Safe Streets For Cycling

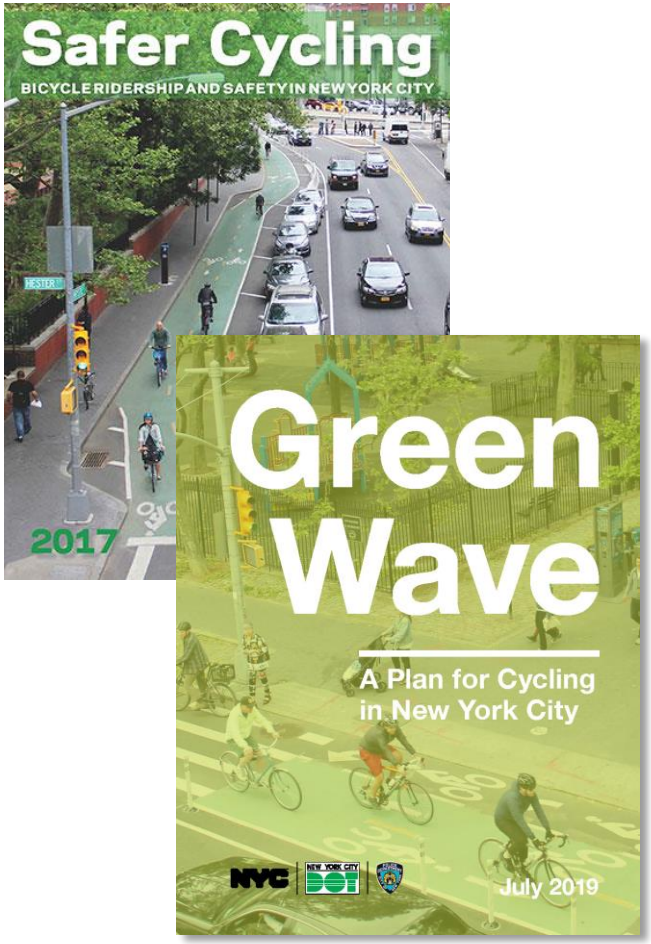
How Street Design Affects Bicycle Safety and Ridership

October 2021

Introduction

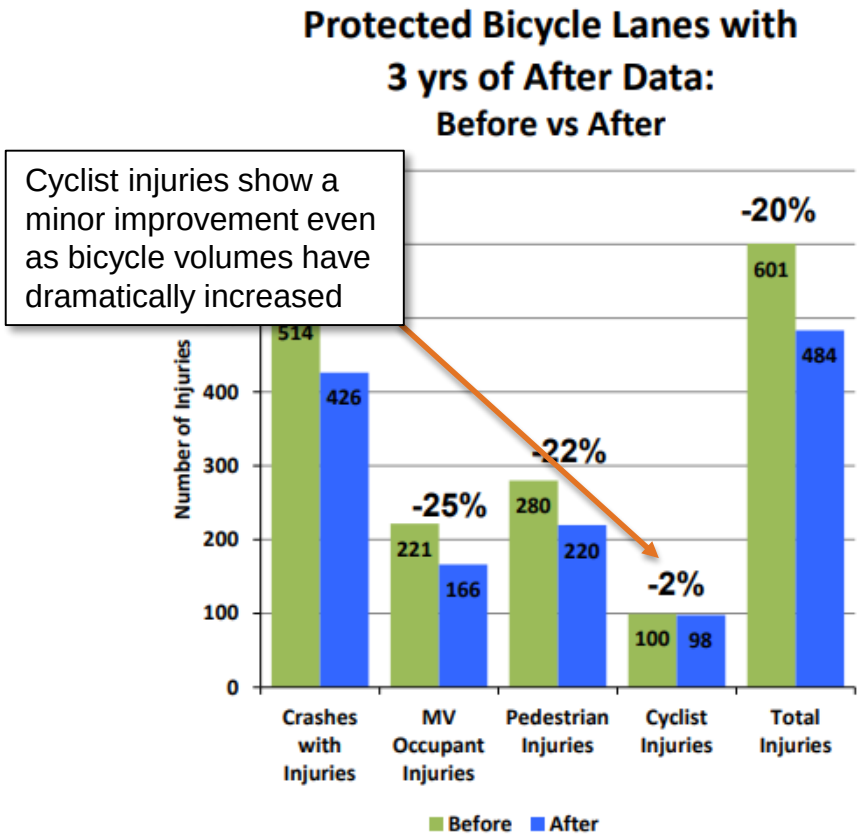
Building on action items the city's 2019 Green Wave citywide bicycle plan and the 2017 Safer Cycling report, this study evaluates the safety and ridership of NYC's on-street bicycle lanes. This in-depth analysis reflects the planning and design decisions of NYC DOT's bicycle projects by measuring the changes in cyclist risk, measured by cycling crashes and volumes, before and after installation.

The results of this study will be used to advance policies that continue to enhance to effectiveness of NYC's bicycle network development. By better understanding where each type of on-street bike lane, primarily protected bike lanes (PBL) and conventional bike lanes, perform best, NYC DOT can use an appropriate design palate to match each street's context. This knowledge will be directly applied to the development of neighborhood bicycle networks that consist of conventional lanes, PBLs, and streets with traffic diverters and calming, which provide safe routes within the neighborhood and also tie into the broader, citywide, PBL network.



Study Background

- This study provides an in-depth analysis of the change in cycling risk following the installation of bicycle lanes across NYC
- Past studies have been simple before-after comparisons of cyclist injuries which do not take into account the increase in cyclist volumes
- For some published results we compare change in single day spot location counts
  - This fails to control for the daily variations in volumes due to factors such as weather
  - Usually compares volumes in year prior to installation with year after, as compared to 3 years of crash data in both directions. Due to the growth in cycling, 3 years of volumes is more reliable measure

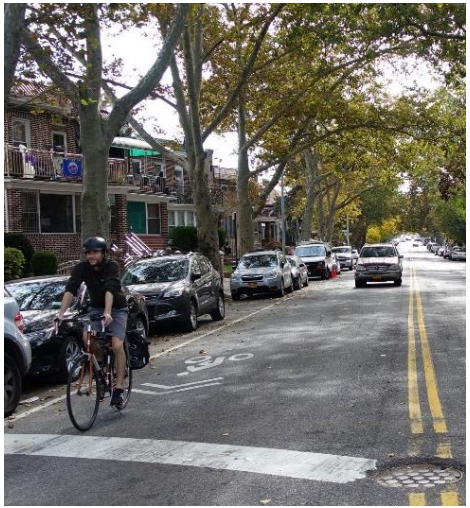


Bicycle Lane Types in NYC

Study focus

Protected Bike Lanes: Class 1

Conventional Bike Lanes: Class 2

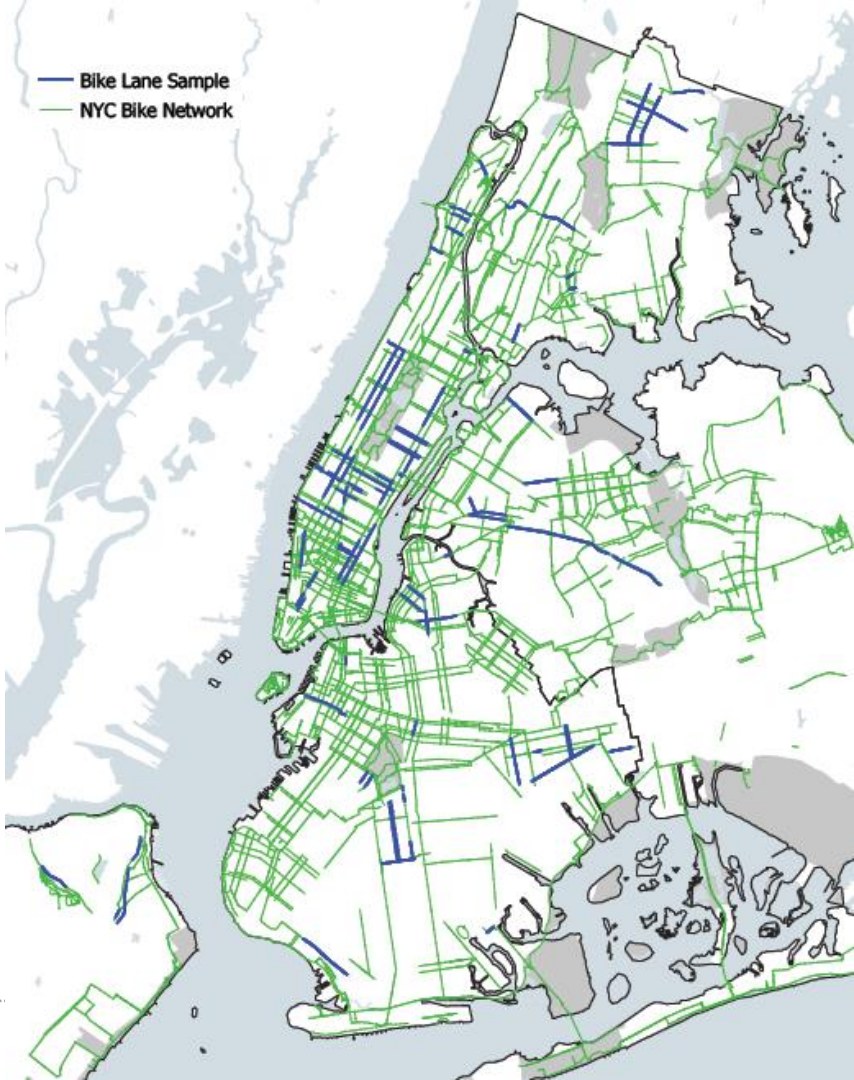


Shared Lanes: Class 3

Off-street Path

Sampling of Projects

- Screened projects for those with weekday counts before installation and 1 year after, minimum ¼ mile length
- 100+ bicycle lane projects
  - 35 Protected (31 miles)
  - 50 Conventional (46 miles)
  - 16 Shared (18 miles)
- Sample size was found to be representative of street types with bike lanes as well as universe of bike lane types
- Project installation years from 2009 - 2018



Measuring Bicycle Risks

Study period: Where possible, data from 3 years before & after project installation are used

$$Bicyclist\ Risk\ =\ \frac{Bicyclist\ injuries\ per\ mile}{Estimated\ bicyclist\ volume}$$

Estimating annual bike volumes

- Compared NYC permanent bike counters on:
  - Bridges (Williamsburg, Pulaski, Queensboro)
  - Major protected lane (Kent Ave)
  - CitiBike daily usage
- Model developed from permanent count data to annualize the 1-day project counts. Model includes weather and daily/seasonal variables.

Results

Results of **before-after** risk analysis (cyclist injuries per 10M cyclists per mile)

OVERALL

- System-wide, the combination of bike lane types reduced bicycling risk by 32%

PROTECTED BIKE LANES (Class 1)

- Risk reduction of 34% across all study projects
- On the highest risk streets, cyclist risk is reduced by over 60%
- Both boroughs with large enough PBL sample sizes have reductions in cyclist risk: Queens (40%) and Manhattan (26%)

CONVENTIONAL BIKE LANES (Class 2)

- Risk reduction of 32% across all study projects
- Improved safety on all streets, particularly on low and mid- volume streets (42%, 26% reduction in risk respectively)
- The Bronx and Brooklyn have risk reductions of 34% and in Manhattan cyclist risk decreased by 28% (the boroughs with large enough sample sizes)

Study Note

This analysis compares the bicyclist risk before and after a project. Since the type of bike lane on each project is selected based on the specific needs and conditions on that street, the results of the different bike lane types are not necessarily comparable.

For example, the results show reductions in risk for all of the bike lane types, which indicates that they are doing well in the types of locations where they were selected. However, it does not mean that the same safety performance of a Conventional Bike Lane can be expected if placed in some of street conditions where Protected Bike Lanes are chosen to be used.

Results

Results of **before-after** risk analysis (cyclist injuries per 10M cyclists per mile)

CYCLING VOLUMES

- These projects are also effective at increasing bicycle ridership; both PBL and conventional bike lane increased bicycle volumes by over 50%.
- On the highest risk streets, bicycling volumes nearly doubled after a bike lane was installed

OTHER PLANNING CONSIDERATIONS

- When considering street widths, PBLs have the greatest risk reduction (35%) on one-way streets wider than 60 ft and conventional lanes, typically installed on narrower streets than PBLs, reduced risk on one-way streets narrower than 40 ft by 35%.
- Class 3 shared lanes saw a risk reduction of 18% across all study projects. Shared lanes, while not a major feature of NYCs bike network, will continue to be used in select locations (for example, to provide wayfinding, as part of bike boulevards, or on very narrow/low volume streets).

Study Note

This study analyzes the effect that DOT bicycle projects installed between 2009 and 2018 had on bicyclist safety. The results should be interpreted, not as predictive, but as an evaluation on the effectiveness of these projects under the planning and design framework in which they were conceived and delivered.

While DOT's bicycle network designs continue to evolve and innovate, a similar level of success in ridership and safety are expected in future bike lane projects.

NYC Bike Lane Network Development

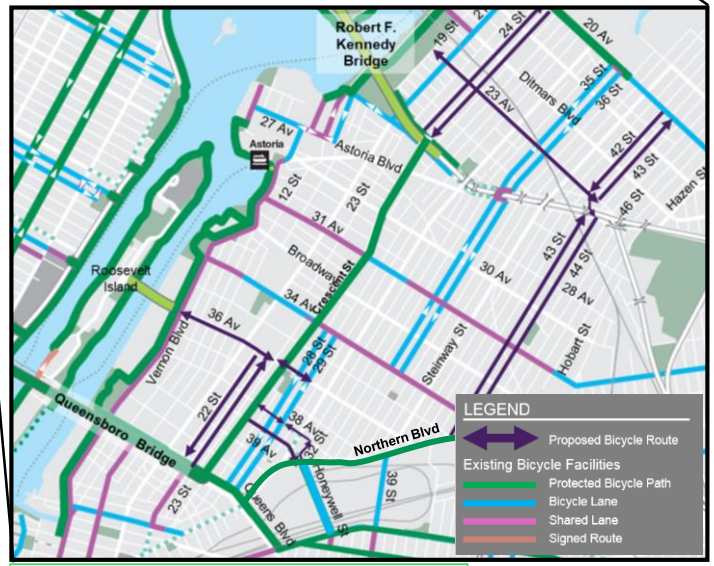
Bike lane selection

This evaluation illustrates the safety and ridership gains from building out a connected bicycle network of appropriately placed PBLs and conventional bike lanes.

Protected bike lanes will continue to form the backbone of the citywide connected bike network. These PBL corridors will be served by a neighborhood bike network that includes a mix of bike lane types include PBLs, conventional bike lanes, traffic- and vehicle-calmed bike boulevards, and other innovative designs. Each type of bicycle lane will be chosen based on the context of the project including vehicular speeds, volumes, land uses, and destinations.

The selection of bike lanes within a neighborhood network will also be based on factors that include the contextual safety findings from this study, feasibility, network connections, and attractiveness to both new and current bicycle riders.

Green Wave Proposal for Astoria



Example of the Astoria neighborhood bike network development using a mix of bike lane types including PBLs on major routes

Realization of Local Bike Lane Network

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