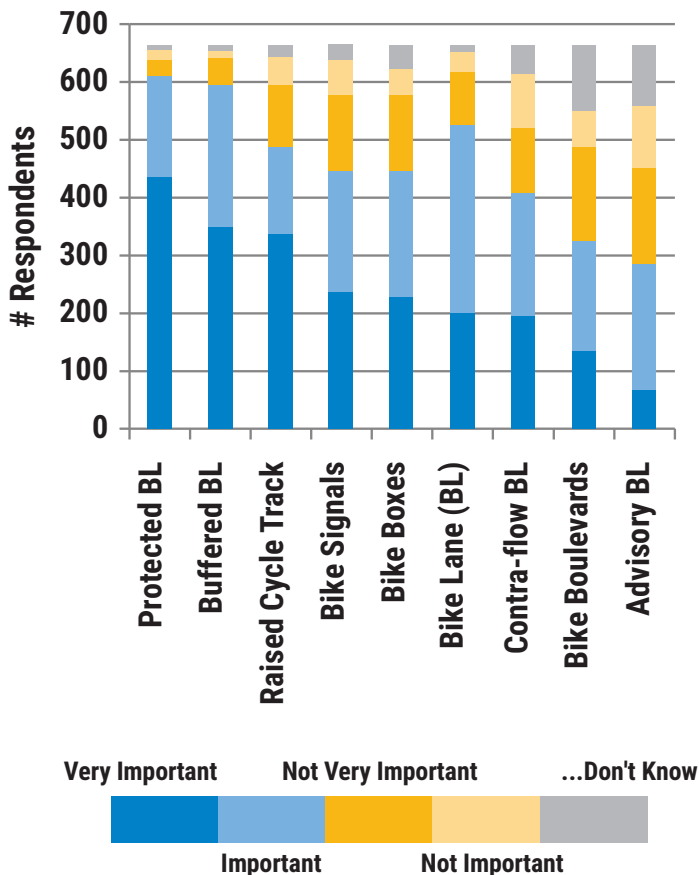


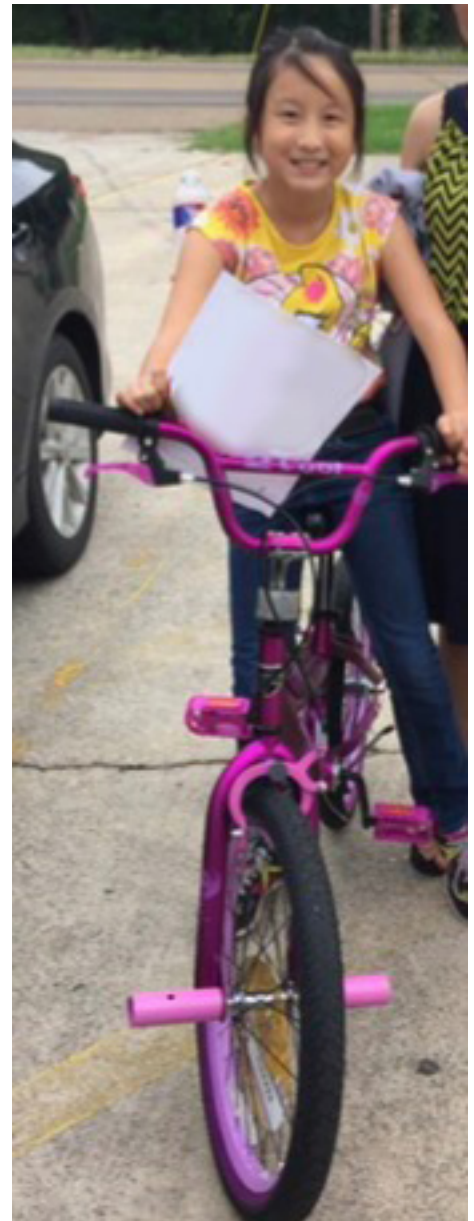
Figure 3.7: Bicycle facility type preferences. (Cambridge Community Survey, 2014).

In a 2019 in-person survey, people were asked to indicate whether they liked, disliked, or were neutral about various street design elements based on photos of facilities located mostly in Cambridge.⁵

Facility	Like	Neutral	Do not like
Raised intersection	44	16	11
Curb extensions	29	18	22
Crossing islands	39	21	1
Chicanes	17	10	28
Low-volume street	40	14	6
Traffic circle	22	20	34
Bicycle priority markings*	10	22	47
Shared lane markings	10	4	60
Bus-Bike lane	26	19	49
Bicycle lane	60	28	1
Buffered bicycle lane	86	15	3
Street level separated	162	7	6
Sidewalk level separated	142	10	9

**a type of shared lane marking with dashed lines indicating preferred lane positioning*
Note: Darker colors indicate a higher level of agreement among participants.

Figure 3.8: Bicycle facility type preferences. (Visual Preference Survey, 2019)



When I'm biking, I can feel the wind in my hair, I can speed or slow down to catch a glimpse of the trees, birds, and buildings, and my legs never stop moving.
 –Jessica, Cambridge

BICYCLE COUNTS

HOW MANY BIKES DO WE OWN?

The 2009 CitySmart survey⁵ showed that 65% of households owned at least one bicycle and those households owned 2.6 bicycles on average. This means that for every 100 households, there were 169 bicycles.

Other studies in the U.S. also show substantial bicycle ownership rates.

- + **Denver Regional Council of Governments (2018): 77% of households have at least one bike and 58% have two or more bikes**
- + **National Household Travel Survey (2001): 1 working adult bike/household.**

HOW MANY PEOPLE ARE CHOOSING TO TAKE TRIPS BY BIKE?

Cambridge has among the highest rates of walking and bicycling in the United States; about a third of Cambridge residents walk or bicycle to work (see Figure 3.9). 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, recreation – constitute approximately 80% of trips.

CENSUS DATA

The American Community Survey, a U.S. Census Bureau survey conducted yearly, provides data on how residents, age 16 and over, commute to work. There has been a steady increase of Cambridge residents biking to work, with the percent of people biking changing from 6.9% in 2011-2013 to 8.1% in 2017-2019. While the percent of residents biking,

walking, and working from home have all gone up, the percent of residents driving to work has decreased. For Cambridge residents, drive alone commuting has decreased from 29.8% in 2011-2013 to 26.9% in 2017-2019 and carpooling has decreased from 4.1% in 2011-2013 to 3.5% in 2017-2019.

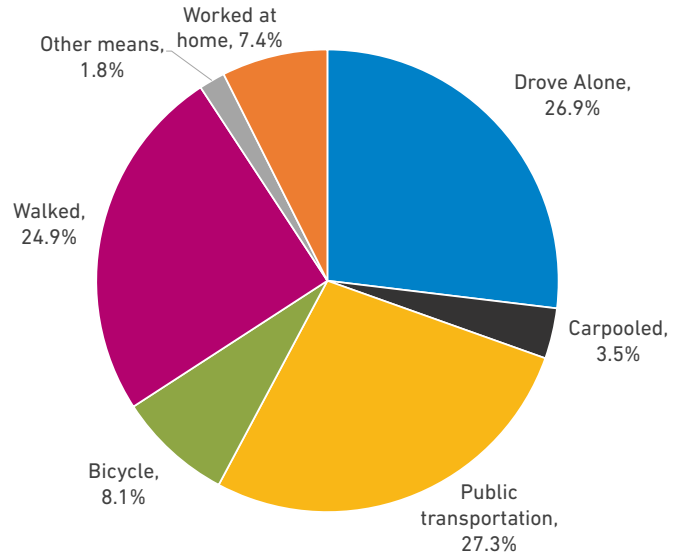


Figure 3.9: Work Commute Mode Split for Cambridge Residents, age 16+ (2017-2019).

Note: Weighted average (by relative size of labor for the stated year) of ACS 1-year data (table B08301).

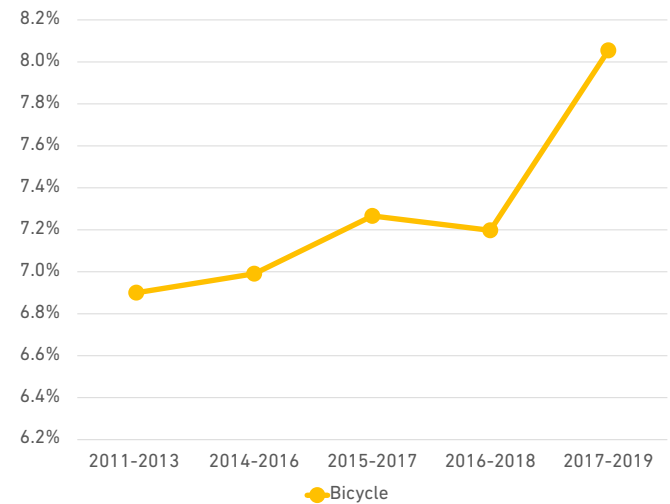


Figure 3.10: Work Commute Bicycle Mode Split for Cambridge Residents, age 16+ (2011-2013 to 2017-2019).

Note: 2011-2013 uses ACS 3-year data and 2014-2016 to 2017-2019 uses weighted averages (by relative size of labor for the stated year) of ACS 1-year data (table B08301).

CITY SURVEYS

Between 2009 and 2011, Cambridge undertook a series of in-depth surveys to learn more about residents' travel patterns. Respondents used a bicycle for a trip approximately 6-9% of the time, depending upon the neighborhood and type of trip.⁶ The 2011 CitySmart survey showed an average of 65% of bicycle users took a shopping trip on the survey day. The survey also found that people who use bicycles for transportation take more trips per day than users of any other mode – about 5 trips per day on average.

Similarly, surveys of visitors to six of Cambridge's commercial districts show that a significant portion of visitors travel by bicycle. The results of these surveys, conducted between 2012 and 2020, are shown in the table below. Of note are the increases in the number of people biking to Porter Square between 2012 and 2020 (10% to 16%) and Inman Square between 2015 and 2019 (17% to 25%).

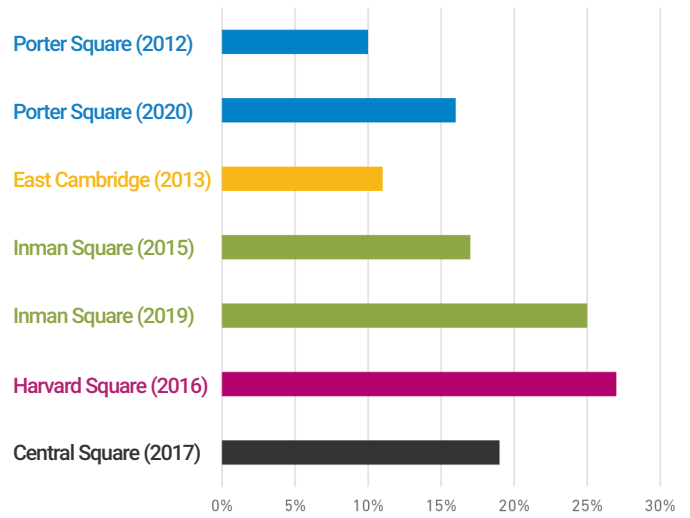


Figure 3.11: Percent of customers who traveled by bike.



HOW MUCH ARE PEOPLE BIKING IN CAMBRIDGE?

Cambridge typically conducts regular bicycle counts every other year at locations throughout the city. This data can be viewed on the City's new [bicycle count data portal](#).

There has been a steady upward trend in bicycling over the years. In total, bicycling increased fourfold between 2002 and 2019. Some locations have seen significantly larger increases than others.

The City has also increased bicycle facility lane miles significantly over the past 15+ years. From 2004 – 2019, the total miles of bicycle facilities doubled, with increases in the number of people bicycling occurring at an even higher rate. The figures on this and the following page demonstrate these trends.

Additionally, the use of scooters, one-wheels, and other wheeled micro-mobility devices has increased. The City is working to ascertain how its counting and crash data collection practices can most accurately reflect this evolution.

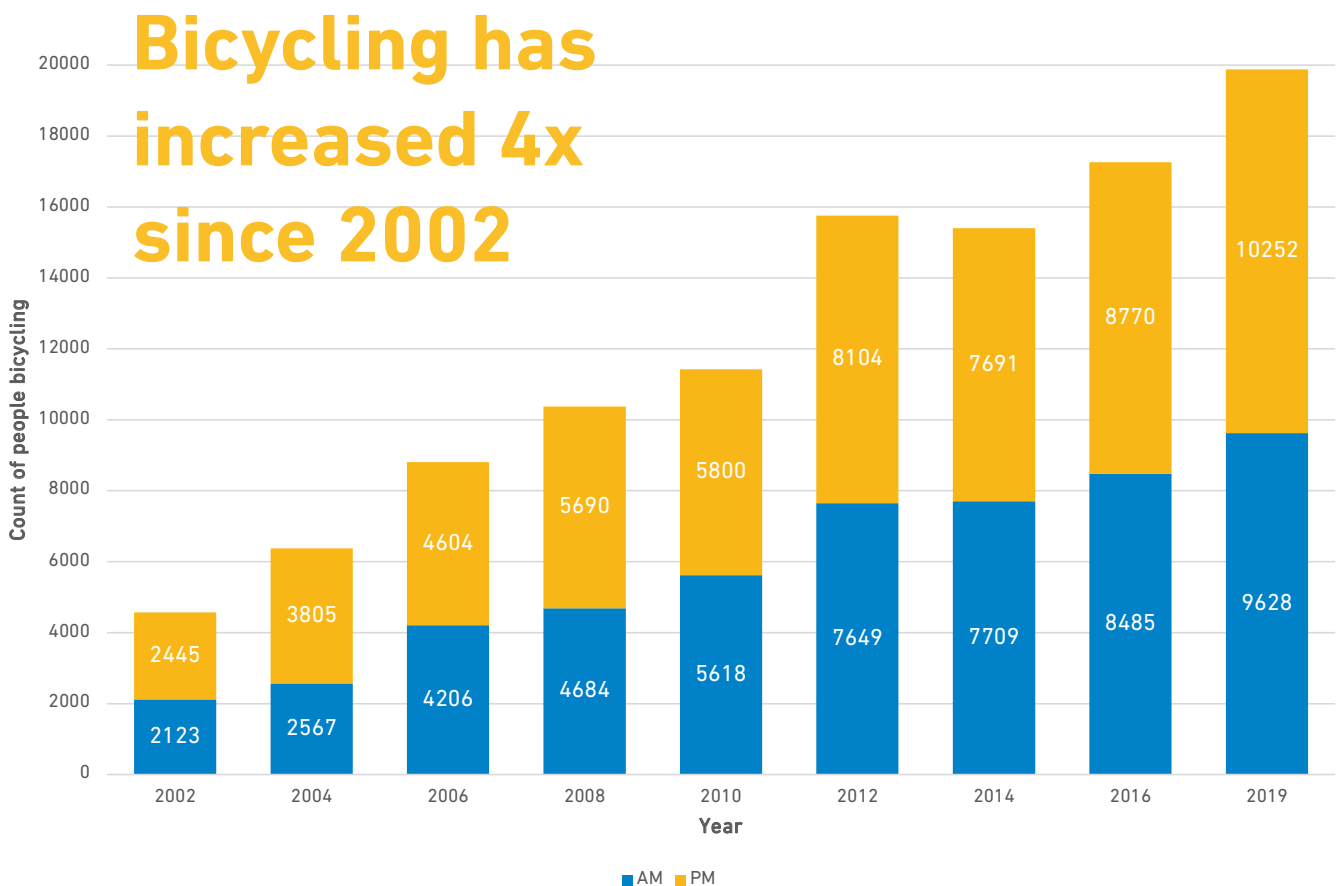


Figure 3.12: Cambridge Bicycle Count Chart, 2002-2019, Combined AM and PM Peak Counts.

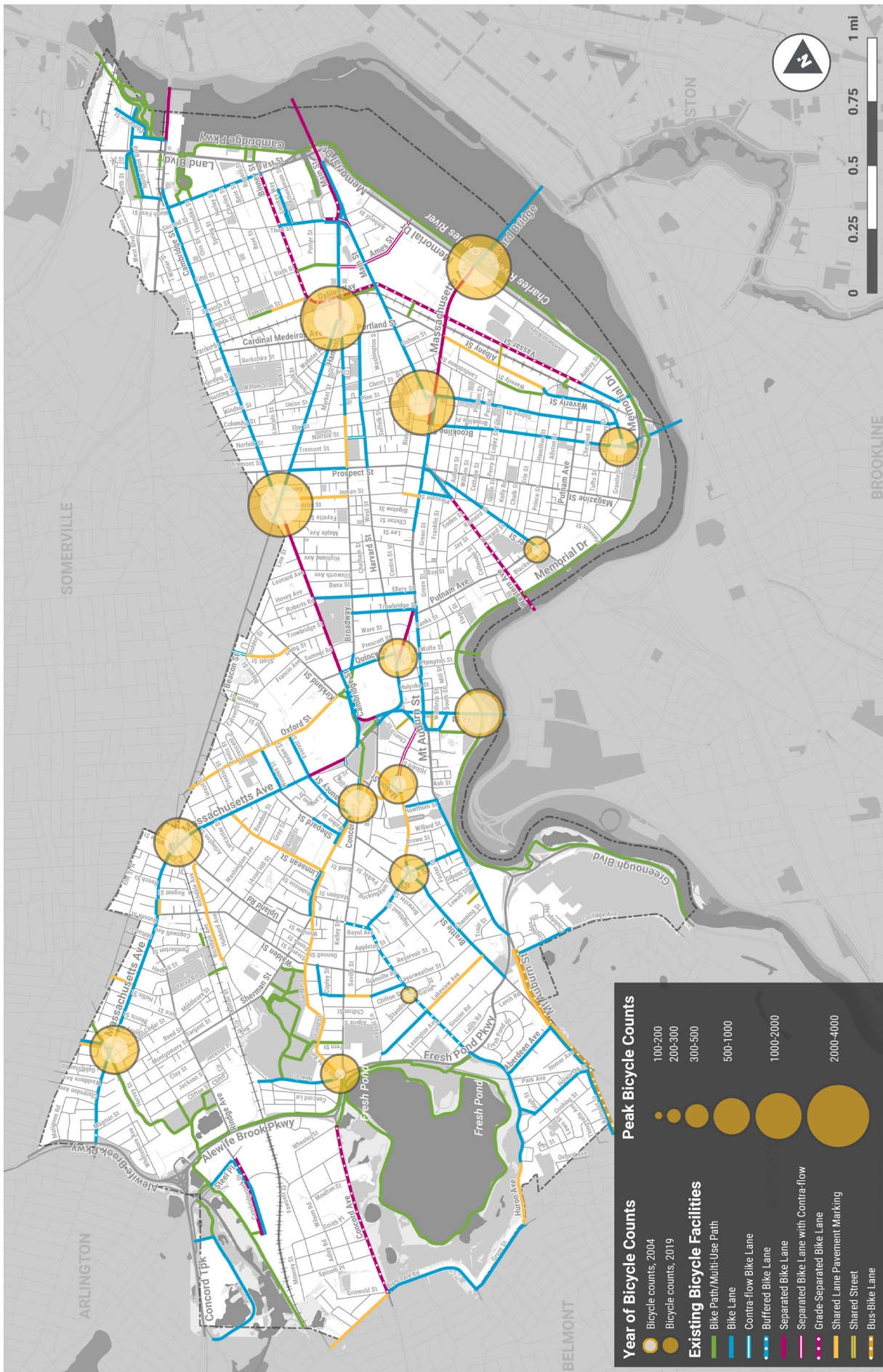


Figure 3.13: Map of Cambridge Bicycle Counts, 2004 to 2019, Combined AM and PM Peak Count.

NUMBER OF PEOPLE BIKING CORRELATES WITH MILES OF BICYCLE FACILITIES

Bicycle Facility Lane Miles and Number of People Bicycling (2004-2019)

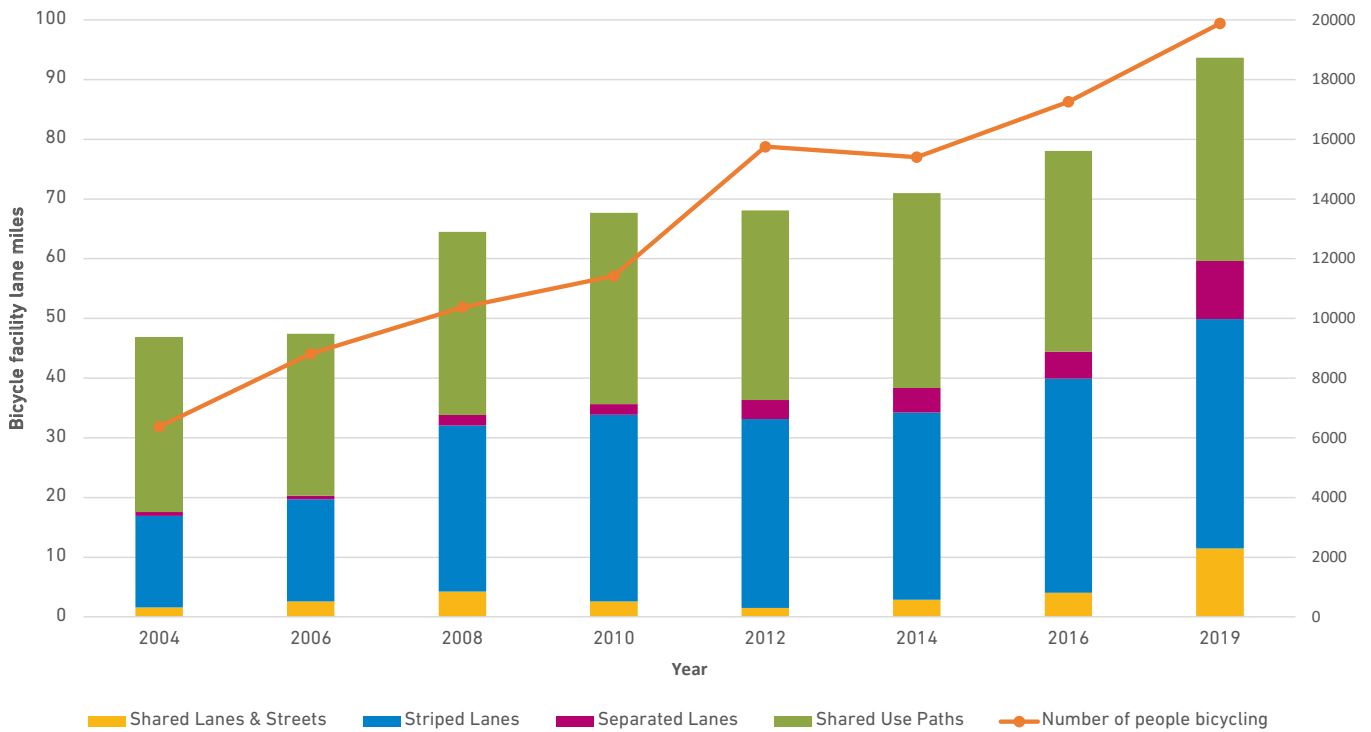


Figure 3.14: Relationship Between Bicycle Facility Lane Miles and Number of People Bicycling (2004-2019).

Note: Bicycle facilities are reported as lane miles. The number of lane miles increased from 46.9 in 2004 to 93.7 in 2019. Bicycle use is the total count of people bicycling in the time periods counted, i.e., turning movement counts across 16 intersections in the AM peak hours (7:30 to 9:30) and PM peak hours (4:30 to 6:30 PM). Bicycle use increased from 6,372 people in the count periods in 2004 to 19,880 people in 2019.



EVALUATING THE IMPACT OF NEW BIKEWAYS

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 [Western Avenue reconstruction project](#). Here are examples of quick-build changes done specifically to create separated bike lanes.

BRATTLE STREET AND CAMBRIDGE STREET CASE STUDIES

Separated bike lanes were installed on Brattle Street between Brattle Square and Mason Street and Cambridge Street between Fayette Street and Quincy Street in 2017. Analysis of bicycle counts pre- and post-implementation show an increase in the number of people biking on these corridors, shown in Figures 3.15 and 3.16. Online and in-person intercept surveys were performed post-implementation, showing the majority of respondents (84% for Brattle Street and 63% for Cambridge Street) were very satisfied, satisfied, or neutral about the new designs. Favorability ranked higher with those who typically walk, bike, or take transit to these locations.



Separated bike lane on Cambridge Street.



Separated two-way bike lane on Brattle Street.”

Brattle Street Bicyclist Count Comparison - Both Directions

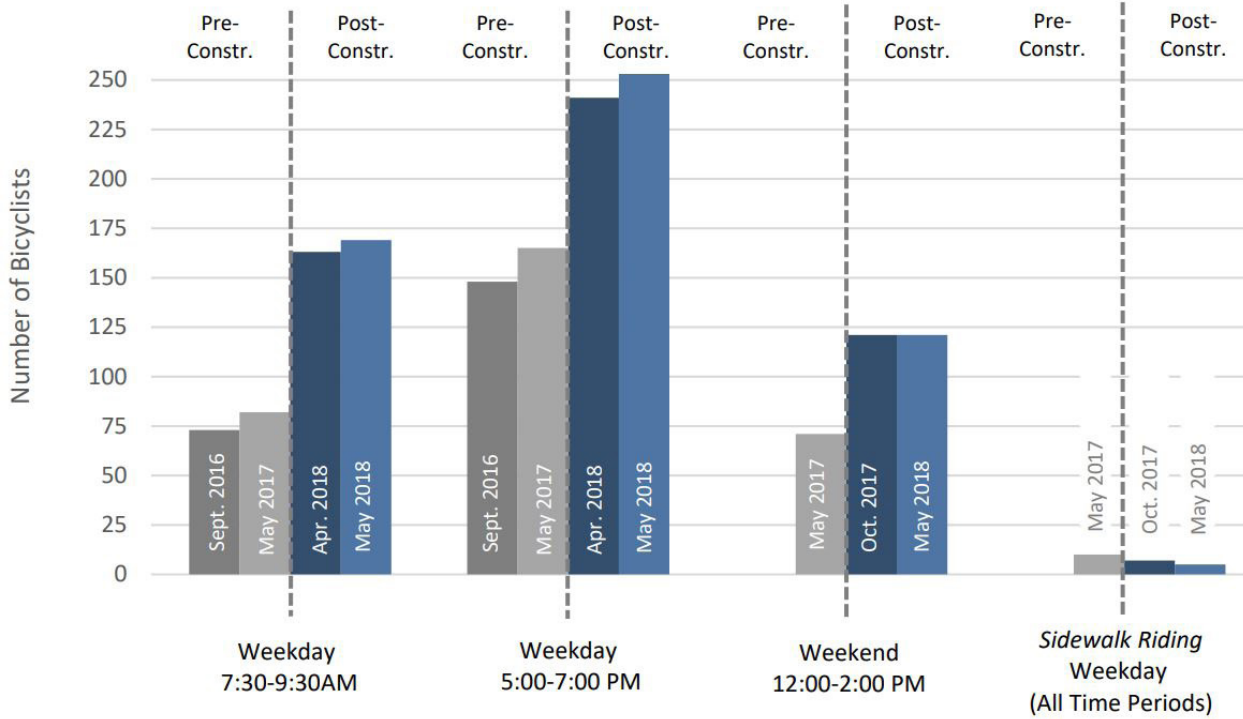


Figure 3.15: Number of bicyclists pre- and post-implementation of Brattle Street separated bike lanes.

Cambridge Street Between Trowbridge Street and Roberts Road: Bicycle Activity (Sidewalk and On-Street)

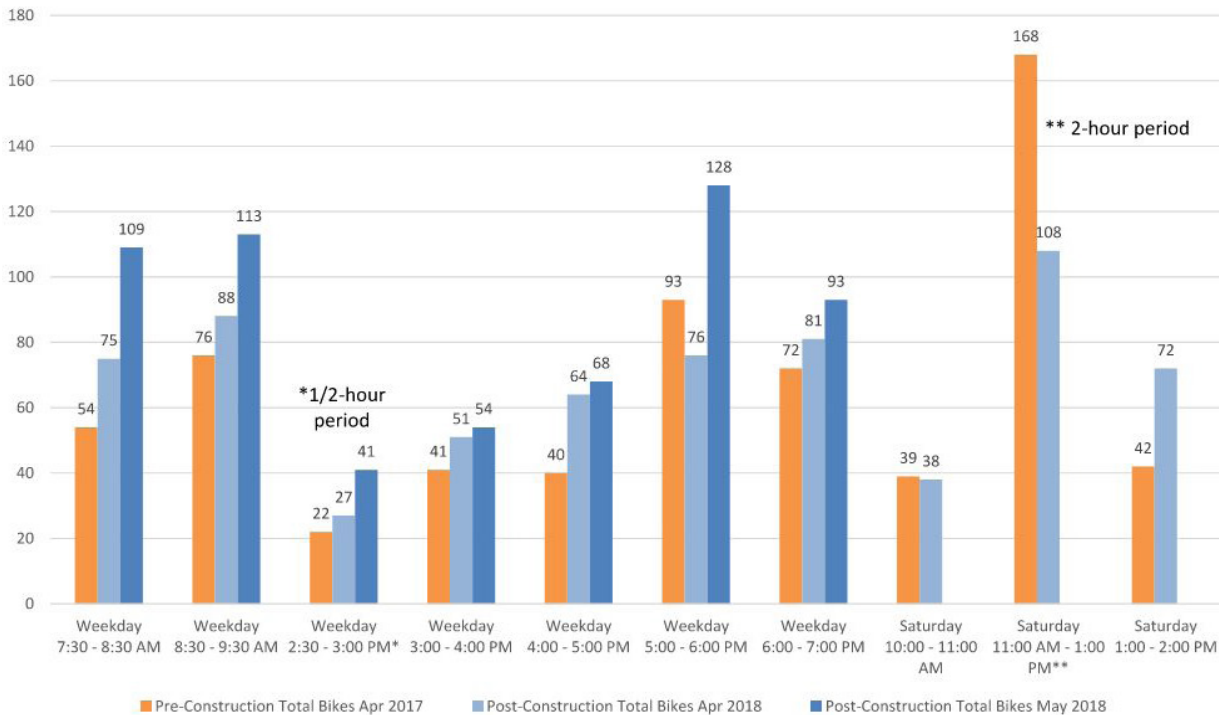


Figure 3.16: Number of bicyclists pre- and post-implementation of Cambridge Street separated bike lanes.

AUTOMATED COUNTING

In 2015, Cambridge installed a permanent bicycle counter in Kendall Square. Funded by a grant from the Helen & William Mazer Foundation, the “Eco-Totem”² counts people biking via in-ground loop detectors, and displays on the monitor how many people ride by. The counter displays daily and cumulative totals and also captures weather data to use for analytical purposes. Nearly two million trips have been captured at this location. The 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 be used to help extrapolate data from other counts.
- + The data assist with determining crash rate analyses.
- + Data can be viewed [online](#).

While a powerful tool, Cambridge’s Eco-Totem does have limitations. One challenge is that it under-counts the number of people biking through Kendall Square to a small but significant degree, because it can only count people that ride in the bike lane, tracking over the loop. Another challenge is that the counter exists at only one location. The City is working on opportunities for additional permanent counters in different locations to gain supplementary information and enable more robust data analyses.

For example, the City recently installed automatic counting devices at 13 signalized intersections. These devices count people walking and bicycling as well as motor vehicle traffic. The City is currently evaluating the efficacy of these counters at counting people walking and biking.

Automated counting systems – when accurate – are powerful tools that offer the possibility of collecting data more often than the biennial manual traffic counts. Continuous counts can better illustrate seasonal and time-of-day variations.



The City added directional information on the pavement as one way to communicate the need for a bicycle to track over the loop in order to trigger the Eco-Totem counter.



Cambridge Eco-Totem in Kendall Square.

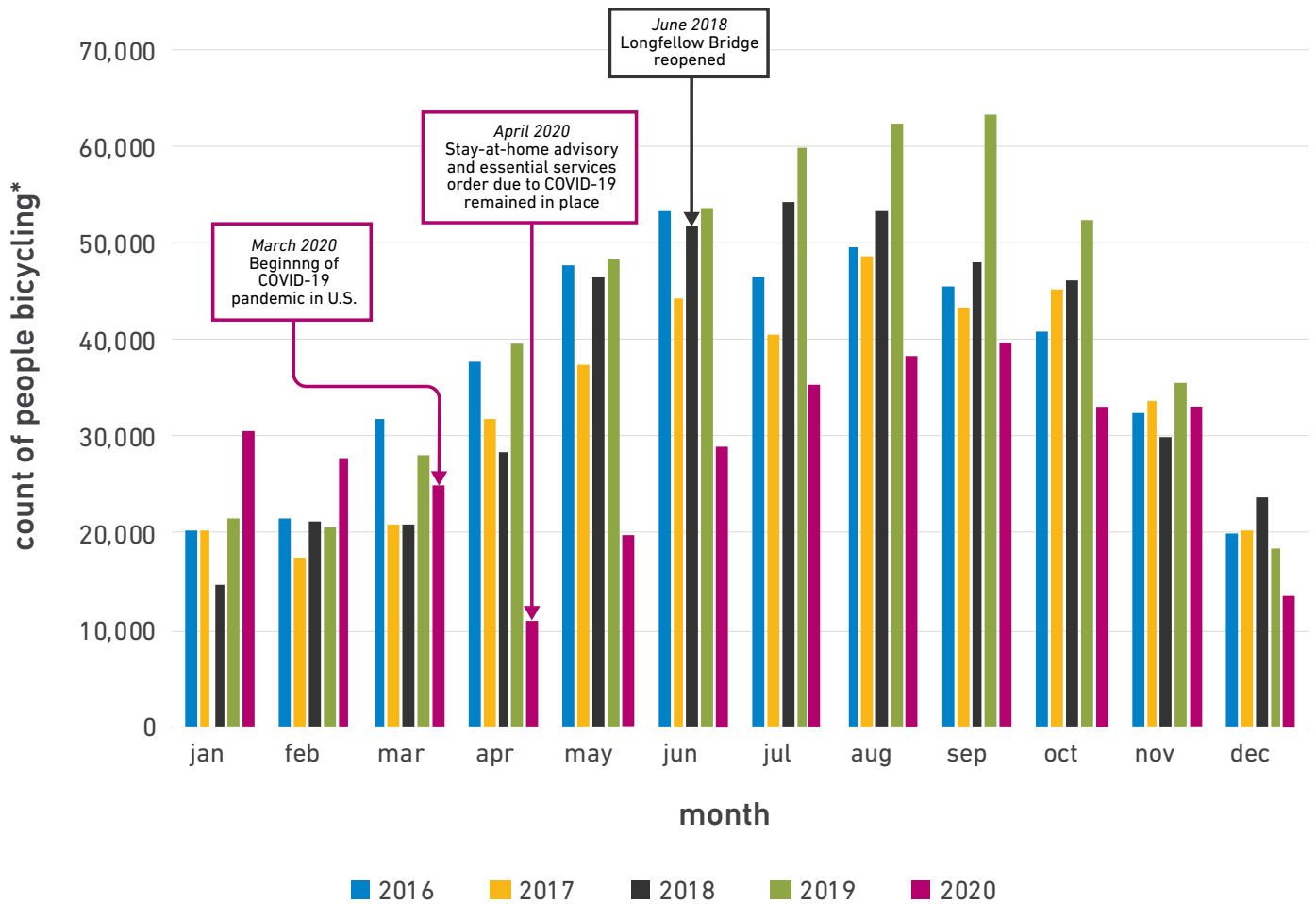


Figure 3.17: Summary of Counts Collected by Eco-Totem on Broadway in Kendall Square, 2016-2021.

*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.

Note: This figure illustrates both the impacts of the Longfellow Bridge construction in 2017 and 2018, and the significant travel pattern disruption triggered by the beginning of the COVID-19 pandemic. Note that after the initial stay-at-home advisory, ridership began to increase as essential services resumed.



BIKE TRAFFIC AND CONSTRUCTION

Extensive construction projects throughout the city can have a significantly negative impact on bike trips. Even if the end result of construction projects is better infrastructure and safer streets, the process of getting there can be months or even years of disruption and stressful travel.

Pavement quality, noise, and exposure to construction are all factors people consider when choosing routes. 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.

This effect has been experienced in Cambridge several times since bicycle count collection began. The 2015 Cambridge Bicycle Plan discussed the

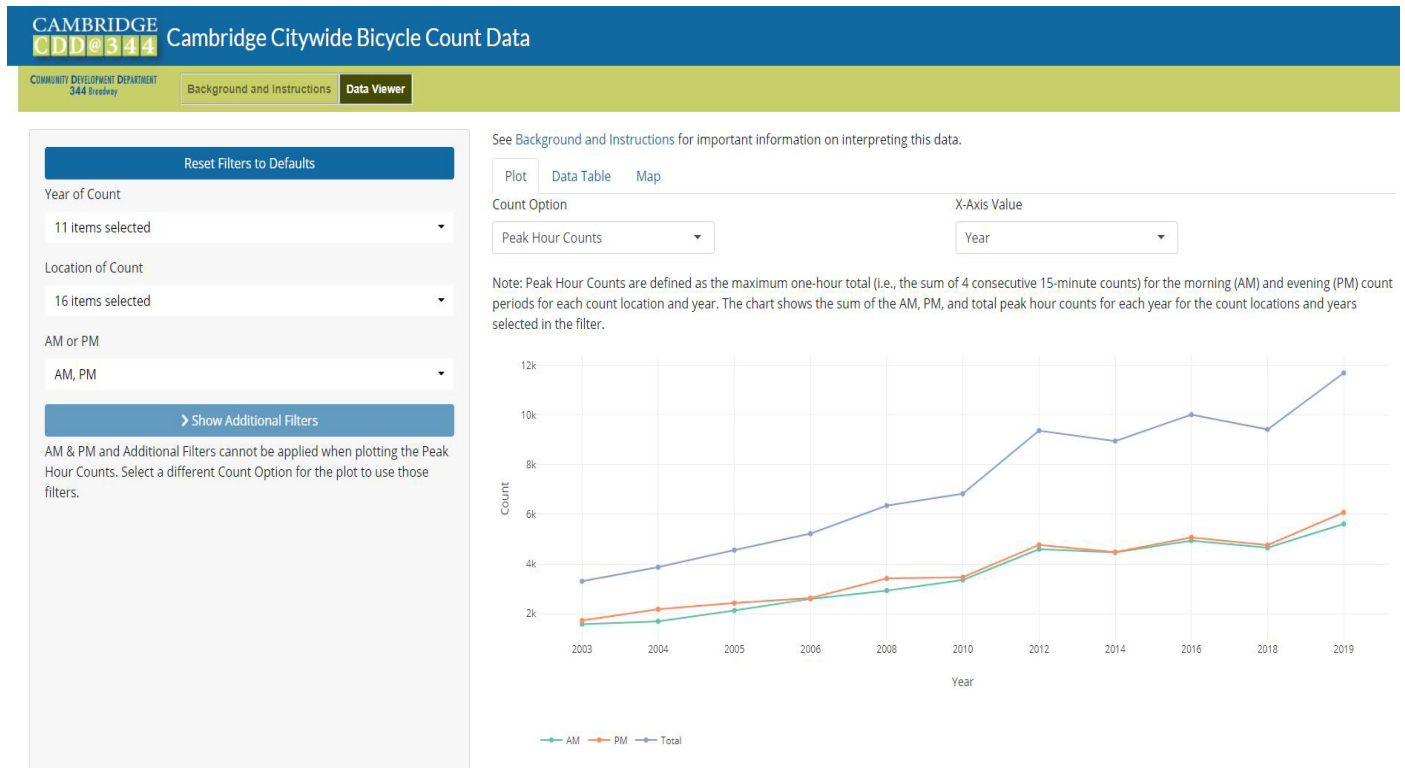
impact that intersection construction had on bike counts at eight locations. After construction was complete, ridership rebounded at those locations.

Similarly, 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.

BICYCLE COUNT DATA PORTAL

The City of Cambridge has released a new [public data application for its regular citywide bicycle counts](#). These bicycle counts have been collected in the mornings and evenings, typically in September, at intersections throughout the city, annually from 2002-2006 and every other year since then (plus an additional count in 2019 due to poor weather in 2018).

The application additionally features a city map showing the change in bicycle facilities over time and intersection graphics for all count locations.



Screen Shot of the Citywide Bicycle Count Data Portal.

BICYCLE CRASH DATA AND ANALYSIS

In the United States, bicycle crashes are generally considered to be under-reported, and few crashes that don't involve a motor vehicle are reported. There is also no reliable source of exposure data in the U.S. to really ascertain crash risk; there are no reliable statistics on how many miles people travel on bicycles each year, or how long it takes them to cover these miles, and thus how long they are exposed to motor vehicle traffic. Therefore, it is difficult to gain a comprehensive picture of bicycle crash statistics.

Since 2004 Cambridge has made a significant effort to gain a clearer picture of local crash risks for people who ride bicycles and to use that data to reduce the frequency and severity of crashes. The City's findings are included in the sections below.

DATA COLLECTION

Since 2004, Cambridge has collected robust data for all reported bicycle crashes. It is recognized that this may be a limited reflection of all crashes that occur. The reported crashes tend to be ones that are more severe, and those that involve a motor vehicle. In addition, these are only crashes on Cambridge streets and do not include the streets within the city under state jurisdiction, such as parkways and highways.

Nonetheless, 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 is reported to the police. Unfortunately, most places do not collect good bicycle crash data, and do not collect records where no injury occurred. This makes any comparisons between communities difficult.

CRASH LOCATION AND FREQUENCY

Figure 3.18 shows the frequency of reported crashes according to location; this is a sum of all crashes over the six-year period from 2015-2020. 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.

However, as discussed above, in order to assess risk and safety, we look at crash numbers together with the number of people bicycling, translated to number of miles traveled. In the 2015 Bicycle Plan, we illustrated the crash rate per million bicycle miles traveled on selected corridors to identify areas with higher than expected crash rates. While we had planned to include an updated version of that analysis, factors such as the COVID-19 pandemic disruption of travel patterns prevented us from having adequate data to do so in this update.

Crash data provide Cambridge with information to help address the most common types of crashes occurring. As the City continues to collect and analyze data related to bicycle crashes, we can input the analysis into design and policy solutions to improve bicycle safety. Strategies will include infrastructure improvements as well as education and enforcement for all road users. These various tools are discussed in detail throughout this plan.



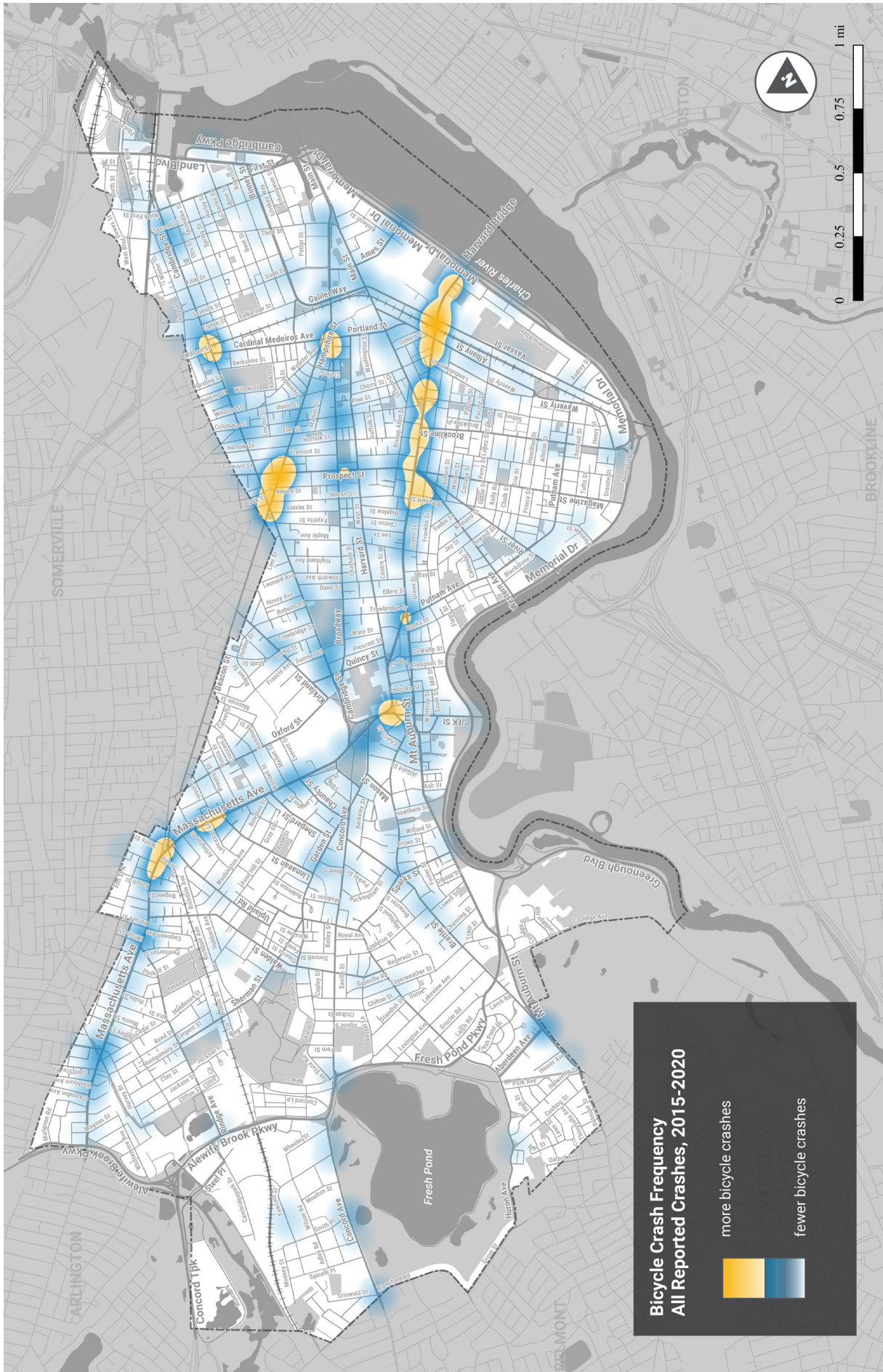


Figure 3.18: Location and frequency of reported bicycle crashes, 2015-2020.

BICYCLE COUNT AND CRASH TRENDS

In order to match annual crash numbers with annual count numbers, the biennial count data were extrapolated to annual counts using a permanent bike count station as a reference, and national analysis standards. The Federal Highway Administration Vehicle Miles Travelled formula was applied to the annual counts to attain citywide Bicycle Miles Travelled (BMT).

As shown in Figure 3.19, BMT has grown from 4.1 million in 2004 to 11.9 million in 2019, an increase of 190% over 15 years. This is based on counts along 21 corridors.

Over the same period, reported crashes involving a bicycle have increased as well. Ninety-one (91) crashes were reported to Cambridge Police Department in 2004 and 149 in 2019. While total crashes are higher in 2019, the number of crashes per BMT (crash rate = crashes/BMT) has decreased.

Bicycle miles traveled in Cambridge increased by

190%
in 15 years

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.

Million Bicycle Miles Traveled (BMT) and Bicycle Crashes (2004-2019)

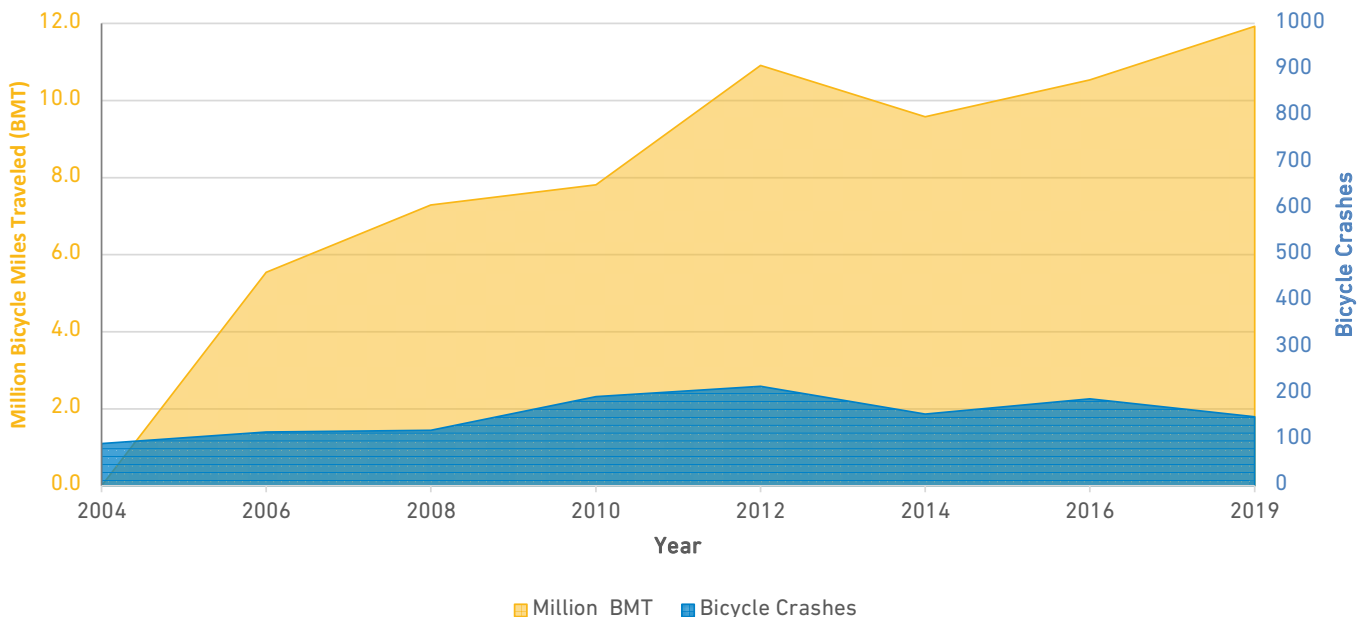


Figure 3.19: Million Bicycle Miles Traveled (BMT) and Number of Bicycle Crashes (2004-2019)

CRASH RATES

The best way to describe the relative change in the level of safety of travelling by bicycle is with a crash rate. A rate accounts for changes in volume of use. With this data, a rate can be shown, i.e. the number of crashes per bicycle mile traveled (BMT) each year. As shown in Figure 3.20, the crash rate has declined from 19.6 crashes per million BMT in 2004 to 12.5 in 2019, a drop of 36%.

The good news: The bicycle crash rate has been decreasing in Cambridge over the period of time that we have been tracking data to enable us to determine a crash rate.

Bicycle crash rates have decreased in Cambridge by 36% in the same time period

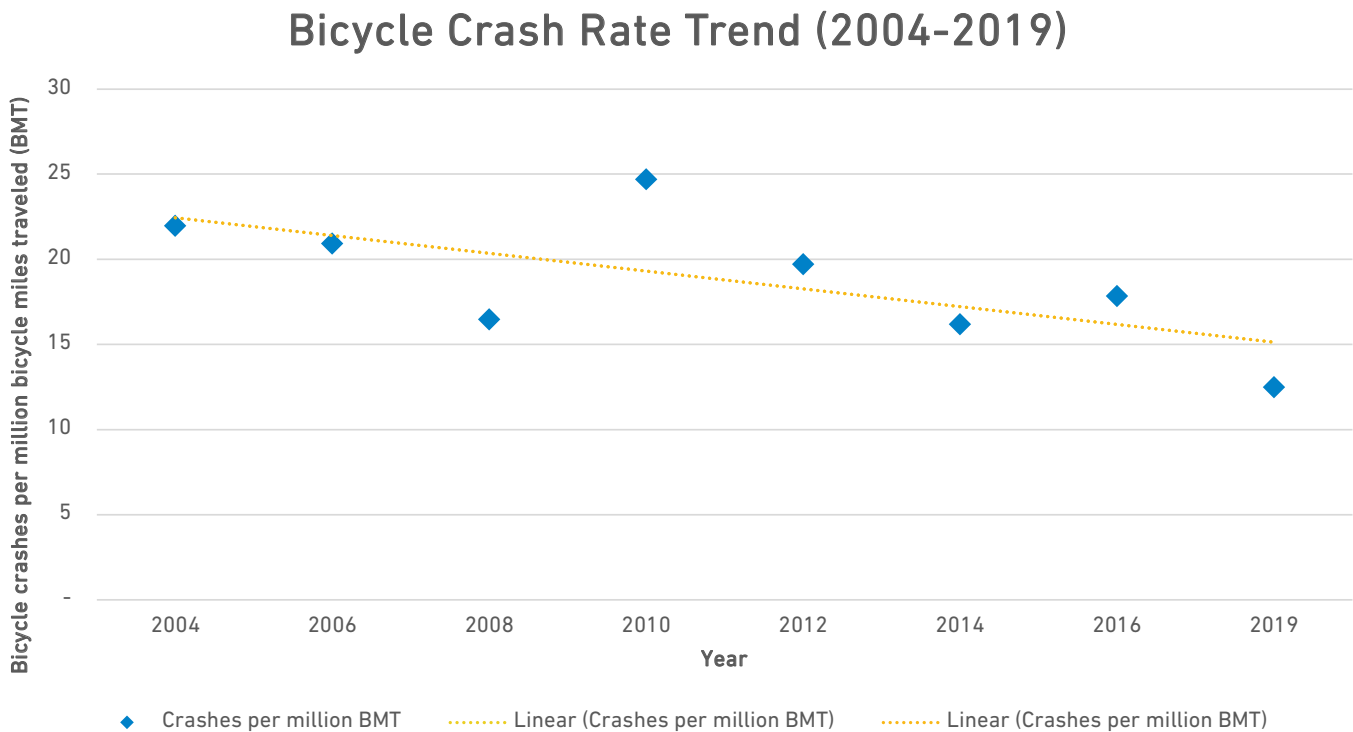


Figure 3.20: Bicycle Crash Rate (2004-2019)

SAFETY IN NUMBERS

The Cambridge bicycle trends correspond with international research demonstrating that as more people start riding bicycles, a person riding a bicycle is far less likely to collide with a motor vehicle or suffer injury and death. This holds for pedestrians as well. It's not necessarily because there are fewer cars on the roads, but because motorists seem to change their behavior and drive more safely when they see more people biking and walking around. There is safety in numbers.

Studies have shown consistently that the number of motorists colliding with people walking and bicycling doesn't increase equally with the number of people walking or bicycling.⁷ For example, a community that doubles its bicycling numbers can expect a one-third drop in the per-person frequency of a crash with a motor vehicle.

One of the most rigorous and frequently cited studies on this topic concludes unequivocally that in locations where more people walk or ride bicycles, the overall injury rate due to motor vehicle collisions decreases.⁸



CRASH TYPES

Each bicycle crash is categorized by type, which helps us understand why crashes occur and how we may prevent future crashes. These types are illustrated in Figure 3.21.

Between 2015 and 2020 in Cambridge, angle crashes were the leading type of bike crash, with dooring and sideswipe crash types prevalent as well.

Preliminary analysis of a limited set of data points to a new type of dooring crash different than the typical scenario of dooring associated with on-street parking. This analysis shows a trend that points to ride-hailing passengers opening doors and dooring people riding bikes. For example, approximately half of dooring crashes along JFK Street involved ride hailing/taxi vehicle passengers exiting their vehicles into the bike lane. The remaining doorings, apart from one driver exiting their parked vehicle, all involved passengers exiting vehicles stopped in the travel lane.

One evening after dark I was biking toward Central Square and a driver opened his door right in front of me—the corner of his door caught me right behind my ear and I went sprawling—luckily I wasn't run over, but got pretty banged up.

—Julie, North Cambridge; Cambridge Bike Stories

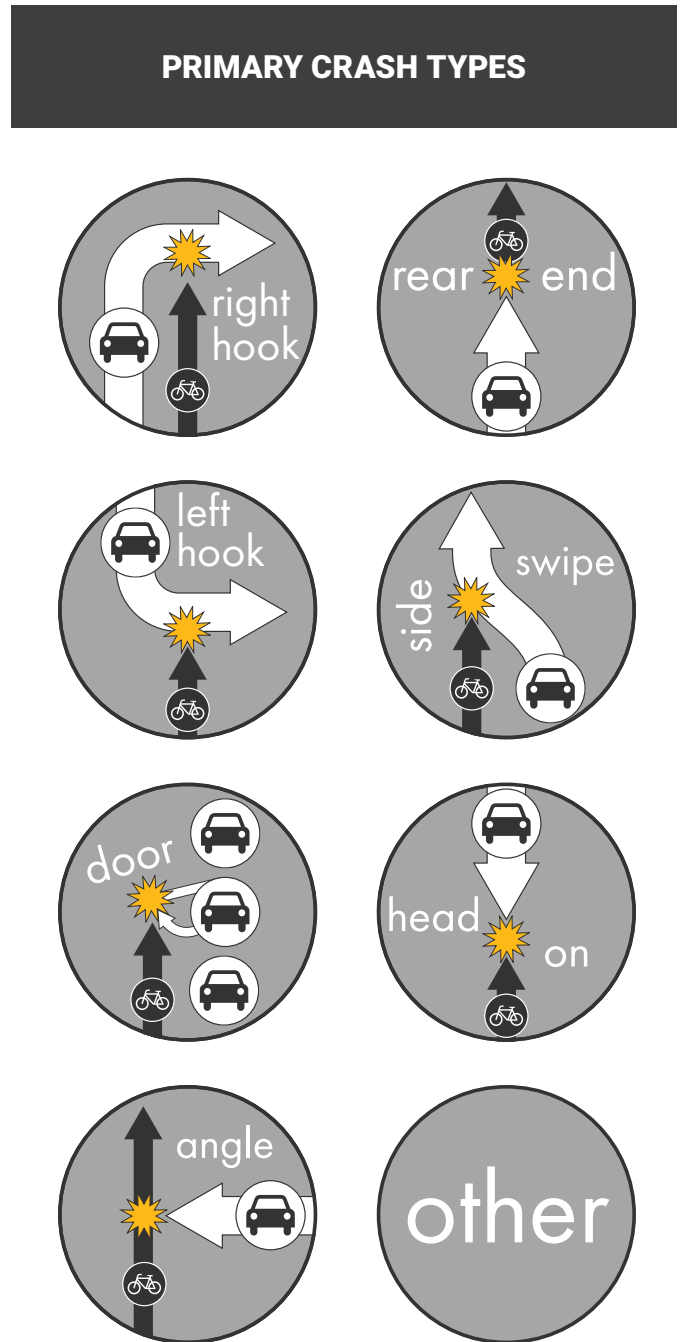


Figure 3.21: Primary Bicycle Crash Types.

INJURY SEVERITY

The severity of the injury in each crash is recorded with crashes reported in Cambridge. Crashes with injuries in 2015-2020 decreased significantly in comparison to crashes with injuries in 2004-2012. In 2015-2020, 46.4% of crashes were reported to have no injuries for the person bicycling while it was 18.3% in 2004-2012. Injuries also decreased significantly. Non-incapacitating injuries decreased from 45.1% in 2004-2012 to 14.7% in 2015-2020 and incapacitating injuries decreased from 5.2% in 2004-2012 to 1.3% in 2015-2020. Incapacitating injuries are those where the injured person was not mobile (e.g., having a broken leg or head trauma). However, crashes with unreported injuries went up from 31.4% in 2004-2012 to 37.6% in 2015-2020. See Figure 3.22.



Injury Severity for Bicyclists in Crashes (2004-2012 vs 2015-2019)

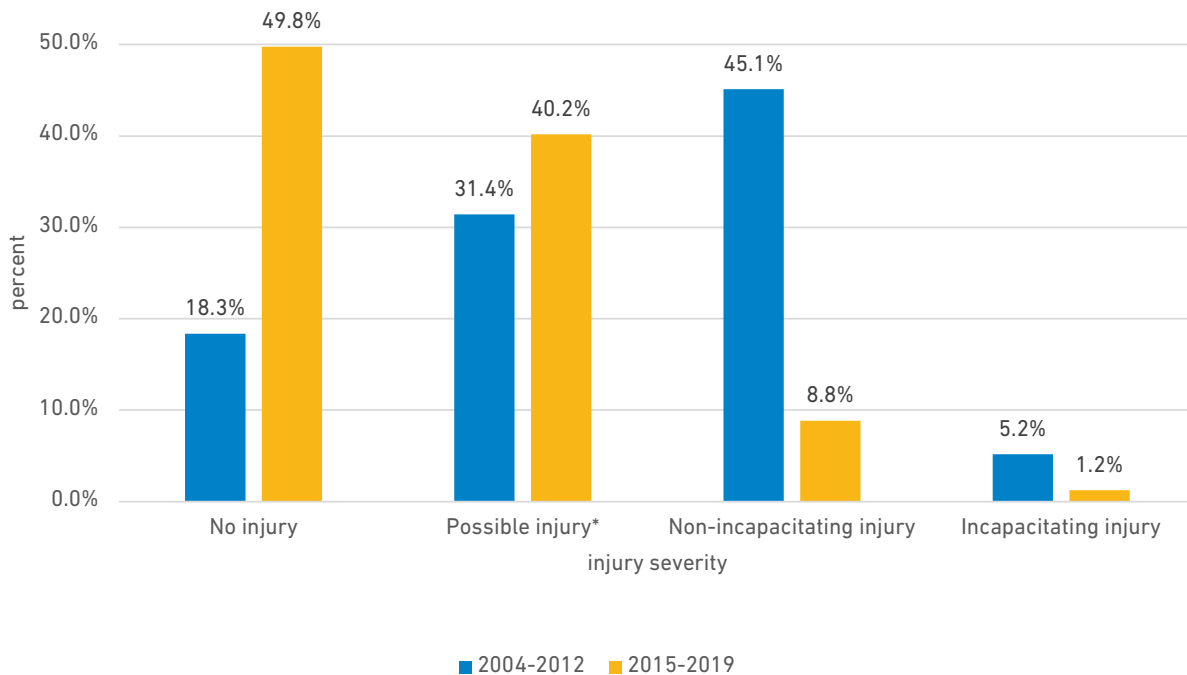


Figure 3.22: Injury Severity for People Bicycling in Crashes (2004-2012 vs 2015-2020).

*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.

SAFETY AROUND TRUCKS

Crashes involving large trucks are more likely to result in the fatality of a person walking or biking than crashes involving passenger vehicles (all of the five fatalities of people on bicycles in Cambridge that have occurred since 2004 have involved trucks). Truck crashes are also more likely to be side-impact crashes.

Side guards on large trucks protect people biking and walking from being swept underneath the vehicle in a side-impact crash. According to a [literature review](#) conducted by the U.S. Department of Transportation⁹, truck side guards are estimated to be 50 to 74 percent effective in preventing fatalities of people biking and 17 to 27 percent effective in preventing fatalities of people walking for parallel/overtaking crash types. Enhanced mirrors substantially improve sight lines for drivers, particularly for seeing cyclists riding on the right-hand side of the vehicle.

In order to address safety issues related to large trucks, the City has been working with Volpe, the National Transportation Systems Center, since 2015 on vehicle design strategies.¹⁰ Standard specifications for the City-owned truck fleet now include truck side guards, blind spot mirrors, and other vehicle-based safety features. The City has also retrofitted its older vehicles with these technologies.

In November of 2020, the Cambridge City Council adopted the Truck Safety Ordinance to mitigate the negative impacts of large vehicles on Cambridge streets. The ordinance requires that City vendors with contracts of \$10,000 or more equip their large vehicles with safety equipment to protect people walking or cycling. The required equipment includes side guards, convex mirrors, cross-over mirrors, and safety decals. The ordinance went into effect in May of 2021.

Harvard University and MIT have adapted their relevant trucks with these safety modifications and will ensure that new vehicles are similarly equipped.



Cambridge Department of Public Works employees demonstrating truck side guards on City trucks.

ENDNOTES

- 1 Resident Telephone and Online Survey (2020), conducted by phone every two years and also online in 2020 (2,951 responses). Additional results can be viewed online.
- 2 Community Needs Survey (2020), conducted for the 2020 Bicycle Plan Update (online and in-person; 305 responses). Additional results can be viewed in Appendix B. The percentages reported in the section on barriers are based on total number of people that responded to that particular question, not total responses. Many respondents skipped one or both questions.
- 3 People responding to the survey had the option to select “other/nongender.” However, a very small number of people selected that option so while their input is valuable and appreciated, cross-tabulating their responses is not statistically significant.
- 4 Cambridge Community Survey (2014), conducted for the 2015 Cambridge Bicycle Plan (online; 733 responses). Additional results can be viewed in Appendix A.
- 5 Visual Preference Survey (2019), conducted for the 2020 Bicycle Plan Update (approximately 200 participants; in-person).
- 6 CitySmart Survey: www.cambridgema.gov/citysmart.
- 7 University of New South Wales (2008, September 7). A Virtuous Cycle: Safety In Numbers For Bicycle Riders. ScienceDaily. Retrieved December 4, 2008, from <http://www.sciencedaily.com/releases/2008/09/080903112034.htm>.
- 8 P L Jacobsen, “Safety in numbers: more walkers and bicyclists safer walking and bicycling,” *Inj. Prev.* 2003; 9; 205-209
- 9 Federal Motor Carrier Safety Administration, “A Literature Review of Lateral Protection Devices on Trucks Intended for Reducing Pedestrian and Cyclist Fatalities,” United States Department of Transportation, 2020, https://rosap.nhtl.bts.gov/view/dot/49250/dot_49250_DS1.pdf.
- 10 Volpe National Transportation Systems Center, “Truck Lateral Protective Device (LPD) Resources,” United States Department of Transportation, 2021, <https://www.volpe.dot.gov/LPDs>.