Addressing Cyclist Safety on Massachusetts Ave.

As a Means of Equitable Development

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I. Executive Summary

Over the first eleven months of 2019, 10.5% of bicycle crashes requiring a public safety response within Boston occurred on Massachusetts Ave.[1] Despite its identification as a priority target for infrastructure and other improvements by Vision Zero Boston and Go Boston 2030 to facilitate safety and efficiency gains, rates along the Massachusetts Ave. corridor have largely stagnated, unlike improvements seen in other comparable locations.[2] The corridor is also an important link connecting the historically marginalized communities of Roxbury and Dorchester, who have seen little-to-no bicycle infrastructure improvements in these developments, with more affluent areas of the Back Bay, South End, and Cambridge. With goals of both safety and equitable development in mind, the City must work towards improving performance along this roadway.

Academic research on the topic of transit infrastructure in gentrifying or traditionally marginalized communities demonstrates the importance of community organizing and coalition building.[3] Case studies looking at similar Vision Zero projects in New York City, San Francisco, and Washington, D.C. demonstrate the high level of commitment needed for projects to work, collaboration amongst a cross-functional set of agencies, and adaptive and iterative methodologies for implementation.[4] Following these insights, policy options to consider for implementation include reconfiguring existing intersections that have received high-crash designations, stepping up enforcement levels along the corridor, and using community organizing to promote safety precautions for cyclists as well as potential infrastructure projects.

The ideal mix of these policies under this circumstance in fact involves pieces of each in collaboration throughout the duration of the project. First, the City should implement increased enforcement as both a rapid response and to gain further observation into the specifics of the issues at hand. Next, due to

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[1] See Table 2 of Appendix A.
[2] See Appendix A; Department of Innovation and Technology, "Vision Zero Crash Records;" Department of Transportation, "Go Boston 2030: Vision and Action Plan," pp. 148–149; 152–153.
[3] Hoffmann, "Beginning of the Equity Era," pp. 145–48; Stehlin, "Institutional Power, Intraclass Conflict," p. 126.
[4] Bliss, Montgomery, and Gerring, "Several Years In, Is Vision Zero Actually Working?"; Giambrone, "D.C. Empowers Bike Lane Enforcement."

the distribution of incidents along Massachusetts Ave., the initiatives of the Boston Transportation Department should re-evaluate the configuration of intersections of concern. Finally, throughout both of the previous steps, leaders should interact with the communities affected by the changes in order to build support among the stakeholders.

II. Background

Massachusetts Ave. acts as a main thoroughfare for Boston residents and commuters. The span connects Dorchester and Roxbury to the south, through the Back Bay and South End, and across the Charles River to the north into Cambridge. As of the 2017 Boston Bicycle Counts, two locations scouted along the corridor, the Massachusetts Ave. Bridge crossing into Cambridge and Massachusetts Ave. south of Columbus Ave., were among the top ten in average number of cyclists over a 24-hour period with 4,321 and 1,080 respectively.[5] The stretch across the Massachusetts Ave. Bridge also is notable for falling within the group of locations with over 10% of vehicle traffic being made up of cyclists, coming in at 18.5%. As this is such a high-traffic area for cyclists, safety is of paramount importance. However, the data shows that Massachusetts Ave. is a particularly dangerous street for cyclists on a relative basis and efforts must be undertaken to lower these rates.[6]

The length of Massachusetts Ave. is rather disparate along socioeconomic lines. In 2017, the median income of Roxbury at the southern end of the corridor was $27,721, made up of 89% people of color, and only 22% of adults held at least a bachelor's degree.[7] To contrast these figures with the northern end of the road within city limits, the Back Bay had respective values of $102,071 median income, 25% people of color, and 85% bachelor's degree attainment.

[5] City of Boston, "2017 Boston Bicycle Counts."
[6] See Appendix A.
[7] Boston Planning & Development Agency, "Neighborhood Profiles."

A. Current Programs

The City of Boston, under the Walsh Administration, has pursued two primary campaigns targeting improvements to existing transportation systems on a variety of fronts. Each of these is led by the Boston Transportation Department but involves collaboration with agencies across the city.

Vision Zero Boston uses data-driven strategies to attempt to reduce traffic crashes across all modes of travel throughout the city.[8] Currently-implemented interventions include reduction of city-wide speed limit, creation the Boston's Safest Driver smartphone application, and increased and improved bike lanes. Massachusetts Ave. is designated a High Crash Network Street under the Vision Zero Boston program and contains six distinct High Crash Intersections along its length.[9]

Go Boston 2030 is concerned with developing equitable, connected, and climate-ready transportation networks throughout the city.[10] Go Boston 2030 has noted Massachusetts Ave. as a Priority Corridor and a Better Bike Corridor in its Vision and Action Plan announced in 2018.[11] As an aspirational goal, Go Boston 2030 seeks to quadruple the rate of commuting by bicycle by 2% to 8% by 2030.[12]

B. Advocates

In terms of grassroots organization, the Boston Cyclists Union is the most prominent in advocating for robust and complete infrastructure for safe and efficient cycling. In June 2019, the organization began a campaign and petition to refocus the efforts of Vision Zero along Massachusetts Ave. to prioritize the southern stretch between Columbia Road and Melnea Cass Blvd.[13] In particular, they state, "This corridor continues to have a high crash and injury rate and deserves the same Vision Zero treatment that Mass Ave has had in the Back Bay… Efforts to redesign the street should also be paired with measures to improve public safety in this area so that people feel encouraged to be on the street to visit businesses, organizations,

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[8] City of Boston, "Vision Zero."
[9] Ibid.
[10] Department of Transportation, "Go Boston 2030: Vision and Action Plan," pp. 8–9.
[11] Ibid., pp. 148–149; 152–153.
[12] Ibid., p. 9.
[13] Boston Cyclists Union, "Progress on 'Mass Ave South.'"

hospitals and homes."[14] The union also benefits from support within the city government itself, notably from City Councilor Michelle Wu, who penned an Op-Ed alongside the group's executive director calling on the City to take a more proactive approach to infrastructure improvements following the death of a cyclist in 2018.[15]

III. Methodology

In considering the question of equitable access and safety amongst cyclists, especially within a corridor stretching between vastly different socioeconomic conditions, a variety of factors and sources must be taken into consideration. The primary data used for analysis is published as a part of Vision Zero Boston and interconnected City initiatives. Vision Zero publishes data sets on vehicular crashes and fatalities updated monthly with information on the mode of transportation involved, date, location, amongst other variables. In this consideration, key information used throughout the analysis includes flagging whether an incident occurred at a location involving Massachusetts Ave. or one of a number of comparison streets and whether a bicycle crash occurred at an intersection or along a roadway.

This primary data analysis then coalesces with published academic research on rates of adherence to safety regulations within Boston, as well as a few publications detailing lessons learned from efforts to enhance bicycle infrastructure within gentrifying communities which have historically been isolated from robust transit networks. Using learnings from analysis of the raw data, published research, and similar case studies from cities around the country, the aim is to identify both key locations along the roadway that still require enhancements to increase safety for users as well as what non-infrastructure interventions may be merited.

[14] Boston Cyclists Union, "Petition to Make Mass Ave South Safer."
[15] Wu, Devereux, and Wolfson, "Another Cyclist Is Killed"

IV. Literature Review

A. Bicyclist Safety Behaviors Observations

Wolfe et al. examined the safety precautions taken by cyclists in high-collision areas throughout Boston to "characterize and quantify the compliance of bicyclists in Boston with state road laws and safety recommendations to influence the creation of future bicycle safety programs and campaigns."[16] Overall, the study found high rates of compliance with obeying signals, riding in bike lanes, and yielding to pedestrians with each having rates above 80%.[17] Helmet rates were split with personal bikers having compliance of 74%, while those using bike-shares had a utilization rate of 39%.[18] Light and reflector compliance was the primary factor the researchers found lacking with around 50% adoption.[19]

The authors of the study note the importance of promoting safety interventions among individual riders as well as increasing enforcement of violations as "several dangerous bicycling intersections in Boston [have] received funding to reconfigure traffic and improve bicyclist safety in the next 5–10 years; however, these improvements will only impact a small portion of the Boston city streets, which may or may not decrease the number of bicycle crashes and deaths that happen each year."[20]

B. The Beginning of the Equity Era

Melody L Hoffmann describes the importance of balancing the history of deprioritization in the context of transportation infrastructure for isolated and underserved communities with advocating for expanded and more robust systems.[21] She summarizes this thought succinctly as "it is not enough to build infrastructure and design community events. If community members get a sense that these efforts seem too much like those in the past that have disenfranchised them, then they will not want to engage."[22] She goes on

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[16] Wolfe et al., "Bicyclist Safety Behaviors," p. 119.
[17] Ibid., p. 120.
[18] Ibid.
[19] Ibid., p. 121.
[20] Ibid., p. 122.
[21] Hoffmann, "Beginning of the Equity Era," pp. 143–144.
[22] Ibid., p. 144.

to describe The Artery in Milwaukee where architects of the project hired community organizers to engage with residents who were primarily people of color and historically disenfranchised from efficient transit systems to promote usage of the project that was designed with them as the primary users.[23] She goes on to describe the friction and gap in efficiency between largely homogeneous cycling advocacy group in Portland and the much more effective groups outside of these confines, including the Portland African American Leadership Forum.[24] The lack of inclusive participation in these causes is largely a hindrance to the causes being promoted by these groups. Largely, Hoffman's argument centers around the idea that "It is time for mainstream bicycle advocates who have societal power and privilege to exploit it for equity purposes" and inclusion in the development of bicycling infrastructure and other projects must be community-based and take into account the specific situations of the individual locations.[25]

C. Institutional Power, Intraclass Conflict

Within his book *Cyclescapes of the Unequal City*, John G. Stehlin devotes a chapter to the discussion of the struggle when developing complete streets within traditionally marginalized communities, particularly in the context of socioeconomic disparities and the catalyst of development that is gentrification.[26] Stehlin discusses this topic through the lens of the redevelopment of Oakland's Telegraph Corridor which stretches between the economically disparate neighborhoods where "Oakland's troubled past and possible futures are interwoven by mobility."[27] This largely mirrors many of the discrepancies along the Massachusetts Ave. corridor of race-class imbalance between Roxbury-Dorchester and Back Bay-South End.

Stehlin describes the inherent tensions that arise when "intervening in the built environment to leverage quality of life into capital accumulation."[28] He describes the rise of conflicting groups arising during the Oakland development, but generally applicable to similar situations, as the bloc supporting bicycle

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[23] Ibid., pp. 145–48.
[24] Ibid., pp. 151–53.
[25] Ibid., pp. 159; 153–54..
[26] Stehlin, "Institutional Power, Intraclass Conflict," pp. 111-12.
[27] Ibid., p. 113.
[28] Ibid., p. 126.

infrastructure made up of those drawn to quality-of-life improvements and groups and small businesses who desire the support of these individuals contrasting with the "older, more car-dependent residents, typically homeowners, who feared overflow from restricted parking supply" and business owners with similar concerns.[29] Stehlin notes, "advocacy for bicycle infrastructure has depended on grassroots networks of cyclists that increase in strength with gentrification" and the lack of action still in poorer areas, primarily with residents of color, compared to those who were similar in years past but have seen recent trends of gentrification.[30] As a result of gentrification, the development occurring in Oakland both benefited from the increased economic power of the camp advocating for robust bicycle infrastructure, while struggling with the overarching fact that many of the improvements under consideration had been needed for decades prior to gentrification.[31] Largely, the struggle for enhanced infrastructure came between seeing an increase in economic activity as a result of cycling activity and missed opportunity from loss of parking.[32]

V. Case Studies

A. New York City

The city that has made the greatest strides as a part of a Vision Zero program is likely New York City.[33] New York has had an intensive approach to reforming its transit network including modified traffic signals, increased penalties for dangerous driving, reduction in speed limits, and speed enforcement cameras, among other improvements. In 2018, the city saw an all-time low of traffic fatalities continuing a steady 5-year decline. However, this is not entirely an improvement across the board. In 2019, cyclist deaths in traffic have more than doubled from the previous year to 23.

New York is unique in its positioning as "roughly 60 percent of trips are already made on another mode of transportation besides a car."[34] With such a high rate of non-car transportation, projects aimed to

[29] Ibid.
[30] Ibid., p. 134.
[31] Ibid., p. 126-28.
[32] Ibid., p. 133.
[33] Bliss, Montgomery, and Gerring, "Several Years In, Is Vision Zero Actually Working?"
[34] Ibid.

limit the access of motor vehicles has become politically possible, if not easy, in recent years. New York's success is largely thanks to the cross-disciplinary approach it has taken in bringing City agencies together to collaborate on initiatives it has undertaken. Cycling advocates also have recently been critical that the pace of improvements has slowed throughout the city and the increase in bicycle fatalities must be treated as an emergency to combat.

B. San Francisco

San Francisco has also adopted a Vision Zero plan to eliminate street fatalities in 10 years by 2024.[35] While it has seen improvements in fatalities in general, those for cyclists have largely stagnated. The city has also identified that "a majority of the city's traffic deaths are people of color and seniors, two groups that are less likely than the general population to own cars, highlighting the imbalances of its transportation networks."[36] The momentum in San Francisco towards these goals is thanks in part to collaboration across agencies enabling evidence-driven policy design. Additionally, San Francisco has adopted numerous "quick build" projects designed to get interventions into the world at a rapid pace and "are designed to be fast, reversible, and adjustable, allowing the city to skip long public engagement processes that can slow the delivery of impactful projects."[37] The city has identified 13% of streets where 75% of incidents occur as its high-injury network and has already begun development of interventions along 40% of them.

C. Washington, D.C.

In an attempt to curb incidents caused by drivers blocking bike lanes, Washington, D.C. has both expanded its workforce of enforcers as well as granting additional methods of administering citations.[38] D.C. has also adopted a Vision Zero program, and this program is a part of the initiative. The city is increasing the parking enforcement officers by just under 10% and focusing on monitoring blocked bike lanes. The mayor's office has also stated that officers will prioritize locations using surveillance and 311 reports in an effort to

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[35] Ibid.
[36] Ibid.
[37] Ibid.
[38] Giambrone, "D.C. Empowers Bike Lane Enforcement."

use data-driven decision making for maximum effect. Additionally, enforcement officers have been granted the power to issue citations on photographic evidence via mail, particularly in case the vehicle departs before the officer is able to present it to the violator.

VI. Best Practices

Each of these cases shines a light on how cities are responding to Vision Zero initiatives in both positive and negative ways.[39] A common thread emphasized in each of these situations is the necessity for a plan to be in place and to have active collaboration across units to implement it with great care. The cross-disciplinary approach each city has taken, whether formally or informally, has been the key to any gains seen towards these goals. Each of these cases is in fact rather unique and each also demonstrates other valuable lessons to carry forward in policy decision making.

The New York City case clearly demonstrates the need for political buy-in for ambitious projects. It also shows the continuous monitoring and response obligations on the side of the city as changes in situations necessitate further and adapted response, such as when cyclist fatalities spike seemingly out of nowhere. San Francisco also shows a variation on this idea in the value of implementing solutions quickly with an ability to adapt as situations change. Their projects implemented on a rapid and continuous scale obviously demand great commitment but allow for improvement gained from new insight following their deployment.

The Washington, D.C. case is somewhat distinct from the other two in that it does not examine an infrastructure change, but rather a policy and personnel change.[40] While San Francisco's projects allowed for flexibility, these changes do so to an even greater degree as people can be moved from site-to-site on a daily basis as new citizen or officer reports come in. This flexibility, in tandem with enhanced powers of pursuing violators, demonstrates both of these common ideas of adaptability and buy-in seen throughout the cases in individual ways.

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[39] Bliss, Montgomery, and Gerring, "Several Years In, Is Vision Zero Actually Working?"
[40] Giambrone, "D.C. Empowers Bike Lane Enforcement."

VII.Findings

A. Analysis of Crash Data

From 2015 through November 2019, 160 separate incidents involving bicycles have occurred along Massachusetts Ave. requiring a response from public safety services.[41] This represents over 7.6% of all such incidents over the time period occurring throughout Boston. Of the six cyclist deaths occurring in the city since 2015, one of these also occurred at the intersection of Massachusetts Ave. and Beacon St. in August 2015.[42]

While other areas targeted as High Crash Network Streets for bicycle crashes have responded positively, demonstrated through a decrease in rates of incidents, Massachusetts Ave. has not seen such improvements despite also being a target for enhancements to existing infrastructure. In fact, when isolated to incidents occurring within the first eleven months of 2019, this rate rises to more than one in ten incidents requiring emergency services throughout the city occurring along this single stretch of road with 37 crashes.[43] For comparison, Commonwealth Ave. went from an average of 26.6 incidents per year over 2015–2019 to only 14 incidents from January through November of 2019.

As the cleaned data presented in Appendix A demonstrates, the overwhelming majority of incidents along Massachusetts Ave. occur at intersections rather than along the street in traffic. This, along with prior research cited by Wolfe et al. indicating that bike lanes may not be as safe or efficient as advertised leads to the conclusion that they are not the most important intervention at this stage along Massachusetts Ave.[44]

B. Boston Safety Adherence

By analyzing data presented in Wolfe et al., learnings about the behavior of cyclists throughout Boston, in particular, can inform future policy recommendations and highlight areas that are both at

[41] See Table 1 of Appendix A
[42] Department of Innovation and Technology, "Vision Zero Fatality Records."
[43] See Table 2 of Appendix A
[44] Wolfe et al., "Bicyclist Safety Behaviors," p. 122.

satisfactory levels, as well as those that may be worth increasing initiatives around. While most of the safety regulations or recommendations studied had a sufficient level of adoption by riders on Boston streets, helmet use among bike-sharing riders only reached 34% and a minority of privately-ridden bikes used proper reflective or illuminating accessories.[45] These conclusions suggest that higher levels of enforcement may create a situation that coerces more riders to adopt these safety measures and reduce the seriousness of potential crashes, if not crashes altogether.

C. Community-Based Intervention

The current literature on infrastructure improvements in gentrifying or heterogeneous locations, as in both Hoffmann and Stehlin, supports and implores community-centered development. Stehlin's analysis of the redevelopment of Oakland's Telegraph Corridor demonstrates the naturally occurring struggles that arise during the course of infrastructure realignments as they change allocation between different means of travel than those implemented thus far.[46] Hoffmann also describes the importance to the success of the Milwaukee redevelopment project of hiring a community organizer to build support for the project in a community that had always been overlooked when it came to transit development.[47] Each of these demonstrates that both community support and coalition building are important when altering the transit network of a gentrifying place in particular. It's not enough to enter the space and begin perceived improvements without support as residents with an interest in the status quo and who are rightfully untrusting of development will very likely have objections to these projects.

VIII. Policy Options

A. Increased Enforcement

Increasing personnel or prioritizing monitoring of violations of existing cycling safety infrastructure along the corridor allows for a maximally adaptable and responsive solution towards mitigating incidents

[45] Ibid., pp. 120–21.
[46] Stehlin, "Institutional Power, Intraclass Conflict," p. 126.
[47] Hoffmann, "Beginning of the Equity Era," pp. 145–48.

along the roadway. This infrastructure does exist along Massachusetts Ave. in various forms and it is certainly possible that motor vehicles blocking susceptible mechanisms are responsible for a large share of preventable incidents. Delivery trucks, MBTA buses, and other large motor vehicles can pose a heightened risk to cyclists due to low visibility, difficult maneuverability, and natural tendency to stop frequently and block sections of road over the course of their business activities, such as delivering to businesses along the street.

Cyclists may also themselves be found engaging in dangerous maneuvers or lack of safety precautions which may inherently put them at higher risk of incident. As Wolfe et al. found, the minority of personal cyclists observed in Boston displayed proper reflectors or lights and an additional minority of cyclists using bike-shares failed to properly wear helmets.[48] Increased enforcement may lead to higher adoption rates of these safety mechanisms, which could either prevent or lessen the seriousness of potential incidents. The authors also note that official campaigns have taken place to raise awareness of helmet usage and safety benefits, but "the efficacy of these initiatives is unknown."[49]

This policy option follows in the same vein as the Washington, D.C. case where more traffic enforcement officers were brought onboard and granted additional powers to pursue violators.[50] This is the least involved of available options in terms of both commitment and investment as officers can be reassigned if no significant reduction of violators is found. This also may be an option to consider in tandem with others outlined below. A primary downside of this in terms of equitable development comes through recognizing potentially rocky relationships between law enforcement officials and communities of color, especially in the present moment. If this tactic to introduce heightened presence of officers in communities is pursued, leaders should absolutely consider a community involvement aspect to the plan.

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[48] Wolfe et al., "Bicyclist Safety Behaviors," p. 120–21.
[49] Ibid., p. 123.
[50] Giambrone, "D.C. Empowers Bike Lane Enforcement."

B. Intersection Redevelopment

Analysis of the data clearly shows that Massachusetts Ave. is unique among comparative locations in that a large majority of its incidents occur at intersections rather than merely along the course of the road.[51] These incidents tend to cluster in the Back Bay to the north and in proximity to Melnea Cass Boulevard to the south.[52] This, therefore, may indicate that a large segment of incidents may be reduced with redevelopment of a limited number of intersections in these areas.

Go Boston 2030 has identified Massachusetts Ave. as a Vision Zero Priority Corridor, the City has effectively identified that the roadways along this area must be scrutinized for safety and efficiency.[53] However, as of the latest update report of the initiative covering 2017 and 2018, no improvements have been identified and the Priority Corridor is considered complete.[54] However, as previously noted, Vision Zero Boston has identified six High Crash Intersections along Massachusetts Ave. which should be among the first to undergo consideration in a revamped effort.[55] Specifically for bike injury crashes, the intersections noted are, from north to south, Massachusetts Ave. at Beacon St., Commonwealth Ave., Newbury St., and Melnea Cass Blvd.

In order for this intervention to take hold, it would likely require commitment from City administrators as well as a sufficient budget for deployment. The City could learn from the San Francisco case study discussed previously and use an agile and iterative process to deploy interventions that are quickly implemented, adaptable to new learnings, and able to be undone before settling on a more permanent solution.[56] Variables of note to consider in a more detailed analysis of intersection performance may include lane order of traffic to avoid right turn lanes for motor vehicles crossing through bike lanes as well as bike-specific signals installed in these locations.

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[51] See Table 2 of Appendix A.
[52] See map of 2019 incidents in Appendix B.
[53] Department of Transportation, "Go Boston 2030: Vision and Action Plan," p. 148–149.
[54] City of Boston, "2017/18 Vision Zero Boston Update."
[55] City of Boston, "Vision Zero."
[56] Bliss, Montgomery, and Gerring, "Several Years In, Is Vision Zero Actually Working?"

C. Community-Based Safety Interventions

While the other policy options suggested thus far concern primarily with safety rather than development, this one mandates these projects as inclusive and equitable in a way that aligns particularly well with Go Boston 2030 goals. In her research, Hoffmann describes the importance of community organizing for buy-in from local residents for infrastructure projects in traditionally marginalized communities.[57] Due to the disparity in socioeconomic factors along Massachusetts Ave., it is likely true that pushback may come towards any project that disturbs the status quo in an effort to modernize or make the current roadways more safe and efficient for cyclists. As such, a community-based solution likely needs to develop in order to work towards a more equitable transit network for cyclists in the area.

IX. Recommendations

The policy options laid out above are, in fact, not mutually exclusive, but rather may very well work best as a multifaceted and temporally staggered solution. Due to the nature of the topic at hand, speed of implementation is of the utmost importance, though being into the winter months with fewer bikes on the road does mitigate this urgency a bit. With that in mind, the recommended policy implementation begins with introducing increased enforcement units to ensure that both cyclists and motor vehicles are obeying regulations designed to prevent accidents. The immediate deployment of enforcement units in areas of most concern also allows for increased intelligence through observation as policymakers consider further interventions.

Following this, Boston Transportation Department initiatives should re-evaluate intersection configurations along the route due to the fact that the primary location of incidents requiring emergency care on Massachusetts Ave. occur at intersections rather than in open traffic.[58] The City should undertake this effort by implementing best practices learned through the experiences of case study city projects. Particularly,

[57] Hoffmann, "Beginning of the Equity Era," pp. 145–48.
[58] See Appendix A.

these efforts require buy-in from a functional cross-section of agencies responsible for developing the plans, implementation, evaluation, and iteration over time.

Finally, due to the socio-economic factors at play, community engagement is a critical factor to evaluate alongside both of the previous steps. The most successful projects seem to stem from and occur with the approval of the community that they are in. Buy-in from communities that have been historically overlooked from the transit factor, as well as those along the route depending on the current configuration for a variety of reasons, must be brought on board as stakeholders throughout the duration of the project.

X. Next Steps and Conclusion

Through these policies, the end goal is to build both a safer and more inclusive roadway network along Massachusetts Ave. As it has not benefited from interventions so far as other throughways throughout the city have, it lacks potential gains as a linkage between key areas. This one street connects vastly different areas, and increasing the safety and efficiency along the corridor is a key way for the City of Boston to live up to its commitment to provide fair and equitable transit networks for residents throughout the city.

Failing to make these improvements will ensure that dozens of cyclists a year face serious and avoidable crashes on the city street. While the proposed solutions are both intensive and multi-pronged, it suggests the most effective way to combat the troubles along the roadway. By taking the initial steps to build community support for enhanced infrastructure and ramping up enforcement of safety violations, the City will move ever closer to these goals.

Appendix A: City of Boston Crash Location Benchmark Comparisons

Table 1: Boston Crashes Requiring Public Safety Response, 2015–2019[59]

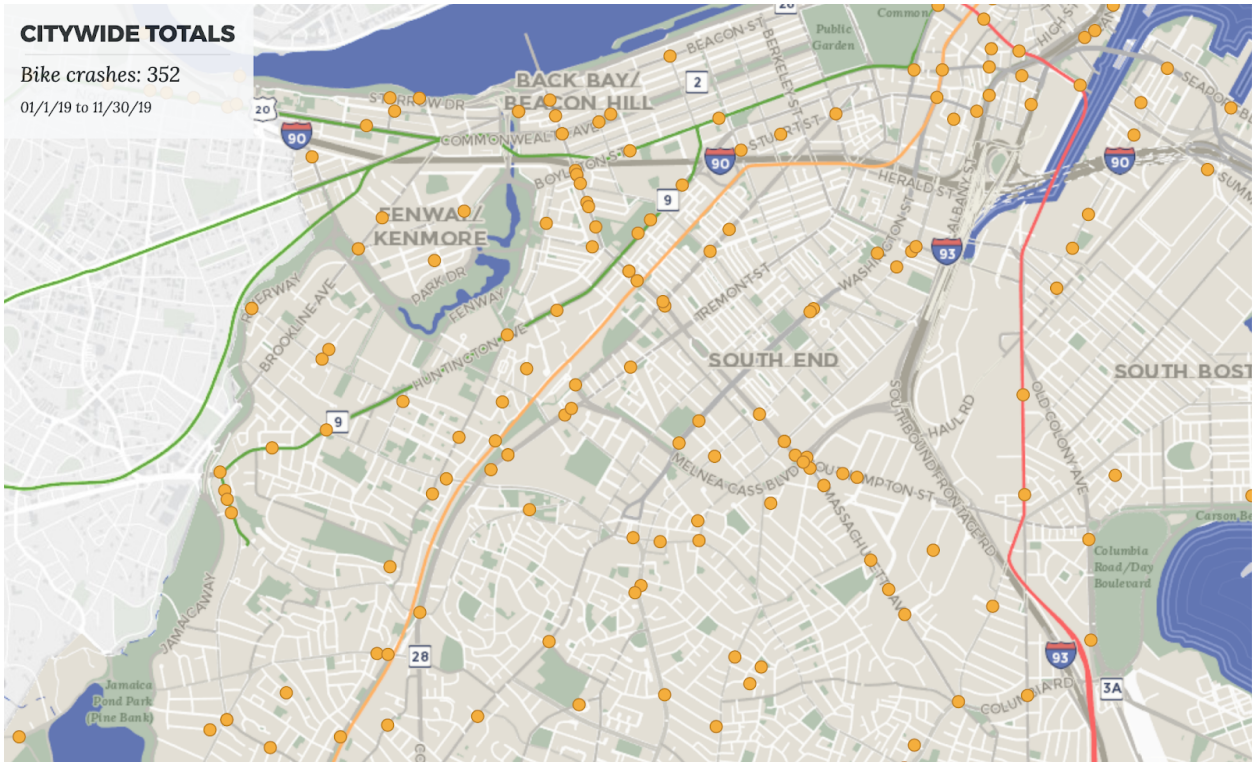
	Intersection	Street	Other	Total
Massachusetts Ave.	110	50	0	160
Commonwealth Ave.	63	68	0	131
Washington St.	95	62	0	157
City of Boston	1,060	993	40	2,093

Table 2: Boston Crashes Requiring Public Safety Response, Jan.–Nov. 2019[60]

	Intersection	Street	Other	Total
Massachusetts Ave.	23	14	0	37
Commonwealth Ave.	7	7	0	14
Washington St.	10	8	0	18
City of Boston	186	160	6	352

[59] Department of Innovation and Technology, "Vision Zero Crash Records."
[60] Department of Innovation and Technology, "Vision Zero Crash Records."

Appendix B: Massachusetts Ave. Bike Crash Map[61]



[61] Analyze Boston. "Vision Zero Boston Injury Crash Map."

References

Analyze Boston. "Vision Zero Boston Injury Crash Map." City of Boston, August 2019. https://apps.boston.gov/vision-zero/.

Bliss, Laura, David Montgomery, and Matthew Gerring. "Several Years In, Is Vision Zero Actually Working?" *CityLab*, November 21, 2019. https://www.citylab.com/transportation/2019/11/vision-zero-data-traffic-deaths-pedestrians-cyclist-safety/601831/.

Boston Cyclists Union. "Petition to Make Mass Ave South Safer," June 26, 2019. https://docs.google.com/forms/d/e/1FAIpQLSfvOpvI5HR9iINEDNJPz2g-zeiUgvCBJHaLXCN6wqjBNApt4w/viewform?usp=sf_link&usp=embed_facebook.

———. "Progress on 'Mass Ave South,' and a Chance to Impact Other Plans Nearby." *Boston Cyclists Union*, June 25, 2019. https://bostoncyclistsunion.org/progress-on-mass-ave-south-and-a-chance-to-impact-other-plans-nearby.

Boston Planning & Development Agency. "Neighborhood Profiles," April 2019. http://www.bostonplans.org/getattachment/f719d8d1-9422-4ffa-8d11-d042dd3eb37b.

City of Boston. "2017/18 Vision Zero Boston Update," 2018. https://www.boston.gov/sites/default/files/document-file-02-2019/vision_zero_2018_report.pdf.

———. "2017 Boston Bicycle Counts." City of Boston, February 12, 2018. https://www.boston.gov/departments/boston-bikes/2017-boston-bicycle-counts.

———. "Vision Zero," January 31, 2019. https://www.boston.gov/transportation/vision-zero.

Department of Innovation and Technology. "Vision Zero Crash Records." City of Boston, September 24, 2019. https://data.boston.gov/dataset/vision-zero-crash-records.

———."Vision Zero Fatality Records." City of Boston, December 10, 2019. https://data.boston.gov/dataset/vision-zero-fatality-records.

———. "Go Boston 2030: Vision and Action Plan." City of Boston, March 7, 2017. https://www.boston.gov/sites/default/files/file/document_files/2019/06/go_boston_2030_-_full_report.pdf.

Giambrone, Andrew. "D.C. Empowers Bike Lane Enforcement Officers to Issue Photo Tickets to Drivers." *Curbed DC*, November 13, 2019. https://dc.curbed.com/2019/11/13/20963452/dc-bike-lanes-enforcement-parking-violations-dpw.

Hoffmann, Melody L. "The Beginning of the Equity Era: Possibilities and Solutions." In *Bike Lanes Are White Lanes: Bicycle Advocacy and Urban Planning*, 143–59. University of Nebraska Press, 2016. https://muse-jhu-edu.ezp-prod1.hul.harvard.edu/chapter/1788710.

Stehlin, John G. "Institutional Power and Intraclass Conflict over Complete Streets." In *Cyclescapes of the Unequal City: Bicycle Infrastructure and Uneven Development*, 111–40. University of Minnesota Press, 2019. http://muse.jhu.edu/book/67782.

Wolfe, Elizabeth Suzanne, Sandra Strack Arabian, Matthew J. Salzler, Nikolay Bugaev, and Reuven Rabinovici. "Bicyclist Safety Behaviors in an Urban Northeastern, United States City: An Observational Study." Journal of Trauma Nursing 23, no. 3 (June 5, 2016): 119–24. https://doi.org/10.1097/JTN.0000000000000202.

Wu, Michelle, Jan Devereux, and Becca Wolfson. "Another Cyclist Is Killed. Our Streets Need to Be Safer. Now." The Boston Globe, November 15, 2018, sec. EditorialOpinion. http://global.factiva.com/redir/default.aspx?P=sa&an=BSTNGB0020181115eebf001p5&cat=a&ep=ASE.